Fiscal and monetary policy coordination, macroeconomic stability, and sovereign risk

Dennis Bonam[1] and Jasper Lukkezen[2,3]

[1]VU University, Amsterdam
[2]Utrecht University
[3]CPB Netherlands Bureau for Economic Policy Analysis

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Policy coordination and macroeconomic stability: the conventional view

- In standard dynamic macroeconomic models, when:
  - fiscal policy stabilises government debt, and...
  - ...monetary policy pins down price level, then...
  - ...equilibrium outcome both stable and unique
- Formalised, and generalised, by Leeper (1991)

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    - ...equilibrium outcome both stable and unique
- Formalised, and generalised, by Leeper (1991)
- Result independent of *relative* policy strengths
- Creates 'dichotomy' between fiscal and monetary policy

But wait...

- In times of sovereign risk:
  - Concerns about government debt sustainability
  - Higher inflation expectations (Davig et al., 2011)
- Necessitate change in fiscal and monetary stance

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Main question:
How does sovereign risk affect stability properties of fiscal and monetary policy?

The model

A simple dynamic model of sovereign risk

- Much like Leeper (1991)
  - Closed endowment economy
  - Infinitely lived, optimising households
  - Fiscal and monetary authority (independent)
  - Rules that specify policy stance

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  - Rules that specify policy stance
- Where we depart from Leeper
  - Allow for sovereign default
  - More general policy rules
  - Cashless economy

Households

- Households receive constant endowment y, consume c, pay lump-sum taxes τ and invest in government bonds B
- Bonds earn gross return R, yet subject to sovereign default risk
- Household problem:

$$\max E_0 \sum_{k=0}^{\infty} \beta^k \log c_{t+k},$$

where $\beta \in (0,1)$ discount factor, subject to budget constraint

$$P_t c_t + P_t \tau_t + B_t = P_t y + (1 - \delta_t) R_{t-1} B_{t-1}, \tag{1}$$

where P_t price level and δ_t sovereign default probability

Fiscal authority ("government")

- Government levies taxes and issues debt to cover expenditures
- Government budget constraint (real terms):

$$\tau_t + b_t = g_t + (1 - \delta_t) \frac{R_{t-1}}{\pi_t} b_{t-1}, \tag{2}$$

where $g_t = g$ public consumption, $b_t \equiv B_t / P_t$ and $\pi_t \equiv P_t / P_{t-1}$

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- Sovereign default possible due to presence of 'fiscal limit' (Bi, 2012)
- Here, fiscal limit exogenous (Corsetti et al., 2013)
- Particularly:

$$\delta_t = H\left(\frac{R_{t-1}}{\pi_t}\,b_{t-1}\right)$$

- Let $\Phi \equiv H^{'}\,(R/\pi)\,b/\,(1-\delta)$ denote default elasticity

Fiscal policy described by policy rule

- Fiscal policy rule:

$$\underbrace{\tau_t - g}_{\text{primary surplus}} = \widetilde{\gamma}_b \underbrace{(b_{t-1} - b^*)}_{\text{'debt target'}} + \widetilde{\gamma}_d \underbrace{(d_t - d^*)}_{\text{'deficit target'}} + \underbrace{\left(\frac{1}{\beta} - 1\right) b}_{\text{constants}}, \qquad (3)$$

where d_t budget deficit and b^* and d^* targets for debt and deficit

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- Log-linearised (around steady state):

$$\hat{\tau}_t = \frac{b}{\tau}\left(\gamma_b \hat{b}_{t-1} + \gamma_d \hat{R}_{t-1}\right), \tag{4}$$

  where $\gamma_b \equiv \left[\widetilde{\gamma}_b + \widetilde{\gamma}_d (R-1)\right] / (1 + \widetilde{\gamma}_d)$ and $\gamma_d \equiv \widetilde{\gamma}_d R / (1 + \widetilde{\gamma}_d)$

- Hat-variables denote percentage deviations from steady state

Characterisation of fiscal stance

Definition 1

If $\gamma_b > 1/\beta - 1$, fiscal policy stance is "passive"; otherwise it is "active" (Leeper, 1991).

- Note, $1/\beta - 1$ is (hypothetical) risk-free real rate in steady state
- Passive (active) policy ensures (ignores) long-run debt sustainability

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Definition 2

If $\gamma_d > 0$, fiscal policy is "strong"; otherwise, it is "weak".

- Strong (weak) policy restricts (allows) budget deficits
- Also, $\gamma_d > 0$ ($\gamma_d < 0$) may imply pro- (anti-) cyclical policy

Monetary authority ("central bank")

- Monetary policy described by monetary rule:

$$R_t = \widetilde{\alpha}_\pi \left(\pi_t - \pi^* \right), \tag{5}$$

where π^* inflation target

- Log-linearised:

$$\hat{R}_t = \alpha_\pi \hat{\pi}_t, \tag{6}$$

where $\alpha_\pi \equiv \widetilde{\alpha}_\pi \pi / R$

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Definition 3

If $\alpha_\pi > 1$, monetary policy is "active"; otherwise, it is called "passive" (Leeper, 1991).

- Active (passive) policy means central bank raises policy rate R more (less) than one-for-one with inflation

Analysis

Linearised system in state-space form

- Reduced linear model:

$$\begin{bmatrix} E_t\hat{\pi}_{t+1} \\ \hat{b}_t \end{bmatrix} = A \begin{bmatrix} \hat{\pi}_t \\ \hat{b}_{t-1} \end{bmatrix}$$

where 2x2 matrix A defined in ▸ Appendix

- 1 forward-looking variable ($\hat{\pi}_t$), 1 pre-determined variable ($\hat{b}_t$)

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- 1 forward-looking variable ($\hat{\pi}_t$), 1 pre-determined variable ($\hat{b}_t$)
- Blanchard-Kahn conditions (Blanchard and Kahn, 1980):
  - No. unstable eigenvalues $= 1$: stable and unique eqm
  - No. unstable eigenvalues > 1: no solution ("unstable")
  - No. unstable eigenvalues < 1: no unique solution ("indeterminate")

Benchmark case: no sovereign risk

Theorem 1

Given $\Phi = 0$, fiscal rule (3) and monetary rule (5), a stable and unique equilibrium is obtained if and only if:

- $\alpha_\pi > 1$ *and* $\gamma_b > \frac{1}{\beta} - 1$; *or*
- $\alpha_\pi < 1$ *and* $\gamma_b < \frac{1}{\beta} - 1$.

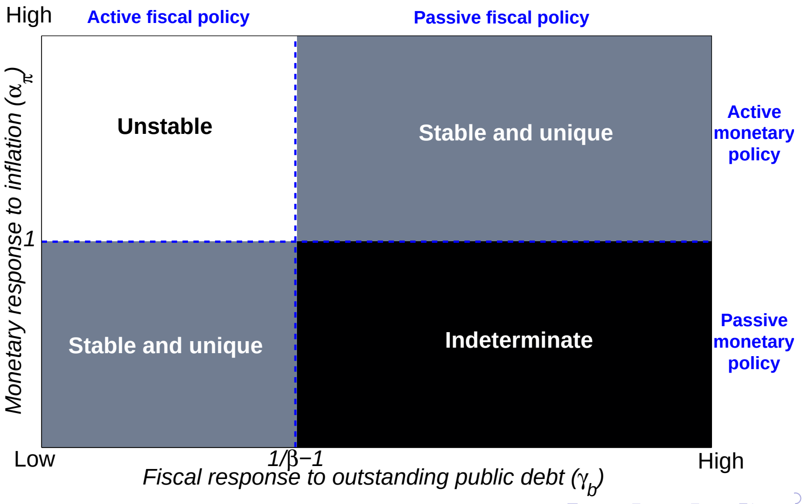
Proof.

See Appendix

$\square$

Visualising the 'fiscal-monetary dichotomy'

Equilibrium outcome as function of policy stance



'Dichotomy' between fiscal and monetary policy

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$\alpha_\pi < 1$ *and* $\gamma_b < \frac{1}{\beta} - 1$.

- Also, policy requirements independent of γ_d - why?
    - No sovereign risk $\Rightarrow$ only long-run debt sustainability important
    - Short-run debt developments irrelevant
    - Government may run deficits from time to time

Implications of sovereign risk

Theorem 2

Given $\Phi > 0$, a fiscal rule (3) and monetary rule (5), a stable and unique equilibrium is obtained if and only if:

- $\alpha_\pi > 1 + \frac{\tilde{\Phi}\gamma_d}{\frac{1}{\beta}-1-\gamma_b-\gamma_d\tilde{\Phi}}$ *and* $\gamma_b > \frac{1}{\beta} - 1 - \gamma_d\tilde{\Phi} + \frac{\tilde{\Phi}\gamma_d}{1-\alpha_\pi}$*; or*
- $\alpha_\pi < 1 + \frac{\tilde{\Phi}\gamma_d}{\frac{1}{\beta}-1-\gamma_b-\gamma_d\tilde{\Phi}}$ *and* $\gamma_b < \frac{1}{\beta} - 1 - \gamma_d\tilde{\Phi} + \frac{\tilde{\Phi}\gamma_d}{1-\alpha_\pi}$.

where $\tilde{\Phi} \equiv \Phi/\left(1-\Phi\right)$.

Proof.

Similar to proof of Theorem 1. □

Dichotomy lost!

- α_π and γ_b now function of each other $\Rightarrow$ dichotomy lost - why?
- Sovereign risk causes debt to be non-neutral:
    - Rise in sovereign risk reduces return on bonds...
    - ...induces households to get rid of bonds and raise consumption...
    - ...which causes price level to go up

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- Budget deficits matter:
  - Economy near fiscal limit
  - Budget deficit *today* raises probability of default *tomorrow*

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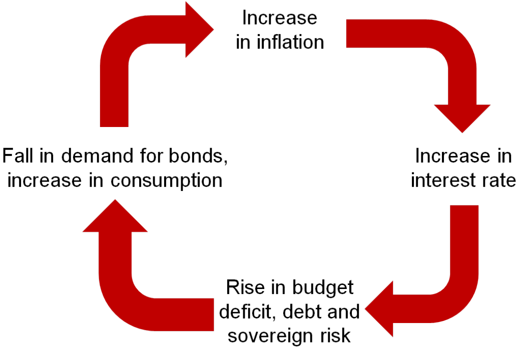
- Eqm outcome more/less stable depending on fiscal objectives

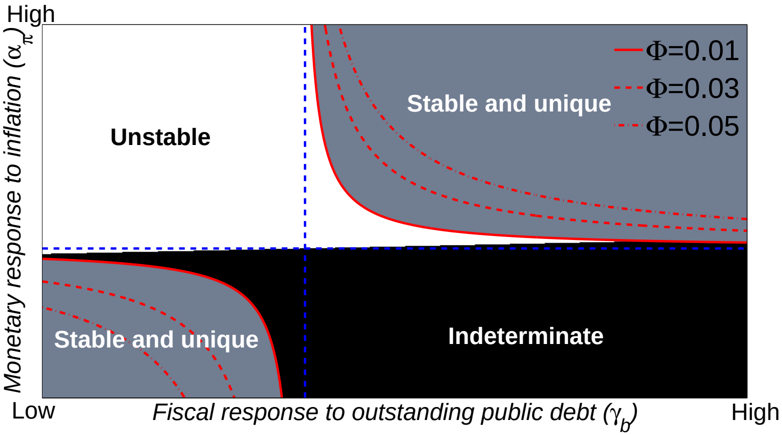
Budget deficits matter

- If fiscal policy weak, eqm more likely to be unstable:



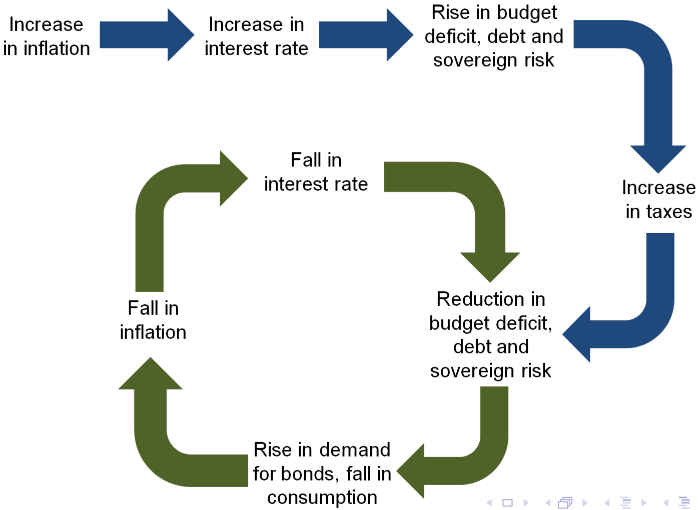
Implications of sovereign risk under weak fiscal policy

Equilibrium outcome as function of policy stance



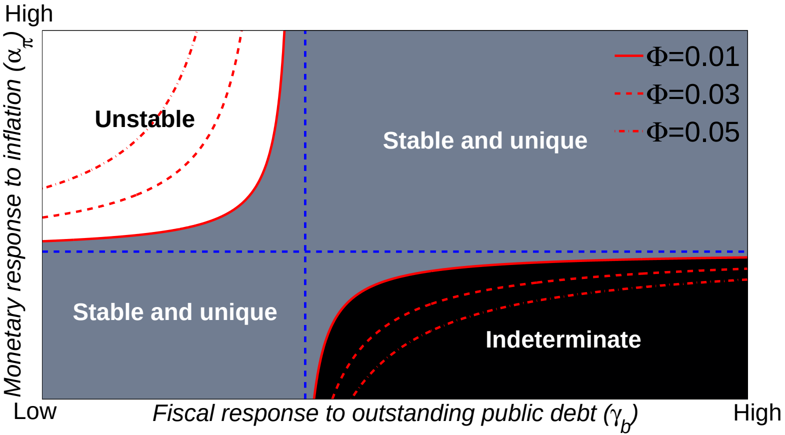
Budget deficits matter (*cont.*)

- If fiscal policy strong, eqm more likely to be stable:



Implications of sovereign risk under strong fiscal policy

Equilibrium outcome as function of policy stance



Conclusion

Wrapping up

- Sovereign risk:
  - causes debt to be non-neutral and generates inflation
  - impairs monetary independence
- When government neglects deficits, eqm outcome more unstable
- When government restricts deficits, stable eqm more easily obtained

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- Highlights benefits of credible deficit restrictions
- Questions role anti-cyclical fiscal policy when debt unstable

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- When government restricts deficits, stable eqm more easily obtained
- Highlights benefits of credible deficit restrictions
- Questions role anti-cyclical fiscal policy when debt unstable
- **Punch-line: restrict deficits in times of sovereign debt crisis!**

Thank you for your attention!

Linearised system in state-space form

Household's first-order condition:

$$\frac{1}{c_t} = \beta E_t \left[(1-\delta_{t+1}) \frac{R_t}{\pi_{t+1}} \frac{1}{c_{t+1}} \right]$$

Log-linearise, realising that $c_t = c = y - g$:

$$0 = \hat{R}_t - E_t \hat{\pi}_{t+1} - \tilde{\Phi} \hat{b}_t \tag{7}$$

Linearised version of public's budget constraint:

$$\hat{b}_t + \frac{\tau}{b} \hat{\tau}_t \quad = \quad \left(\frac{1-\Phi}{\beta} \right) \left(\hat{R}_{t-1} - \hat{\pi}_t + \hat{b}_{t-1} \right) \tag{8}$$

Combine (4), (6), (7) and (8) to obtain:

$$\begin{bmatrix} E_t \hat{\pi}_{t+1} \\ \hat{b}_t \end{bmatrix} = \begin{bmatrix} \alpha_\pi + \tilde{\Phi} \gamma_d & -\tilde{\Phi} \left(\frac{1}{\beta} - \gamma_b - \gamma_d \tilde{\Phi} \right) \\ -\gamma_d & \frac{1}{\beta} - \gamma_b - \gamma_d \tilde{\Phi} \end{bmatrix} \begin{bmatrix} \hat{\pi}_t \\ \hat{b}_{t-1} \end{bmatrix}$$

Return to Analysis

Proof of Theorem 1

Proof.

When $\Phi = 0$, A reduces to $\begin{bmatrix} \alpha_\pi & 0 \\ -\gamma_d & \frac{1}{\beta} - \gamma_b \end{bmatrix}$. For ξ_i eigenvalues of A, with $i = 1, 2$, we know that $\xi_1 \xi_2 = \det(A)$ and $\xi_1 + \xi_2 = \operatorname{tr}(A)$. A stable and unique solution requires one eigenvalue outside and one within unit circle. Necessary condition therefore $(\xi_1 - 1)(\xi_2 - 1) < 0$. Multiplying out, substituting for $\xi_1 \xi_2$ and $\xi_1 + \xi_2$ and solving for α_π and γ_b, one obtains conditions in Proposition 1. □

Return to Theorem 1