Optimal Macroprudential and Monetary Policy in a Currency Union

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Stabilization Tools

Tools for macroeconomic stabilization

- Monetary policy (Great Moderation)
- Macroprudential regulation (Great Recession)

Stabilization Tools

Tools for macroeconomic stabilization

- Monetary policy (Great Moderation)
- Macroprudential regulation (Great Recession)

Monetary Union

- Single monetary policy cannot stabilize asymmetric shocks
- Macroprudential policy *can* be used to stabilize economy

This Paper

Optimal macroprudential and monetary policy in MU

1. Is optimal macroprudential policy used for regional stabilization?

2. Gains from coordination of macroprudential policy?

This Paper

Optimal macroprudential and monetary policy in MU

1. Is optimal macroprudential policy used for regional stabilization?

   Yes, even with optimal fiscal transfers

2. Gains from coordination of macroprudential policy?

   Yes, even without monopoly power over traded goods/assets

Why Macroprudential Regulation?

This paper

- Agents value holding safe assets (debt)
- Banks have incentives to create safe assets
- Safe debt must be guaranteed to be safe
- Banks don't internalize all the of costs of issuing safe debt
  $\Rightarrow$ fire-sale externality $\Rightarrow$ safe debt overissuance
- Macroprudential policy limits safe debt issuance

Model Overview: Closed Economy

- Time: $t = 0, 1$
- Aggregate uncertainty: s_0, s_1
- Goods
  - perishable consumption goods [sticky price in $t = 0$]
  - durable good (housing) [flexible price]
- Identical large families
  - **consumers**: consumption and portfolio allocation
  - **workers**: hired by firms
  - **firms**: produce consumption goods, set prices
  - **bankers**: produce durable goods and issue securities
- Government
  - monetary authority
  - fiscal authority
  - financial regulator
- Any security (backed by durable good) is traded

Preferences

$$\mathcal{U} = u(c_0) - v(n_0) + \beta \Big[u(c_1 + \underline{c}_1) - v(n_1) \Big]$$

- $c_1 + \underline{c}_1$ total consumption in period 1

Preferences

$$\mathcal{U} = u(c_0) - v(n_0) + \beta\Big[u(c_1 + \underline{c}_1) - v(n_1)\Big] \\ + \beta\Big[\nu u(\underline{c}_1) + X_1(s_1) g(h_1)\Big]$$

- $c_1 + \underline{c}_1$ total consumption in period 1
- $\underline{c}_1$ consumption that must be bought with safe securities
- h_1 consumption of durable goods
- $X_1(s_1) \in \{\theta, 1\}$ shock to preferences

Large Family Problem

$$\mathbb{E}\left\{u\left(c_0\right)-v\left(n_0\right)+\beta\left[u\left(c_1+\underline{c}_1\right)-v\left(n_1\right)+u\left(\underline{c}_1\right)+X_1(s_1)g\left(h_1\right)\right]\right\}$$

$$\begin{aligned}
s.t.: & T_0+P_0c_0+\frac{D_1^c}{1+i_0}+P_0k_0\leq\frac{D_1^b}{1+i_0}\left(1-\tau_0^B\right)+W_0n_0+\Pi_0^j\\
& P_1\left(c_1+\underline{c}_1\right)+T_1+\Gamma_1h_1+D_1^b\leq D_1^c+W_1n_1+\Gamma_1G(k_0)+\Pi_1^j\\
& P_1\underline{c}_1\leq D_1^c\\
& D_1^b\leq\min\{\Gamma_1\}G\left(k_0\right)
\end{aligned}$$

Large Family Problem

Consumer

$$\mathbb{E}\left\{u\left(c_0\right)-v\left(n_0\right)+\beta\Big[u\left(c_1+\underline{c}_1\right)-v\left(n_1\right)+u\left(\underline{c}_1\right)+X_1(s_1)g\left(h_1\right)\Big]\right\}$$

$$s.t.:T_0+P_0c_0+\frac{D_1^c}{1+i_0}+P_0k_0\leq\frac{D_1^b}{1+i_0}\left(1-\tau_0^B\right)+W_0n_0+\Pi_0^j$$

$$P_1\left(c_1+\underline{c}_1\right)+T_1+\Gamma_1h_1+D_1^b\leq D_1^c+W_1n_1+\Gamma_1G(k_0)+\Pi_1^j$$

$$P_1\underline{c}_1\leq D_1^c \quad \text{[Safe-assets-in-advance constraint]}$$

$$D_1^b\leq\min\{\Gamma_1\}G\left(k_0\right)$$

Large Family Problem

Worker

$$\mathbb{E}\left\{u\left(c_0\right)-v\left(n_0\right)+\beta\Big[u\left(c_1+\underline{c}_1\right)-v\left(n_1\right)+u\left(\underline{c}_1\right)+X_1(s_1)g\left(h_1\right)\Big]\right\}$$

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Large Family Problem

Banker

$$\mathbb{E}\left\{u\left(c_0\right)-v\left(n_0\right)+\beta\Big[u\left(c_1+\underline{c}_1\right)-v\left(n_1\right)+u\left(\underline{c}_1\right)+X_1(s_1)g\left(h_1\right)\Big]\right\}$$

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$$P_1\underline{c}_1\leq D_1^c$$

$$D_1^b\leq\min\{\Gamma_1\}G\left(k_0\right)\ \text{[Collateral constraint]}$$

Large Family Problem

Firm

$$\mathbb{E}\left\{u\left(c_0\right)-v\left(n_0\right)+\beta\Big[u\left(c_1+\underline{c}_1\right)-v\left(n_1\right)+u\left(\underline{c}_1\right)+X_1(s_1)g\left(h_1\right)\Big]\right\}$$

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\end{aligned}$$

$$\Pi_t^j=\left(P_t^j-\frac{\left(1+\tau_t^L\right)W_t}{A_t}\right)y_t\left(\frac{P_t^j}{P_t}\right)^{-\epsilon}$$

Government

Monetary authority

- Sets i_0, Π^*

Fiscal authority

- Sets lump sum taxes T_t, labor taxes $\tau_0^L, \tau_1^L = -1/\epsilon$; issues safe debt D_1^g

Financial regulator

- Sets macroprudential tax τ_0^B

Equilibrium

Euler equation + mkt clearing conditions

$$u'(c_0) = \beta \frac{1+i_0}{\Pi^*} u'(y_1^*) \left(1+\tau^A\right), \; \tau^A = \frac{\nu u'(d_1^b + d_1^g)}{u'(y_1^*)}$$

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Investment in durable goods + durable goods mkt clearing

$$\beta \frac{u'(y^*)}{u'(c_0)} G'(k_0)\left[(\mu + (1-\mu)\theta)\frac{g'[G(k_0)]}{u'(y^*)} + \zeta_0(\tau_0^b)\theta \frac{g'[G(k_0)]}{u'(y^*)}\right] = 1$$

Equilibrium

Euler equation + mkt clearing conditions

$$u'\left(c_0\right)=\beta\frac{1+i_0}{\Pi^*}u'\left(y_1^*\right)\left(1+\tau^A\right),\ \tau^A=\frac{\nu u'(d_1^b+d_1^g)}{u'\left(y_1^*\right)}$$

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$$\beta\frac{u'(y^*)}{u'(c_0)}G'(k_0)\left[(\mu+(1-\mu)\theta)\frac{g'\left[G(k_0)\right]}{u'(y^*)}+\zeta_0(\tau_0^b)\theta\frac{g'\left[G(k_0)\right]}{u'(y^*)}\right]=1$$

Collateral constraint + durable goods mkt clearing

$$d_1^b\leq\theta\frac{g'[G(k_0)]}{u'\left(y_1^*\right)}G(k_0)$$

Ramsey Problem

$$\max_{c_0,k_0,d_1^b} \quad \mathbb{E}_{s_1} V(c_0, k_0, d_1^b | s_0, s_1)$$

$$s.t.: \quad d_1^b \leq \theta \frac{g'[G(k_0)]}{u'(y_1^*)} G(k_0)$$

Ramsey Solution

Optimal choice of consumption

$$u'(c_0) = \frac{v'(n_0)}{A_0}$$

Ramsey Solution

Optimal choice of consumption

$$u'(c_0) = \frac{v'(n_0)}{A_0}, \quad \text{Labor wedge} \quad \tau_0 \equiv 1 - \frac{v'(n_0)}{A_0 u'(c_0)}$$

Ramsey Solution

Optimal choice of consumption

$$u'(c_0) = \frac{v'(n_0)}{A_0}, \quad \text{Labor wedge} \quad \tau_0 \equiv 1 - \frac{v'(n_0)}{A_0 u'(c_0)}$$

Optimal investment in durables production and safe debt supply

$$\beta \frac{u'(y^*)}{u'(c_0)} \cdot \frac{g'[G(k_0)]}{u'(y^*)} G'(k_0) \left[\mu + (1-\mu)\theta + \theta \tau^A (1 - \epsilon_\Gamma)\right] = 1$$

[ϵ_Γ - elasticity of durables demand]

Implementation

Optimal monetary and macroprudential policy

$$\tau_0 = 0$$

$$\tau_0^b = \frac{\tau_A}{1 + \tau_A}\epsilon_\Gamma$$

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Krugman, Svensson

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If macroprudential policy is suboptimal, then

$$\tau_0 = \frac{1}{Z_1}\left[\frac{\epsilon_\Gamma \tau_A}{1+\tau_A} - \tau_0^b\right], Z_1 > 0$$

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Borio, Stein

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Optimal monetary and macroprudential policy

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Krugman, Svensson

If macroprudential policy is suboptimal, then

$$\tau_0 = \frac{1}{Z_1}\left[\frac{\epsilon_\Gamma \tau_A}{1+\tau_A} - \tau_0^b\right], Z_1 > 0$$

Borio, Stein

If monetary policy is suboptimal, then

$$\tau_0^b = \frac{1}{1-\tau_0}\left[\frac{\epsilon_\Gamma \tau_A}{1+\tau_A} - \tau_0 Z_2\right], Z_2 > 1$$

Monetary Union: New Elements

- Continuum of countries $i \in [0, 1]$
- Goods
  - perishable non-traded produced consumption goods [sticky price in $t = 0$]
  - perishable traded consumption goods [endowment e_0^i, e_1^i]
  - local durable good is made from non-traded goods
- Identical large families: no mobility
- International Markets
  - traded goods
  - safe debt
- Government
  - union-wide monetary authority
  - regional fiscal authority
  - regional financial regulator

Preferences

$$\mathcal{U} = u\left(c_0\right) - v\left(n_0\right) + \beta\Big[u\left(c_1 + \underline{c}_1\right) - v\left(n_1\right)\Big]$$
$$+ \beta\Big[\nu(s_0)u\left(\underline{c}_1\right) + X_1(s_1)g\left(h_1\right)\Big]$$

Preferences

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$$\Downarrow$$

$$\mathcal{U}^i = U\left(c^i_{NT,0}, c^i_{T,0}\right) - v\left(n^i_0\right) + \beta U\left(c^i_{NT,1} + \underline{c}^i_{NT,1}, c^i_{T,1} + \underline{c}^i_{T,1}\right) \\ + \beta\Big[\nu^i(s_0)U\left(\underline{c}^i_{NT,1}, \underline{c}^i_{T,1}\right) + X^i_1(s_1)g\left(h^i_1\right) - v\left(n^i_1\right)\Big]$$

- $c^i_{T,0}, c^i_{T,1}, \underline{c}^i_{T,1}$ traded goods consumption
- $c^i_{NT,0}, c^i_{NT,1}, \underline{c}^i_{NT,1}$ non-traded goods consumption

Preferences

$$\mathcal{U} = u\left(c_0\right) - v\left(n_0\right) + \beta\Big[u\left(c_1 + \underline{c}_1\right) - v\left(n_1\right)\Big]$$
$$+\beta\Big[\nu(s_0)u\left(\underline{c}_1\right) + X_1(s_1)g\left(h_1\right)\Big]$$

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- $c^i_{T,0}, c^i_{T,1}, \underline{c}^i_{T,1}$ traded goods consumption
- $c^i_{NT,0}, c^i_{NT,1}, \underline{c}^i_{NT,1}$ non-traded goods consumption

Assumption $\quad U\left(c_{NT}, c_T\right) = \log\left(c^a_{NT} c^{1-a}_T\right)$

Equilibrium in Country i

$$\frac{a}{c^i_{NT,0}} = \frac{1+i_0}{P^i_{NT,1}/P^i_{NT,0}} \beta \frac{a}{y^{i,*}_{NT,1}} \left(1+\tau^i_A\right), \tau^i_A = \frac{\nu^i y^{i,*}_{NT,1}}{\underline{c}^i_{NT,1}}$$

$$\frac{a}{c^i_{NT,0}} = \beta g' \left[G\left(k^i_{NT,0}\right)\right] G'\left(k^i_{NT,0}\right) \left(\mu + (1-\mu)\theta^i + \zeta^i_0 \theta^i\right)$$

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$$d^{b,i}_1 \leq \theta^i \frac{g'[G(k^i_0)]}{a/y^{i,*}_{NT,1}} G(k^i_0) p^i_1$$

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$$d^{b,i}_1 \leq \theta^i \frac{g'[G(k^i_0)]}{a/y^{i,*}_{NT,1}} G(k^i_0) p^i_1$$

$$\frac{\underline{c}^i_{NT,1} p^i_1}{a} = d^{c,i}_1$$

Regulator in Country i

- Objective: $\mathcal{U}^i$
- Constraints:
  - local equilibrium conditions
  - international prices
- Tool: local macroprudential tax

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Implementation

$$\tau_0^{b,i} = \frac{1}{1-\tau_0^i}\left[\frac{\tau_A^i \epsilon_\Gamma^i}{1+\tau_A^i} - \tau_0^i Z_2^i + Z_3^i d_1^{b,i} - Z_3^i a d_1^{c,i} - \frac{a}{1-a}\tau_0^i Z_4^i\right]$$

$$Z_2^i > 1, Z_3^i > 0, Z_4^i > 0$$

Global Regulator

- Objective: $\int \omega^i \mathcal{U}^i di$
- Constraints: ALL equilibrium equations
- Tools: local macroprudential taxes and monetary policy

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Implementation

- Monetary policy: $\int \omega_i \tau_0^i di = 0$

Global Regulator

- Objective: $\int \omega^i \mathcal{U}^i di$
- Constraints: ALL equilibrium equations
- Tools: local macroprudential taxes and monetary policy

Implementation

- Monetary policy: $\int \omega_i \tau_0^i di = 0$
- Macroprudential policy:

$$\tau_0^{b,i}\Big|_{global} = \tau_0^{b,i}\Big|_{local} + \frac{Z_5^i \widetilde{\psi}_0}{1 - \tau_0^i}$$

$\widetilde{\psi}_0$ - social marginal value of traded goods

Adding Fiscal Transfers

- Monetary and macroprudential policies are set optimally
- Fiscal transfers: redistribution of gov. revenues
- Equalizes social value of traded goods across countries
- Labor wedge is not closed $\Rightarrow$ macropru depends on τ_0^i

Conclusion

1. Optimal macroprudential and monetary policy in MU

2. Macroprudential policy is used to stabilize business cycles
   - even when fiscal transfers are allowed

3. Gains from policy coordination
   - even when no monopoly power over traded goods/assets