Monetary and Financial Policies in Emerging Markets

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Emerging market economies tend to be vulnerable to global financial cycle

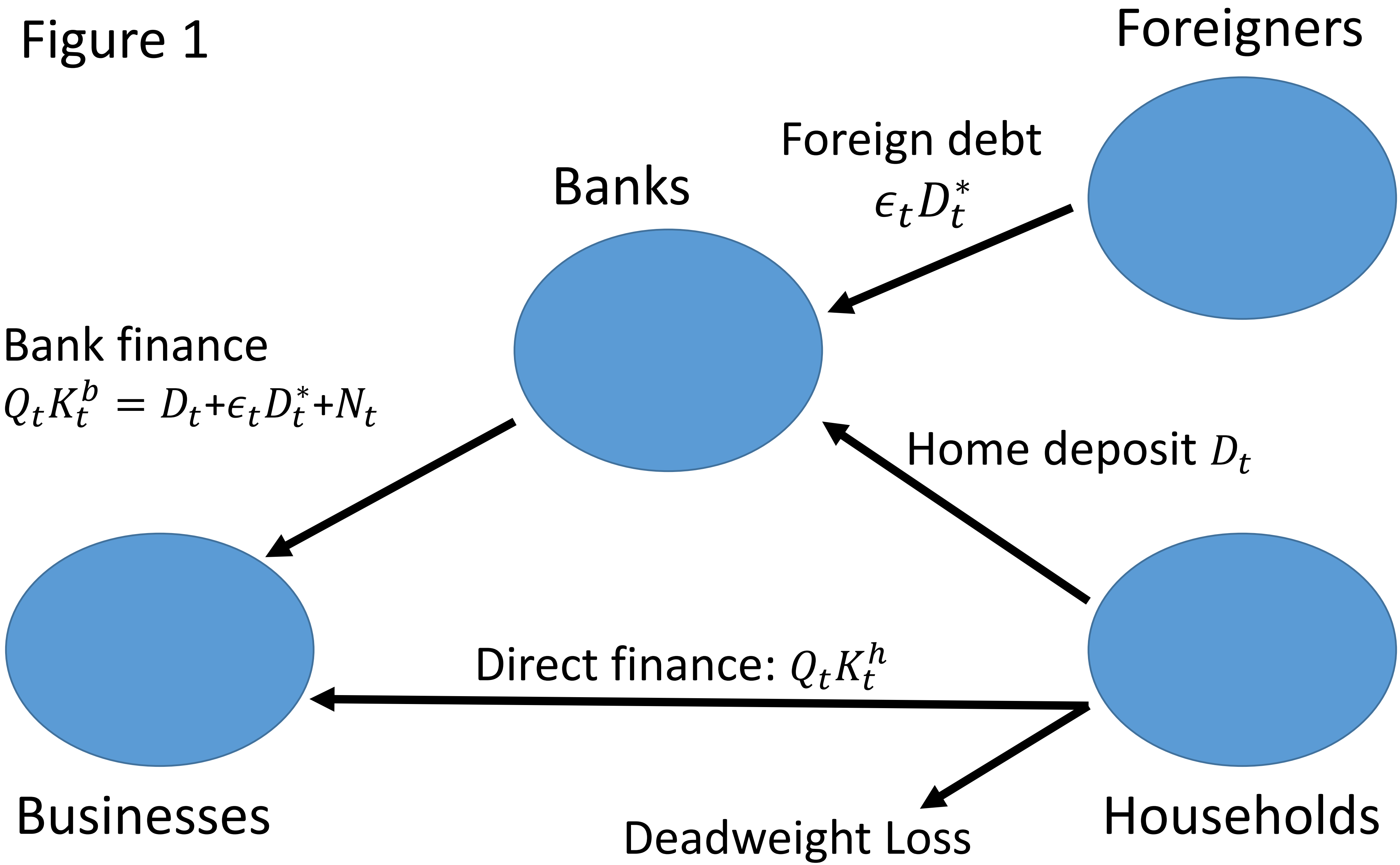
Why?

How to conduct monetary policy?

How to coordinate with macro-prudential policy?

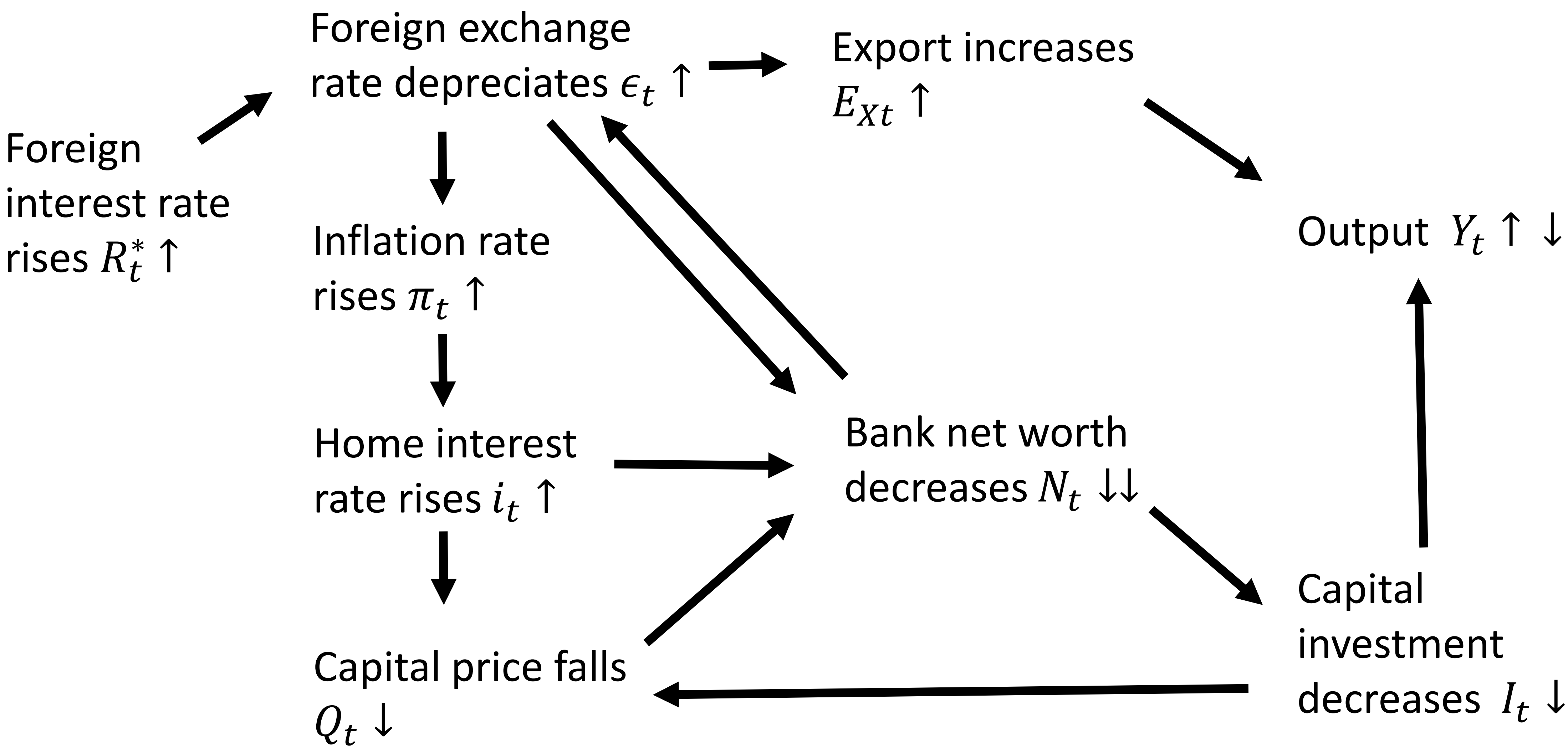
Approach: Open Economy New Keynesian + Banks

Figure 1



Foreigners
Foreign debt
$\epsilon_t D_t^*$
Banks
Bank finance
$Q_t K_t^b = D_t + \epsilon_t D_t^* + N_t$
Home deposit D_t
Direct finance: $Q_t K_t^h$
Businesses
Deadweight Loss
Households

Transmission of external financial shocks



Model

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

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

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

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

$\longrightarrow$

$$\pi_t \left(\pi_t - 1 \right) \ = \ \frac{\eta}{\kappa} \left(m_t^C - \frac{\eta\text{-}1}{\eta} \right) + E_t \left[\Lambda_{t,t+1} \frac{Y_{t+1}}{Y_t} \pi_{t+1} \left(\pi_{t+1}\text{-}1 \right) \right]$$

$$\text{where } \pi_t \ = \ \frac{P_t}{P_{t-1}}$$

Capital accumulation

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

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

Export

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

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

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 and capital ownership. To own capital, household needs management cost $\chi(K_t^h) = \frac{\varkappa}{2}(K_t^h)^2$

Household members consume together

Household's choice

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

$$C_t+Q_tK_t^h+\chi(K_t^h)+D_t = w_tL_t+\Pi_t+(Z_t+\lambda Q_t)K_{\text{t-1}}^h+R_tD_{\text{t-1}}$$

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

$\longrightarrow$

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

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

Bank's Flow-of-funds

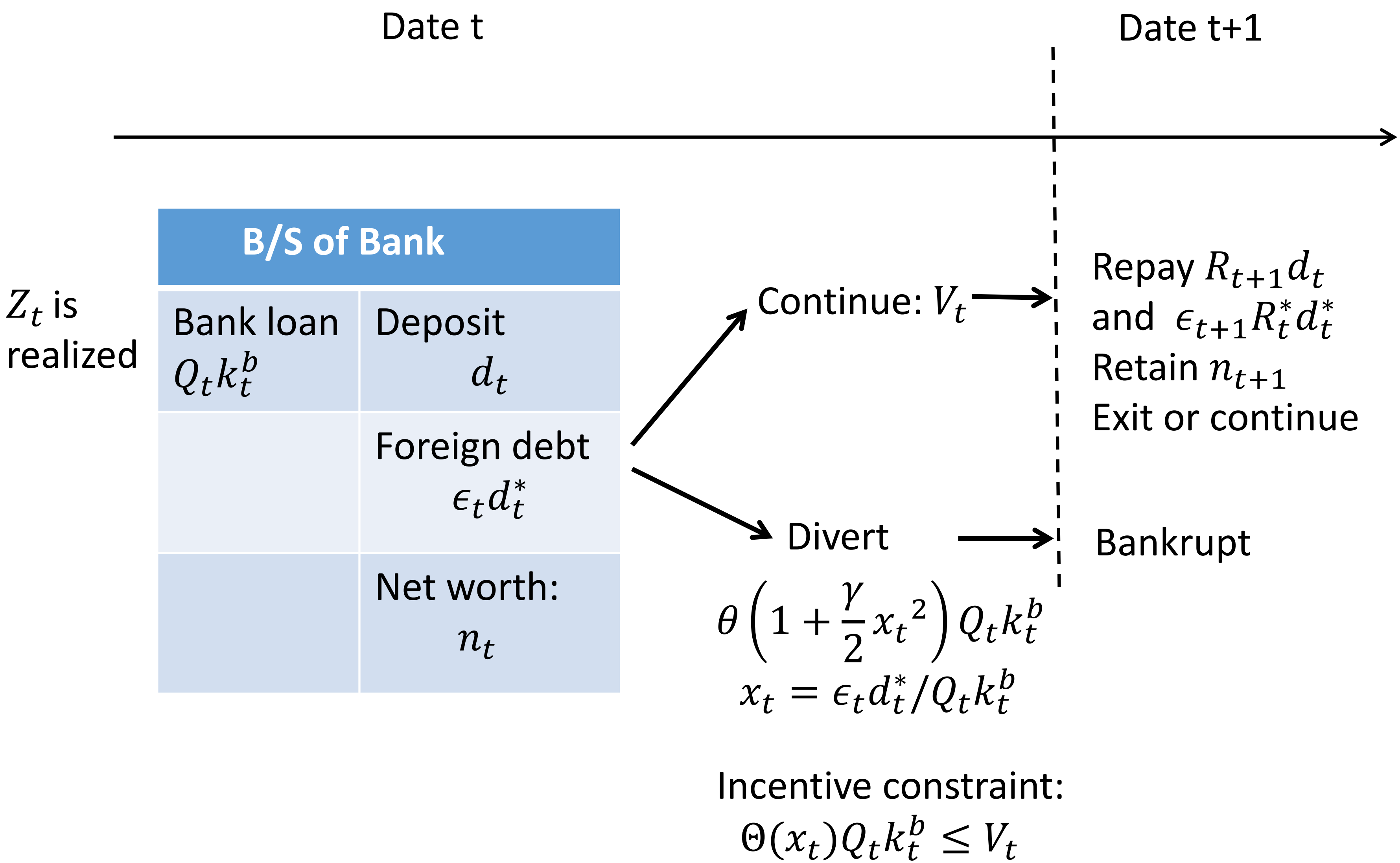
$$Q_t k_t^b = n_t + d_t + \epsilon_t d_t^*$$

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

Value of the bank

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

Figure 2: Timing



The incentive constraint becomes a leverage multiple constraint

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

where

$$\mu_t = E_t\left[\Lambda_{t,t+1}\left(1-\sigma+\sigma\frac{V_{t+1}}{n_{t+1}}\right)\left(\frac{Z_{t+1}+\lambda Q_{t+1}}{Q_t}-R_{t+1}\right)\right]$$

$$\mu_{dt}^* = E_t\left[\Lambda_{t,t+1}\left(1-\sigma+\sigma\frac{V_{t+1}}{n_{t+1}}\right)\left(R_{t+1}-\frac{\epsilon_{t+1}}{\epsilon_t}R_t^*\right)\right]$$

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

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

Bank balance sheet

$$N_t = (\sigma + \xi)(Z_t + \lambda Q_t) K^b_{t-1} - \sigma R_t D_{t-1} - \sigma \epsilon_t R^*_{t-1} D^*_{t-1}$$

$$Q_t K^b_t = \phi_t N_t = N_t + D_t + \epsilon_t D^*_t$$

Capital market

$$K_t = K^b_t + K^h_t$$

Net foreign debt

$$\epsilon_t D^*_t = x_t Q_t K^b_t = x_t \phi_t N_t$$

$$D^*_t = R^*_{t-1} D^*_{t-1} + M_t - \frac{1}{\epsilon_t} E_{Xt}$$

Goods market equilibrium

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

Net output

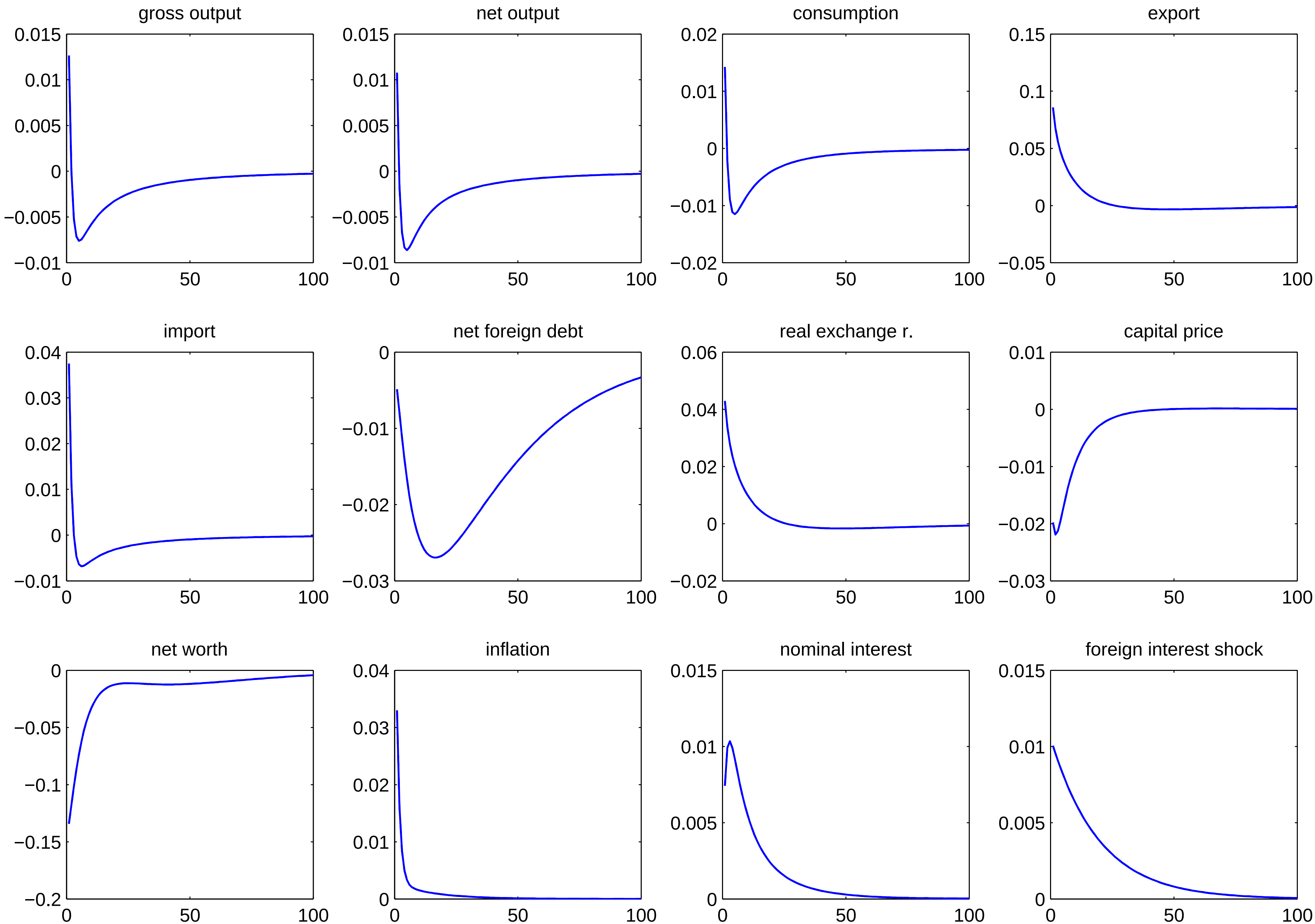
$$Y_t^n = Y_t - \epsilon_t M_t - \frac{\kappa}{2}\left(\pi_t - 1\right)^2 Y_t - \chi(K_t^h)$$

Monetary policy rule

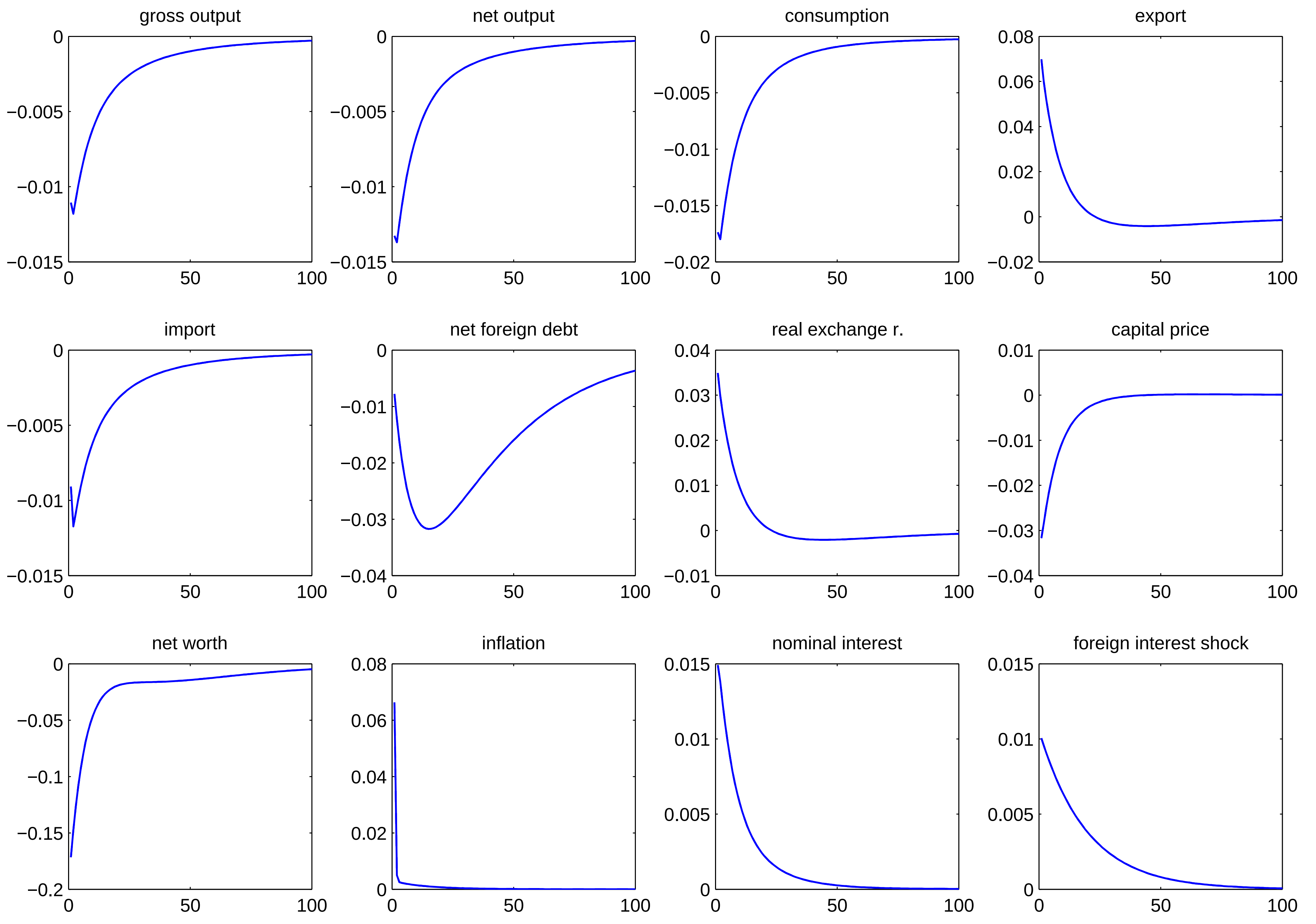
$$i_t - i = (1 - \rho_i)\omega_\pi\left(\pi_t - 1\right) + \rho_i\left(i_{t-1} - i\right) + \xi_t^i$$

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

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



gross output
net output
consumption
export
import
net foreign debt
real exchange r.
capital price
net worth
inflation
nominal interest
foreign interest shock


gross output
net output
consumption
export
import
net foreign debt
real exchange r.
capital price
net worth
inflation
nominal interest
foreign interest shock
0
−0.005
−0.01
−0.015
−0.02
0.08
0.06
0.04
0.02
0.04
0.03
0.01
−0.03
−0.04
−0.05
−0.1
−0.15
−0.2
0.015
0.005
50
100

Macro-prudential 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 macro-prudential policy

$$\tau_t^{D*} = \omega_{\tau^{D*}} \left(\ln K_{t-1}^b - \ln K^b \right)$$

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 $(\ln R_t^*, i_t, \ln A_t, \ln Y_t^*) = (0.5, 0.25, 1.0, 2.0)\%$

auto correlation of $(\ln R_t^*, i_t, \ln A_t, \ln Y_t^*) = (.95, .85, .95, .95)$

all numbers are quarterly. interest rate is annual %

Remark on Policy

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 macro-prudential policy can reduce welfare

Topics for future research include official foreign reserve and foreign exchange intervention, gross financial flows, and foreign direct investment

Table A1: Variance Decomposition with Large $var(R^*)$				
	R_t^*	i_t	A_t	Y_t^*
$\ln Y_t$	36.1	3.6	59.0	1.3
π_t	86.0	3.9	10.0	0.1
$\ln \epsilon_t$	92.5	0.2	5.0	2.3
$\ln Q_t$	72.3	2.2	25.0	0.5
$\ln N_t$	78.7	10.4	10.1	0.8

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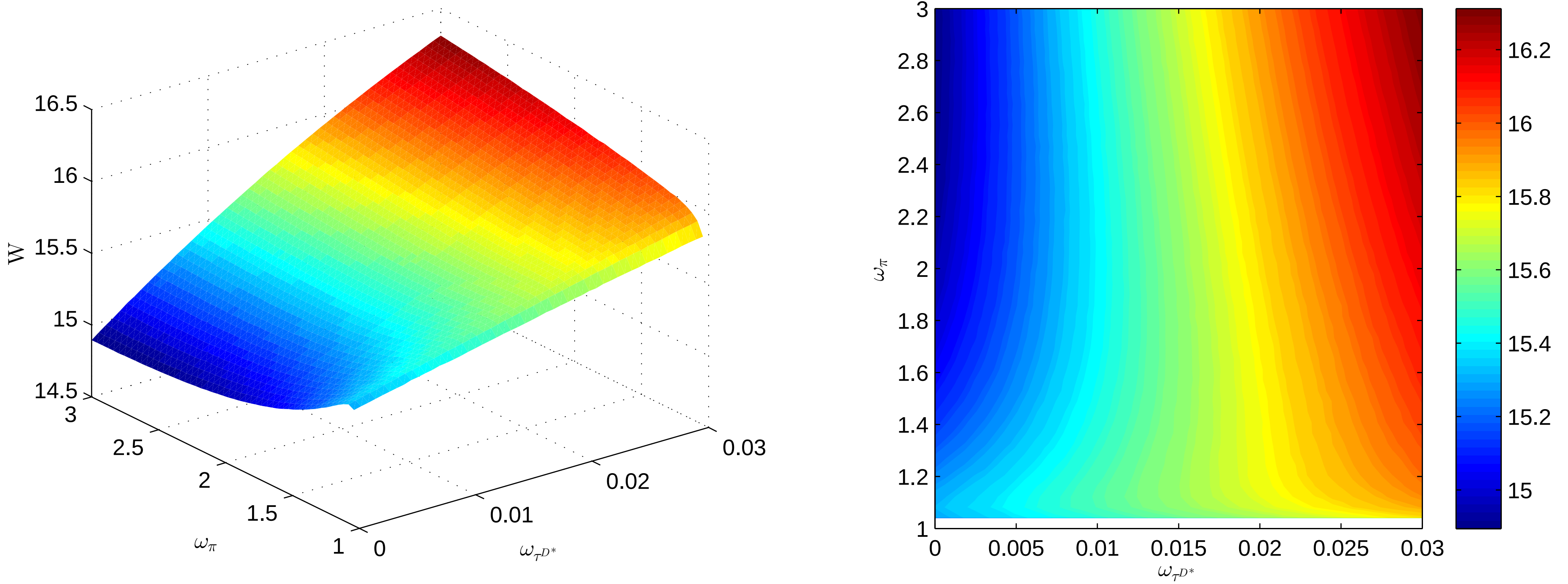

W
16.5
16
15.5
15
14.5
3
2.5
2
1.5
1
ω_π
0
0.01
0.02
0.03
$\omega_{\tau D^*}$
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
ω_π
0
0.005
0.01
0.015
0.02
0.025
0.03
$\omega_{\tau D^*}$
16.2
16
15.8
15.6
15.4
15.2
15