

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

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## Macro stability: a joint monetary-fiscal effort

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  - ▶ ...monetary policy must “actively” target inflation...
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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 (this conference))
- 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
  - ▶ May require shifts from debt stabilization towards macro stabilization

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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
- How to allow for such visits, without threatening stability?

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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:

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

with  $R_t$  gross nominal interest rate,  $\pi_t$  union-wide gross inflation



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- Policy parameters may vary across regimes, indexed by  $s_t$

## Characterizing fiscal policy

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

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

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:

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

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

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

- State-dependent **bailout fraction**,  $\gamma_{s_t}$ , determined by

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

with  $\phi_{\gamma, s_t}$  **bailout elasticity**

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- Evolution of government debt in country 2:

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



## Households

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

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

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

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

with  $y_i$  constant endowment

- Consumption Euler equation:

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

## Resource constraint

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

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

- 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 Unstable:

- ▶ 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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# The four regimes we consider

## ① Unstable \*\*\*our baseline\*\*\*:

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- Switching occurs only between U and one other regime



## Regime transitions

- Switching occurs only between U and one other regime
- Transition matrix given by

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

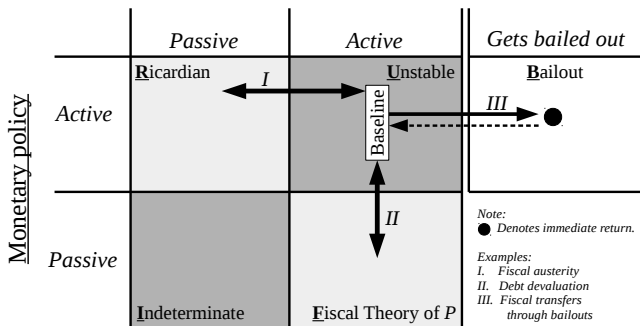
with  $p_{UU} + p_{Us_t} = p_{s_{t-1}U} + p_{s_{t-1}s_t} = 1$

- 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

## Fiscal policy in country 1



## Results

# Strategy

- Keep Unstable 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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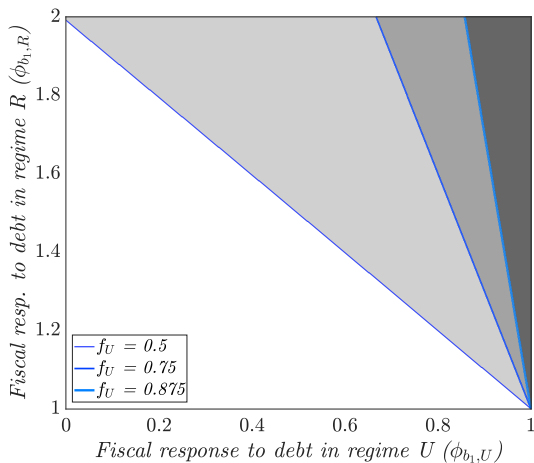
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▶ See benchmark calibration

## Example 1: regime-switching fiscal policy

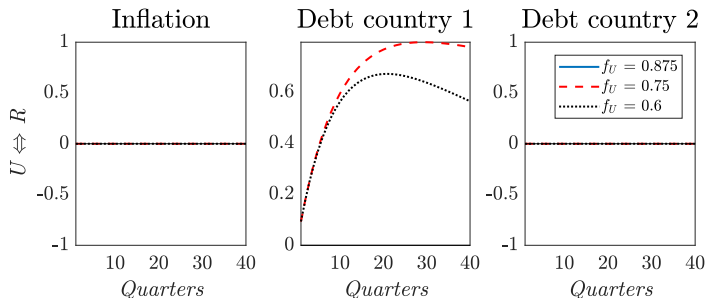


Note: white = no stable equilibrium; gray: stable equilibrium.



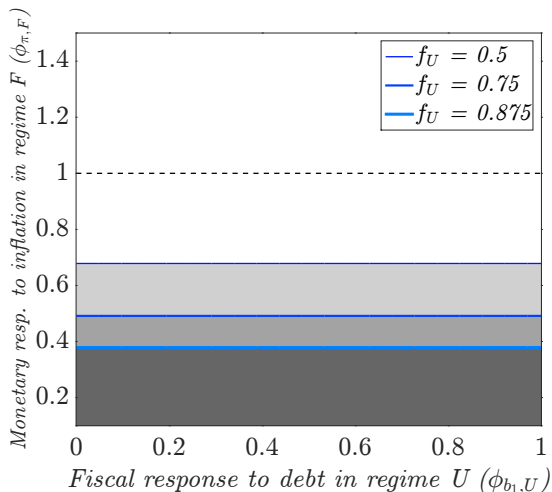
# Ricardian Equivalence holds

## Responses to tax cut in country 1



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

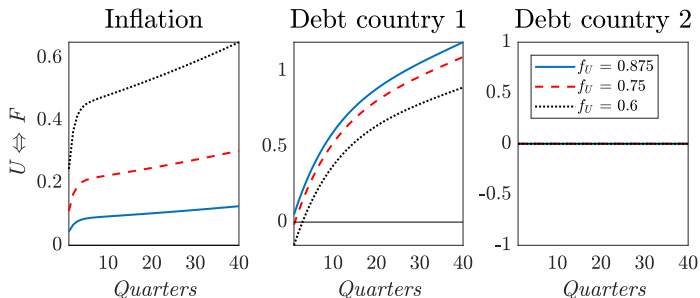
## Example 2: regime-switching monetary policy



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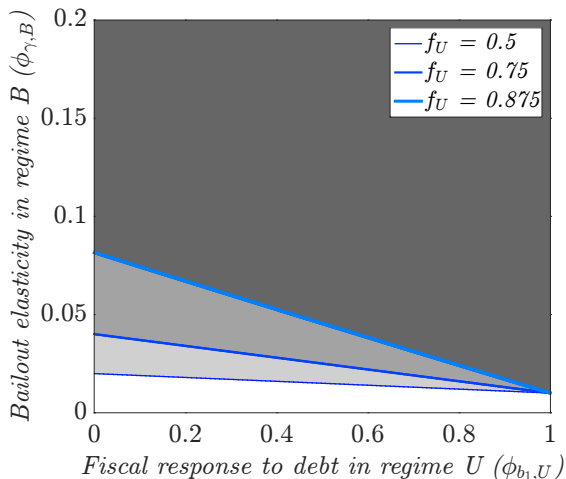
# Debt devaluation in country 1

## Responses to tax cut in country 1



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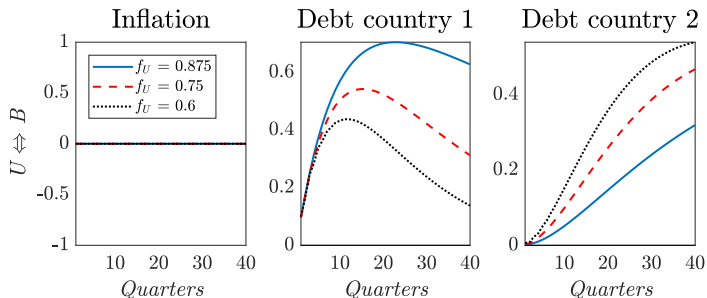
### Example 3: regime-switching fiscal bailouts



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

# Fiscal transfers to country 1

## Responses to tax cut in 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 U
  - ▶ Dynamic responses of economy sensitive to expected future regimes

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## Reference slides

# Benchmark calibration

	Description	Value	Interpretation
$\beta$	Discount factor	0.99	4 percent annual real interest rate
$\rho_{\tau}$	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
$\phi_{\pi, s_t}$	Monetary policy stance ( $s_t \neq F$ )	1.5	Ensures active monetary policy
$\phi_{b_2}$	Fiscal policy stance country 2	0.02	Ensures passive fiscal policy

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