Monetary and Financial Policies for Emerging Market Economies

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Motivation

- Global financial cycle in capital flows, asset prices and credit growth.
  Common component mainly driven by monetary policy of the centre country in international monetary system (Bruno and Shin (2013), Miranda-Agrippino and Rey, (2014), Forbes and Warnock, (2012)).
- Central Role in the transmission mechanism of global financial cycle is given by financial intermediaries (Shin (2013), Bruno and Shin (2014))
- Why do we care?

  Dilemma versus Trilemma (Rey, 2013)

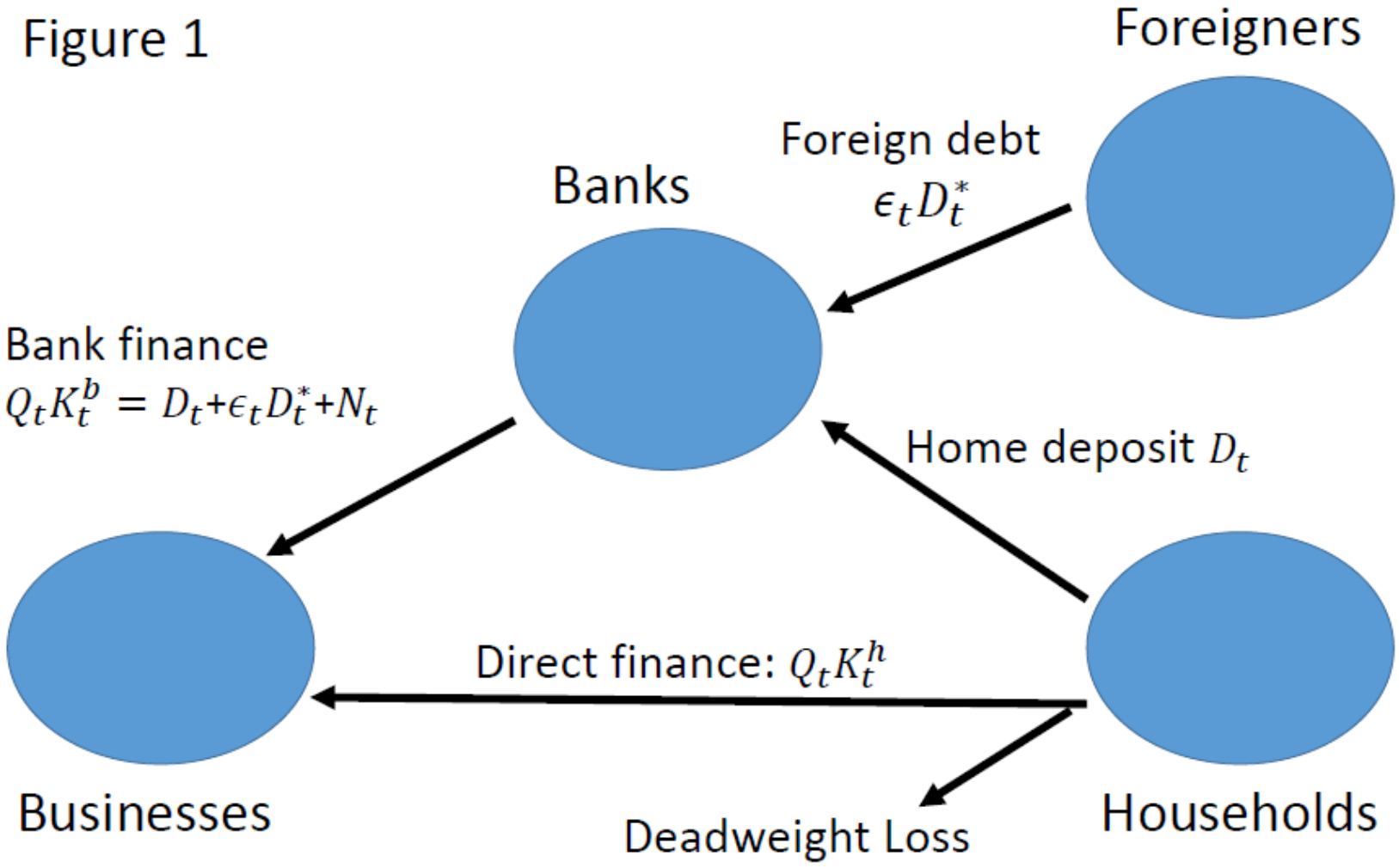
  Policy trade-offs and domestic objectives (Obstfeld, 2014)

Research Questions and Motivation

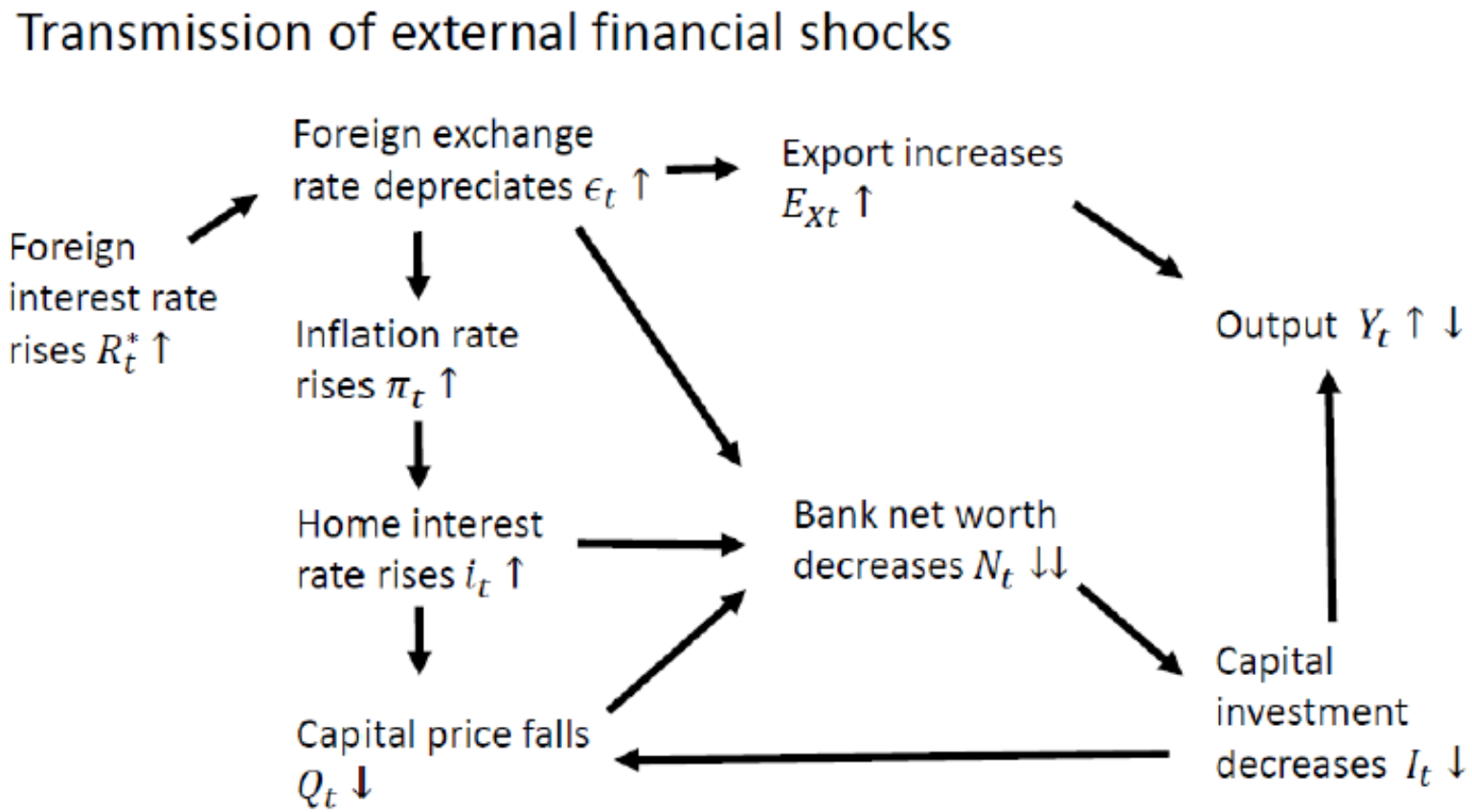
- Focus on Emerging Market Economies
- Examine two aspects of global financial cycle dependence
  - transmission mechanism
  - policy implications (interaction between monetary and macroprudential policies).
- Model of financial intermediation in new keynesian open economy framework.

Financial Intermediation

Figure 1



Transmission mechanism



Main results

- Distinction between financial and nonfinancial shocks affects scope for macroprudential policies.
  - Financial shocks $\rightarrow$ cyclical tax on foreign borrowing;
  - Non financial shocks $\rightarrow$ permament tax on risky assets held by banks
- Monetary and cyclical macropurdential policies are complementary when external financial shocks are dominant.
- Price flexibility amplify the effects of external financial shocks.

Outline

- Model
- Transmission mechanism
- Policy analysis

Model: household

- Each household consists of a continuum of workers and bankers
- Each banker manages a bank until retires with probability $1 - \sigma$, and then brings back the net worth as dividend
- Equal number of workers become new bankers with start-up funds given by the household
- Household saves in home currency deposit, D_t, and capital ownership, K_t^h. To own capital, households face management cost.
- Household members consume together

Model: household problem

- Household utility function:

$$E_t \left[\sum_{t=0}^{\infty} \beta^t \ln \left(C_t - \frac{\zeta_0}{1+\zeta} {L_t}^{1+\zeta} \right) \right],$$

- Household budget constraint

$$C_t + Q_t K_t^h + \chi(K_t^h) + D_t = w_t L_t + \Pi_t + (Z_t + \lambda Q_t) K_{t-1}^h + R_t D_{t-1}$$

- Saving choices:

$$1 = E_t \left(\Lambda_{t,t+1} \frac{Z_{t+1} + \lambda Q_{t+1}}{Q_t + \chi'(K_t^h)} \right)$$

$$1 = E_t \left(\Lambda_{t,t+1} R_{t+1} \right)$$

with

$$R_t = \frac{1 + i_{t-1}}{\pi_t}$$

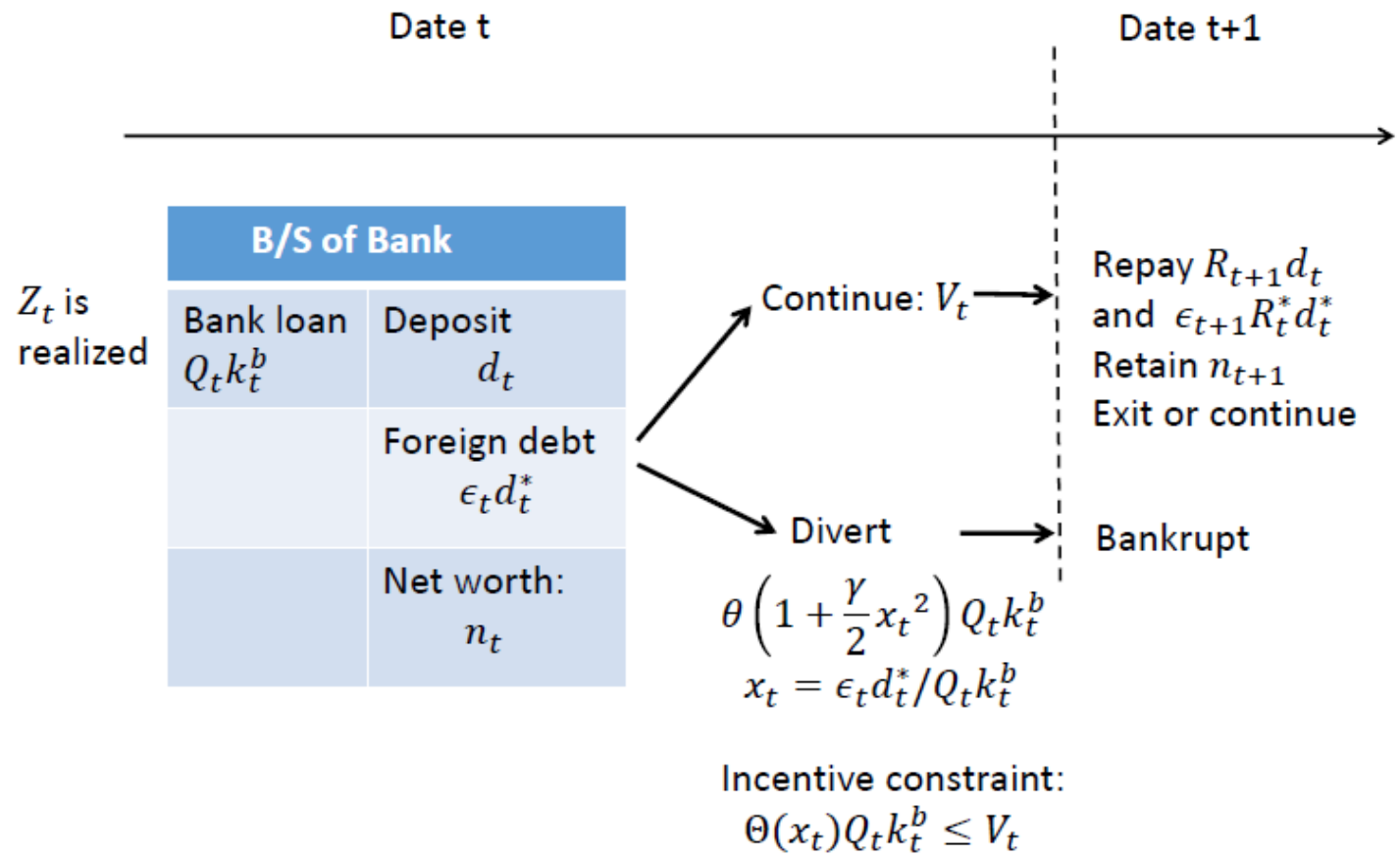
and $\Lambda_{t,\tau}$ is the stochastic discount factor between t and τ.

Banks

- Bank finances capital investment by issuing
  - home currency denominated deposit to households
  - foreign currency denominated debt to foreigners
- No financial friction between bank and nonfinancial businesses
  - bank finance capital investment by buying capital ownership (equity)

Banks

Figure 2: Timing



Banks

- Bankers maximizes the value of the bank

$$V_t = E_t\{\Lambda_{t,t+1}[(1-\sigma)n_{t+j} + \sigma V_{t+1}]\}$$

with the flow of funds constraints

$$Q_t k_t^b = n_t + d_t + \epsilon_t d_t^*$$

$$n_t = (Z_t + \lambda Q_t)k_{t-1}^b - R_t d_{t-1} - \epsilon_t R_{t-1}^* d_{t-1}^*$$

and the incentive compatibility constraint:

$$V_t \geq \Theta(x_t) Q_t k_t^b$$

with $x_t = \frac{\epsilon_t d_t^*}{Q_t k_t}$ is the fraction of assets financed by foreign borrowing.

Banks

- The incentive constraint becomes a leverage multiple constraint

$$\frac{Q_t k_t^b}{n_t} \leq \underset{+}{\phi}(\underset{+}{\mu_t}, \underset{+}{\mu_{dt}^*}, \underset{-}{\Theta}(x_t))$$

where

$$\begin{aligned}
\mu_t &= E_t\left[\Lambda_{t,t+1}(1-\sigma+\sigma\psi_{t+1})\left(\frac{Z_{t+1}+\lambda Q_{t+1}}{Q_t}-R_{t+1}\right)\right] \\
\mu_{dt}^* &= E_t\left[\Lambda_{t,t+1}(1-\sigma+\sigma\psi_{t+1})\left(R_{t+1}-\frac{\epsilon_{t+1}}{\epsilon_t}R_t^*\right)\right]
\end{aligned}$$

$$\mu_t = \mu_{dt}^* = 0, \text{ iff the leverage constraint is not binding}$$

$$\mu_t, \mu_{dt}^* > 0, \text{ iff the leverage constraint is binding}$$

$$\frac{\epsilon_t d_t^*}{Q_t k_t^b} = x_t = x\left(\mu_{dt}^*/\mu_t\right),\ x'(\cdot) > 0$$

Production

- Final good production (perfect competition).

$$Y_t = \left(\int_0^1 y_{it}^{\frac{\eta-1}{\eta}} di \right)^{\frac{\eta}{\eta-1}}$$

- Intermediate goods production:

$$y_{it} = A_t \left(\frac{k'_{it}}{\alpha_K} \right)^{\alpha_K} \left(\frac{m_{it}}{\alpha_M} \right)^{\alpha_M} \left(\frac{l_{it}}{1-\alpha_K-\alpha_M} \right)^{1-\alpha_K-\alpha_M}$$

$$m_t^C = \frac{1}{A_t} Z_t^{\alpha_K} \epsilon_t^{\epsilon_M} w_t^{1-\alpha_K-\alpha_M}$$

$$\underset{p_{it},\, y_{it}}{Max}\; E_0 \left\{ \sum_{t=0}^{\infty} \Lambda_{0,t} \left[\left(\frac{p_{it}}{P_t} - m_t^C \right) y_{it} - \frac{\kappa}{2} \left(\frac{p_{it}}{p_{it-1}} - 1 \right)^2 Y_t \right] \right\}$$

Production

- Capital accumulation

$$K_t = I_t + \lambda K_{t-1}$$

$$\text{Cost of Investment} = \left[1 + \frac{\kappa_I}{2}\left(\frac{I_t}{I}\right)^2\right] I_t$$

- Export

$$E_{Xt} = \left(\frac{P_t}{e_t P_t^*}\right)^{-\varphi} Y_t^* = \epsilon_t{}^{\varphi} Y_t^*, \text{ where } \epsilon_t = \frac{e_t P_t^*}{P_t}$$

$$P_t^* = P^* = 1$$

Policy behavior

- Monetary policy rule

$$i_t - i = (1 - \rho_i)\omega_\pi (\pi_t - 1) + \rho_i (i_{t-1} - i) + \xi_t^i$$

- Macroprudential policy:
  - tax on bank capital investment finance τ_t^K
  - tax on foreign currency borrowing τ_t^{D*}
  - subsidy on net worth τ_t^N to balance the budget

$$\tau_t^N N_t = \tau_t^K Q_t K_t^b + \tau_t^{D*} \epsilon_t D_t^*$$

- Cyclical macroprudential policy

$$\tau_t^{D*} = \omega_{\tau^{D*}} \left(\ln K_t^b - \ln K^b \right)$$

Aggregate Equilibrium Conditions

- Market Equilibrium

$$Y_t = C_t + \left[1 + \frac{\kappa_I}{2}\left(\frac{I_t}{I}\right)^2\right] I_t + E_{Xt} + \frac{\kappa}{2}\left(\pi_t - 1\right)^2 Y_t + \chi(K_t^h)$$

- Net foreign debt evolution:

$$D_t^* = R_{t-1}^* D_t^* + M_t - \frac{1}{\epsilon_t} E_{Xt}$$

- Bank balance sheet:

$$N_t = (\sigma + \xi)\left(Z_t + \lambda Q_t\right) K_{t-1}^b - \sigma R_t D_{t-1} - \sigma \epsilon_t R_{t-1}^* D_{t-1}^*$$

$$Q_t K_t^b = \phi_t N_t = N_t + D_t + \epsilon_t D_t^*$$

- Net foreign debt

$$\epsilon_t D_t^* = x_t Q_t K_t^b = x_t \phi_t N_t$$

- Capital market

$$K_t = K_t^b + K_t^h$$

Calibration

Table 1: Baseline Parameters		
Banks		
θ	divertable proportion of assets	0.475
γ	home bias in funding	6.4
σ	survival probability	0.94
ξ	fraction of total assets brought by new banks	5.88×10^{-4}
Households		
β	discount rate	0.985
ζ	inverse of Frisch elasticity of labor supply	0.2
ζ_0	inverse of labor supply capacity	5.89
$\varkappa$	cost parameter of direct finance	9.85×10^{-4}
Producers		
α_K	cost share of capital	0.3
α_M	cost share of imported intermediate goods	0.15
λ	one minus depreciation rate	0.98
η	elasticity of demand	9
ω	fraction of non-adjuters $\left(\kappa = \frac{(\eta-1)\omega}{(1-\omega)(1-\beta\omega)}\right)$	0.66
κ_I	cost of adjusting investment goods production	1
φ	price elasticity of export demand	2

Calibration: steady state

Table 2: Baseline Steady State (Annual)		
Q	price of capital	1
π	inflation rate	1
R^*	foreign interest rate	1.02
R	deposit interest rate	1.06
R_k	rate of return on capital for bank	1.08
ϕ	bank leverage multiple	6
x	foreign debt-to-bank asset ratio	0.25
$\frac{K}{Y-\epsilon M}$	capital-output ratio	1.92
K^b/K	share of capital financed by banks	0.75
$\frac{\epsilon D^*}{Y-\epsilon M}$	foreign debt-to-GDP ratio	0.36
$Y-\epsilon M$	GDP	10.40
C	consumption	8.68
I	investment	1.60
E_X	export	1.68
ϵM	import	1.60
$\chi\left(K^h\right)$	cost of direct finance	0.049

Transmission mechanism

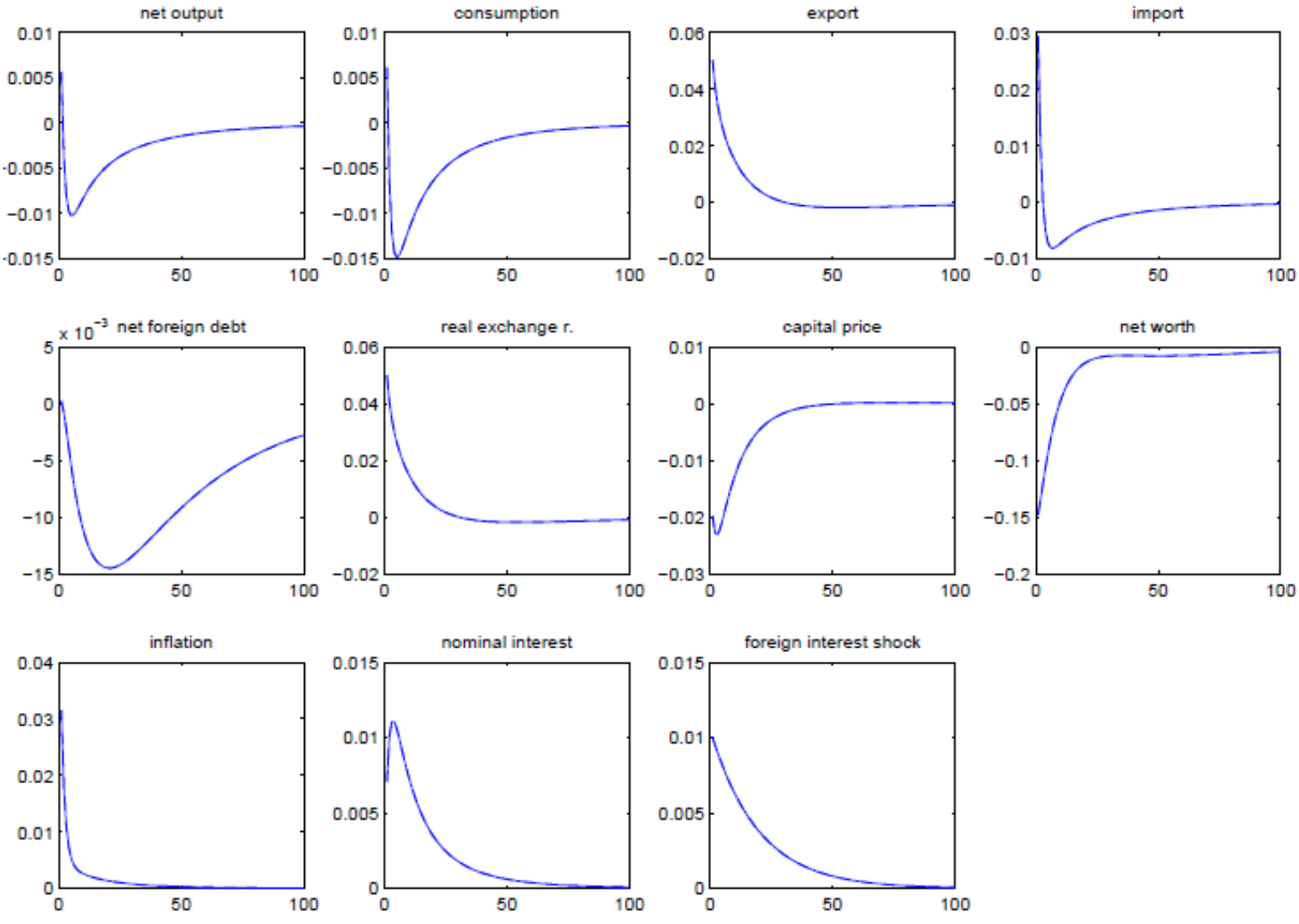


Figure 4: response to 1% annual foreign interest rate shock

Transmission mechanism

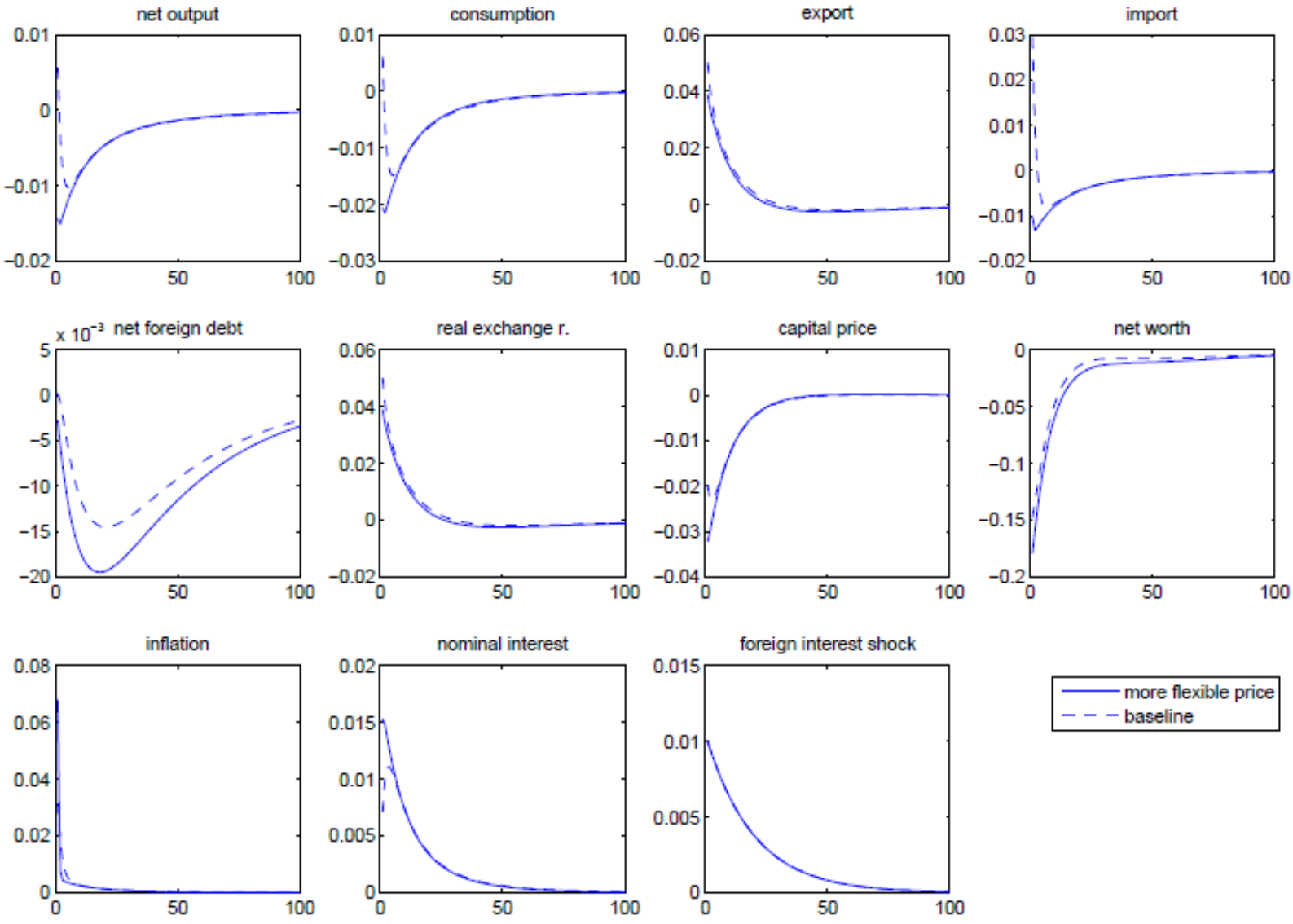


Figure 5: foreign interest rate shock under flexible price

Normative analysis (macroprudential analysis)

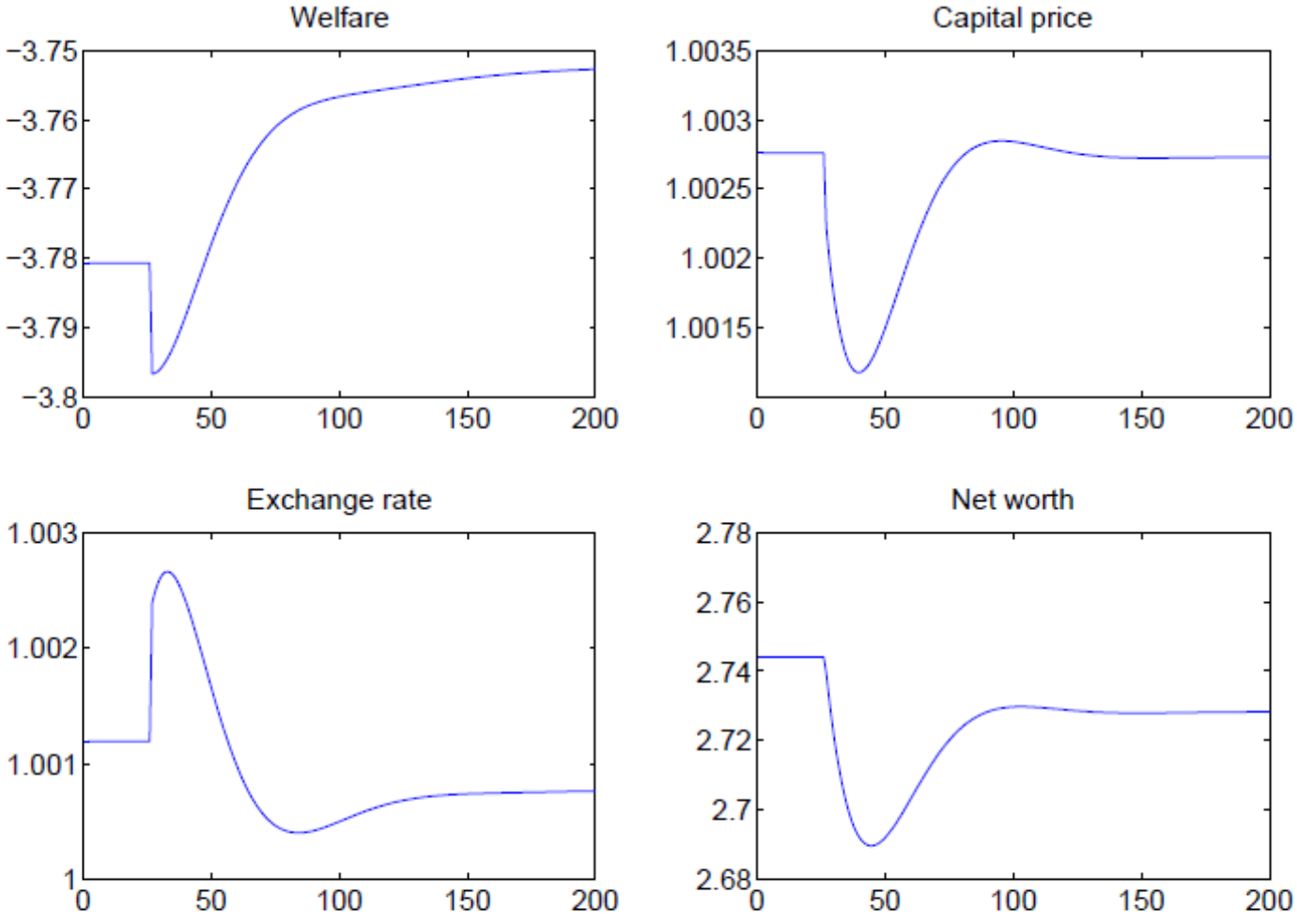


Figure 6: permanent tax on foreign borrowing

Normative analysis (macroprudential analysis)

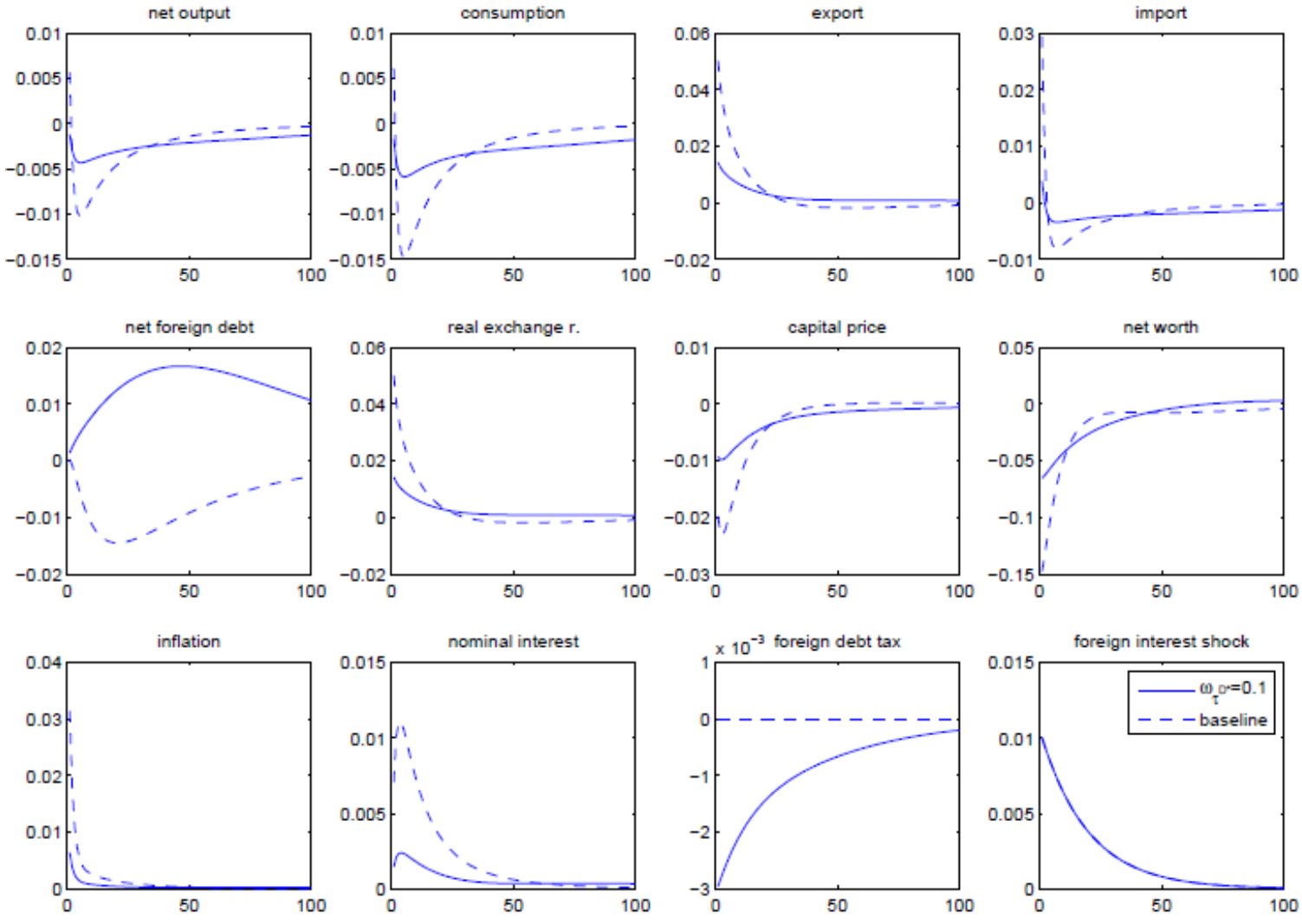


Figure 9: foreign interest rate shock with macro-prudential policy

Normative analysis

Comparison among diffierent combination of rules and welfare comparisons

Welfare Effects with Large $var(R_t^*)$			
ω_π \ $\omega_{\tau^{D*}}$	0.00	0.01	0.02
1.05	0.57	1.73	2.88
1.5	0.00	2.19	4.22
2.0	-0.46	2.30	4.78

stand dev of $(\ln R_t^*, i_t, \ln A_t, \ln Y_t^*) = (.50, .25, 1.0, 2.0)\%$
auto correlation of $(\ln R_t^*, i_t, \ln A_t, \ln Y_t^*) = (.95, .85, .95, .95)$

Understanding Monetary and Financial Policies in Emerging Market Economies

- A small permanent tax on bank foreign borrowing improves welfare modestly if external financial shocks are important;
- Procyclical tax on bank foreign borrowing significantly improves welfare if external financial shocks are important and prices are flexible;
- It allows monetary authority to pursue macroeconomic stability. Strict inflation targeting without macroprudential policy can reduce welfare

Conclusions

- Preliminary model of financial intermediation in open economy;
- Study interaction between monetary and financial policies
- To do: optimal policy analysis and extentions to foreign direct investment and home currency bonds.