Integrated Monetary and Financial Policies for Small Open Economies

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Motivation

- Many small open economies follow more eclectic approaches than textbook inflation targeting
  $\Rightarrow$ But the eclectic approach lacks a framework
- Goal is provide a framework to guide the optimal use of central bank tools:
  - Monetary policy and exchange rate flexibility
  - Capital controls
  - FX intervention
  - Macroprudential polices
- Build an integrated model with multiple externalities and ask:
  - How do the entire range of policies and externalities interact?
  - How do the tradeoffs change when policies are used in combinations?
  - How should countries optimally use these policies?

Preview of Results

1. Prudential capital controls depend on pricing paradigm
   - Exchange rates are more volatile when pricing is in dominant currency than in producer currency
2. Capital controls and FX intervention enhance monetary autonomy if FX markets are shallow
   - Trilemma and dilemma
3. Limits on currency mismatches can make FX markets shallower
4. Depreciations relax domestic currency constraints but tighten FX constraints

Roadmap

- Motivation
- Preview of results
- Environment
- Result 1: Capital controls and pricing paradigm
- Result 2: Monetary autonomy with shallow FX markets
- Conclusion

Three-Period Small Open Economy

- **Joint use of policy tools**

- **Households** consume home tradable goods C_{Ht}, imports C_{Ft}, housing C_{Rt}, supply labor N_t (Cole and Obstfeld, 1991; Gali and Monacelli, 2005), borrow in domestic currency

$$C_{Ht} = \frac{\alpha_H}{\alpha_F}\frac{E_t P^*_{Ft}}{P_H} C_{Ft}, C_{Rt} = \frac{\alpha_R}{\alpha_F}\frac{E_t P^*_{Ft}}{P_{Rt}} C_{Ft}, \text{ and } W_t = \frac{1}{\alpha_F} E_t P^*_{Ft} C_{Ft}$$

$$\frac{\alpha_F}{P^*_{Ft} C_{Ft}} = \beta\left(1+\theta_{HHt}\right)\left(1+\rho_t\right)\mathbb{E}_t\left[\frac{E_t}{E_{t+1}}\frac{\alpha_F}{P^*_{Ft+1} C_{Ft+1}}\right]$$

- **Tradable goods firms** produce $Y_{Tt} = A_t N_t$ and set rigid prices at $t = 0$
  - PCP: export prices sticky in domestic currency; dollar price $= \frac{P_H}{E_t}$
  - DCP: export prices sticky in dollars at price P_X (Gopinath et al., 2020)

$$Y_t = C_{Ht} + Y_{Xt}, \text{ where } Y_{Xt} = \omega\frac{E_t P^*_{Ft}}{P_H} C^*_t \text{ or } \omega\frac{P^*_{Ft}}{P_X} C^*_t$$

- **Commodity sector** earns $P^*_{Zt} Z_t$ in dollars

Three-Period Small Open Economy

- **Housing firms** from two subsectors (Kiyotaki and Moore, 1997) borrow at rate $(1+\theta_{Rt})\,\rho_t$ and linear subsector faces a borrowing constraint at $t=1$

$$Y_{Rt+1}^{k}=\left\{\begin{array}{cc} L_t^k & \text{for } k=Linear \\ G\left(L_t^k\right) & \text{for } k=Concave \end{array}\right\} \text{ and } D_{R2}^{Linear}\leq \kappa_{L1} q_{L1} L_1^{Linear}$$

- **Domestic banks** lend at rate ρ_t, borrow at rate i_t from financial intermediaries subject to a borrowing constraint at $t=1$ based on P_H (similar to Farhi and Werning, 2016)

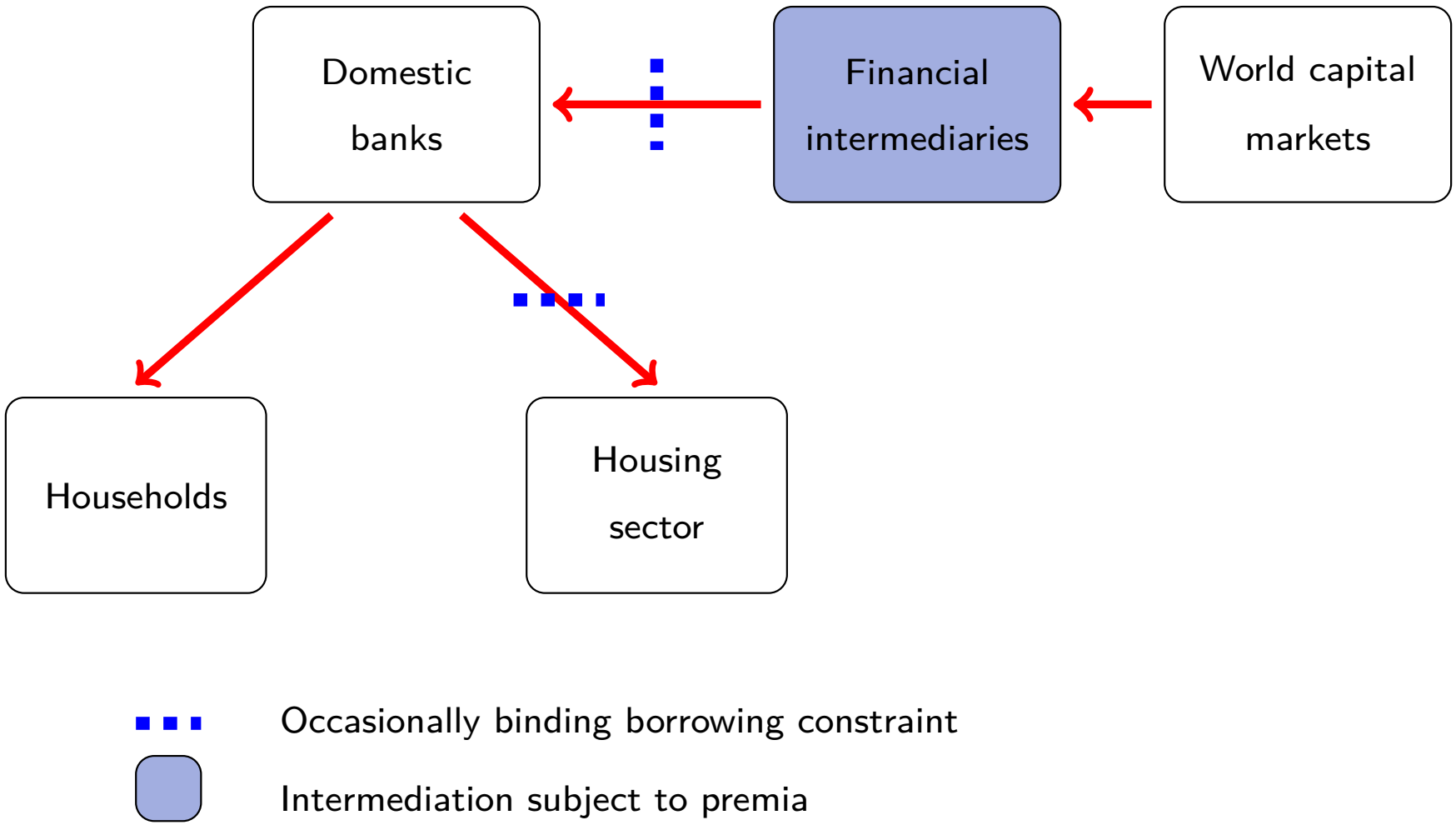
$$D_2 = D_{HH2} + D_{R2} \leq \kappa_{H1} P_H$$

- **Financial intermediaries** take open positions in domestic currency and FX bonds subject to balance sheet frictions (Gabaix and Maggiori, 2015)

$$\Gamma\left(\frac{D_{t+1}}{E_t}+FXI_t-S_t\right)=\mathbb{E}_t\left[(1-\varphi_t)(1+i_t)\frac{E_t}{E_{t+1}}-(1+i_t^*)\right]$$

$\lambda\in[0,1]$ of them are owned by domestic households $\Rightarrow$ currency mismatch

Financial Markets



Externalities

- Aggregate demand externality: households do not internalize the impact of their consumption decisions on aggregate demand
- Terms of trade externality: tradable goods firms do not take into account that production decisions impact the position of the aggregate economy on the export demand schedule
- Pecuniary aggregate demand externality: households do not internalize the effects of their individual actions on aggregate demand and the tightness of the constraint
- Pecuniary production externality: housing firms do not internalize the effects of their production decisions on land prices
- *Financial* terms of trade externality: households do not internalize that their borrowing decisions impact the premium that the economy as a whole needs to pay

Social Planner's Problem

Characterize constrained efficient allocations

$$\max_{\left\{C_{Ft},P_H,E_t,\eta_{t+1},FXI_t,L_{t-1}^{Linear}\right\}} \mathbb{E}_0\left[\sum_{t=0}^{2}\beta^t V\left(C_{Ft},\frac{E_tP_{Ft}^*}{P_H},\frac{P_{Ft}^*}{P_{\$t}},L_{t-1}^{Linear}\right)\right]$$

Pricing paradigm: $P_{\$t}=\frac{P_H}{E_t}$ if PCP; $P_{\$t}=P_X\left(\{C_{Ft}\},\{E_t\},P_H\right)$ if DCP

Resource constraint:

$$\left(1+i_{-1}^*\right)B_0\leq\sum_{t=0}^{2}\frac{P_{Ft}^*\left[\omega C_t^*-C_{Ft}\right]+P_{Zt}^*Z_t-(1-\lambda)FXI_{t-1}\left[\eta_t-\left(1+i_{t-1}^*\right)\right]}{\Pi_{s=1}^{t}\left[\lambda\left(1+i_{s-1}^*\right)+(1-\lambda)\eta_s\right]}$$

Housing firms' borrowing constraint: $B_{R2}^{Linear}\leq\kappa_{L1}\frac{q_{L1}}{E_1}L_1^{Linear}$

Domestic banks' borrowing constraint: $B_2\leq\kappa_{H1}\frac{P_H}{E_1}$

Intermediary friction: $\Gamma\left(B_{t+1}+FXI_t-S_t\right)=\mathbb{E}_t\left[\eta_{t+1}-(1+i_t^*)\right]$

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How do capital controls vary with the pricing paradigm?

Farhi and Werning (2016) meet Gopinath et al. (2020)

- Turn off housing sector and intermediary friction
- Ex ante capital controls are related to the ex post external constraint, which binds after large depreciations
- How does exchange rate volatility differ across PCP and DCP?
  - Consider a permanent commodity price decline $\Rightarrow$ permanently lower C_{F1}

PCP:

$$\underbrace{\frac{\alpha_H}{\alpha_F}\frac{E_1 P^*_{F1}}{P_H} C_{F1}}_{\text{import substitution}} + \underbrace{\omega C^*_1 \frac{E_1 P^*_{F1}}{P_H}}_{\text{export substitution}} - \alpha_H A_1 = 0$$

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DCP:

$$\underbrace{\frac{\alpha_H}{\alpha_F}\frac{E_1 P^*_{F1}}{P_H} C_{F1}}_{\text{import substitution}} + \underbrace{\omega C^*_1 \frac{E_1 P^*_{F1}}{P_H} \Theta C^2_{F1}}_{\text{price setting}} - \alpha_H A_1 = 0$$

where $\Theta\left(\{C_{Ft}\}, \{A_t\}\right)$ does not vary with the shock

DCP economy has more volatile exchange rates after shocks which alter imports.

How do capital controls vary with the pricing paradigm?

Farhi and Werning (2016) meet Gopinath et al. (2020)

- After adverse commodity price shocks, exchange rate depreciates more under DCP
- Banks' constraint may bind under DCP but not PCP

$$\underbrace{\frac{\alpha_H}{\alpha_F}\frac{E_1 P^*_{F1}}{P_H} C_{F1}}_{\text{import substitution}} + \underbrace{\text{DCP term}}_{\text{price setting}} + \underbrace{\Psi_{B1}\kappa_{H1}\frac{P_H}{E_1}}_{\text{internalize constraint}} - \alpha_H A_1 = 0$$

- Internalize the constraint $\Rightarrow$ Depreciate less, lower aggregate demand at $t = 1$
- To shift aggregate demand from $t = 0$ to $t = 1$, planner imposes ex ante capital controls

> Ex ante capital controls are more likely to be optimal under DCP than PCP.

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Does exchange rate flexibility deliver monetary autonomy?

Gabaix and Maggiori (2016) meet Rey (2013)

- Turn off borrowing constraints, turn on intermediation inefficiency
- Consider a decline in the foreign appetite for domestic currency debt, $S_1 < 0$

Deep: $$\beta I_0 \frac{\alpha_F}{P^*_{F1} C_{F1}} \left[1 + \frac{\alpha_H}{\alpha_F}\left(1 - \frac{C_{H1}}{\alpha_H}\right)\right] = \Phi$$

Shallow: $$\beta I_0 \frac{\alpha_F}{P^*_{F1} C_{F1}} \left[1 + \frac{\alpha_H}{\alpha_F}\left(1 - \frac{C_{H1}}{\alpha_H}\right)\right] = \Phi + \underbrace{I_0 \Gamma \Omega}_{\text{financial ToT externality}}$$

- Others showed that FX intervention helps (Fanelli and Straub, 2019; Cavallino, 2019)
- Integrated model reveals that capital controls should also be used to improve autonomy

Financial terms of trade externality generates a rationale for ex post capital controls.

Does exchange rate flexibility deliver monetary autonomy?

Gabaix and Maggiori (2016) meet Rey (2013)

- FXI can absorb the shock: $\Gamma(B_2 + \underbrace{FXI_1 - S_1}_{=0}) = \eta_2 - (1 + i_1^*)$
- But this is not optimal because of carry profits/losses
- Therefore, $\Omega < 0 \Rightarrow$ Role for capital inflow subsidies
- Trilemma and dilemma: do external shocks destabilize the wedge in UIP premia?
  - Deep FX markets ($\Gamma = 0$): policy rate balances aggregate demand and terms of trade wedges
  - Shallow FX markets ($\Gamma > 0$): external shocks destabilize UIP wedge
    - If policy rate addresses UIP wedge, it can no longer balance aggregate demand and terms of trade wedges

FXI and capital controls reduce response of policy rate to foreign appetite shocks.

Conclusions

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