Financial Intermediation and Credit Policy

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Motivation

Present a canonical framework to think about the current financial crisis and the financial accelerator

Disruption of Financial Intermediation

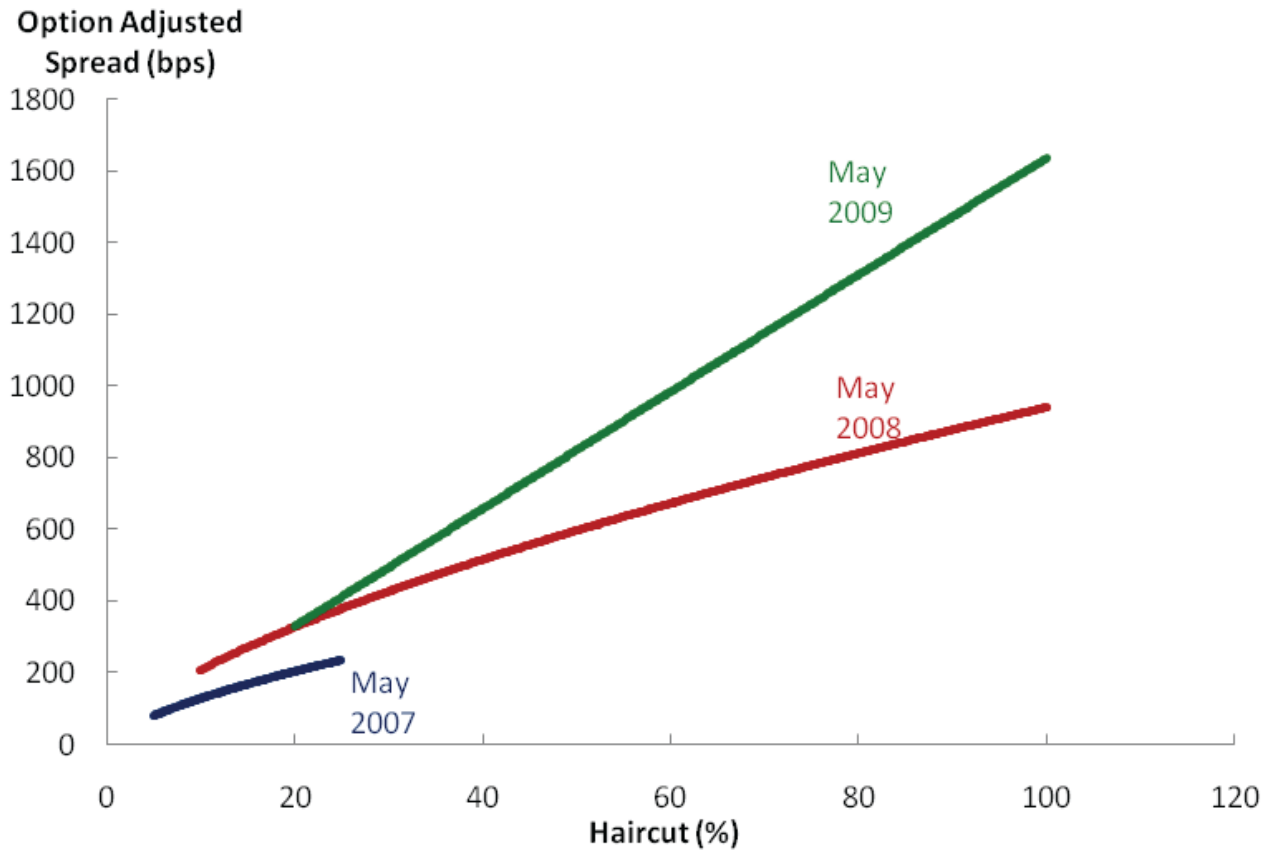
More about financing constraint of financial intermediaries than non-financial businesses and households

Unconventional Monetary Policy

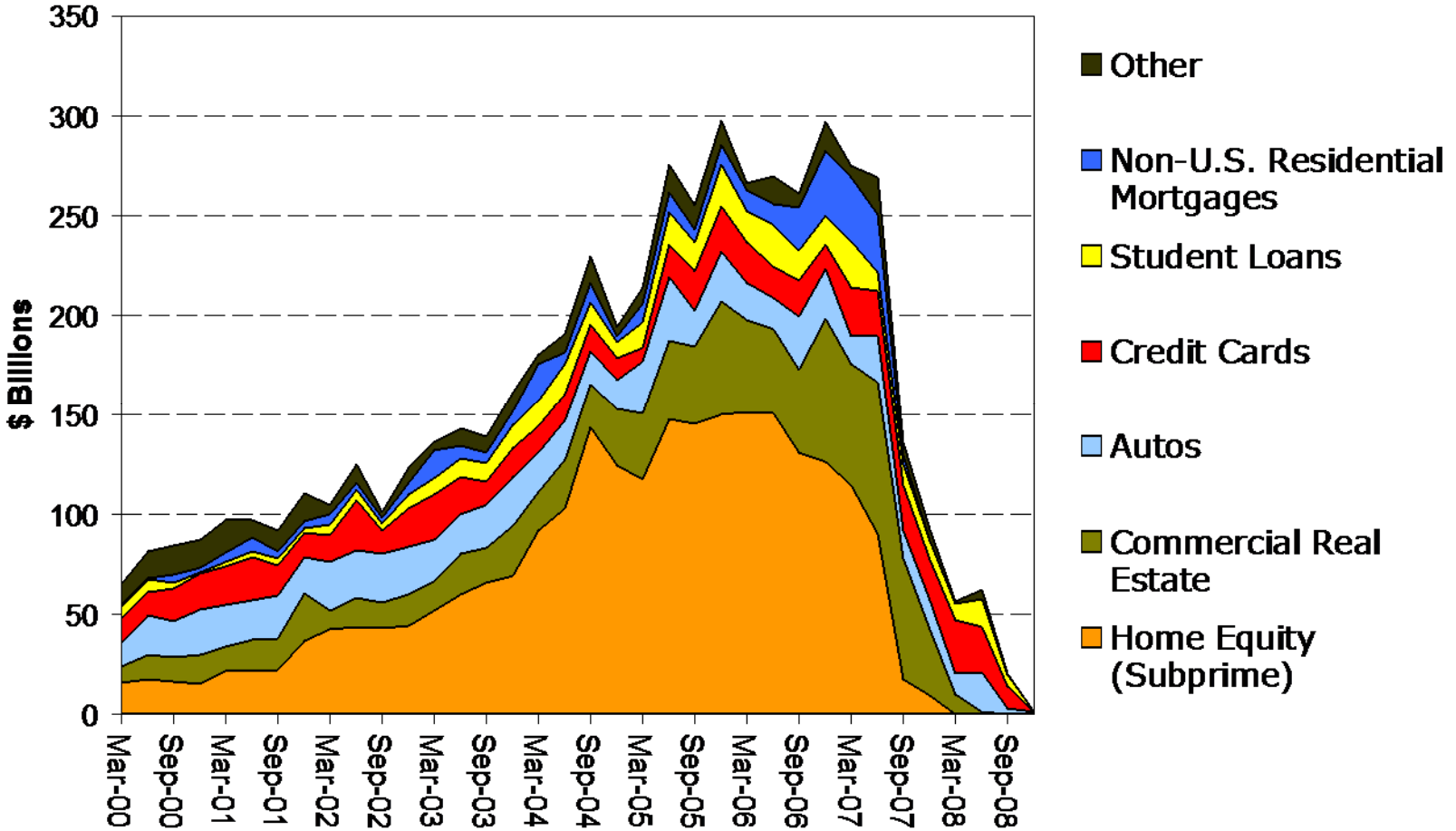
Liquidity facilities to financial intermediaries

Direct lending to non-financial firms

Equity injections to financial intermediaries

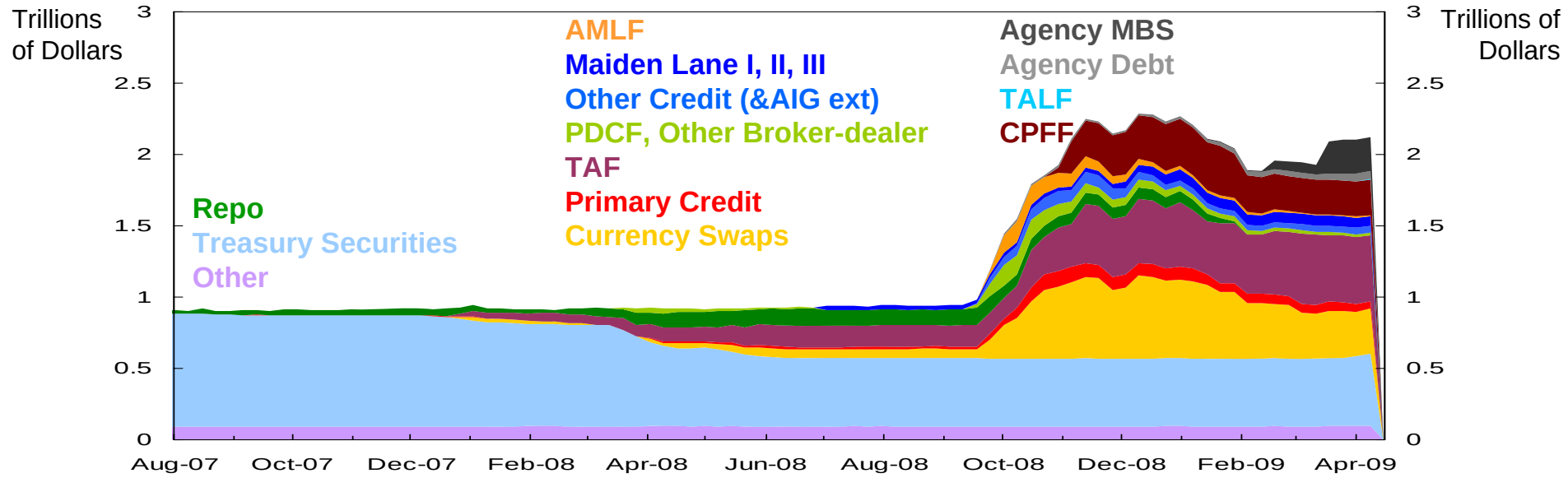

Option Adjusted Spread (bps)
1800
1600
1400
1200
1000
800
600
400
200
0
0
20
40
60
80
100
120
Haircut (%)
May 2009
May 2008
May 2007

New Issuance of Asset Backed Securities in Previous Three Months

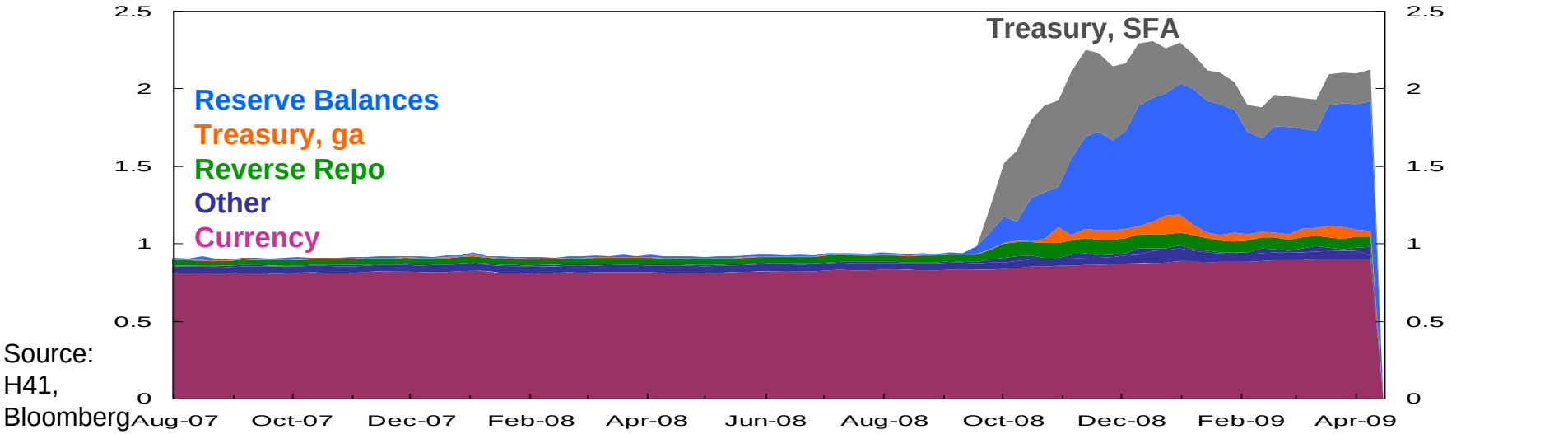


Source: JP Morgan

Federal Reserve Assets



Federal Reserve Liabilities



Source: H41, Bloomberg

Model

Goods producers dispersed across islands with perfectly mobile labor:

$$Y_t = A_t {K_t}^{\alpha} L_t^{1-\alpha}, \quad 0 < \alpha < 1$$

Investment opportunity arrives to each island with prob $\pi^i = \pi$ - $i.i.d.$ across island and time:

$$\begin{aligned} K_{t+1} &= \psi_{t+1}[I_t + \pi(1-\delta)K_t] + \psi_{t+1}(1-\pi)(1-\delta)K_t \\ &= \psi_{t+1}[I_t + (1-\delta)K_t] \end{aligned}$$

Shocks to the quality of capital ψ_{t+1} and productivity A_t follow AR(1)

Resource constraint

$$Y_t = C_t + \left[1 + f\left(\frac{I_t}{I_{t-1}}\right)\right] I_t + G_t$$

Each household consists of many members, $1-f$ workers, f bankers

Workers supply labor and bring wages back to the household

Each banker manages a bank, retains some earning and brings back the rest to the household

Perfect consumption insurance within the household

Each period, bankers exit to become workers and bring back the retained earning with prob $1-\sigma$

$(1-\sigma)f$ workers become bankers with ξ fraction of total asset of the household as the start-up fund

The household chooses (C_t, L_t, D_t) to maximize

$$E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \left[\ln(C_t - \gamma C_{\tau-1}) - \frac{\chi}{1+\varepsilon} L_\tau^{1+\varepsilon} \right]$$

subject to $C_t = W_t L_t + \Pi_t - T_t + R_t D_{t-1} - D_t$

D_t is short-term debt (bank deposit and government debt)

Π_t is net transfer to the household from firms and banks

The goods producer hires workers to produce $\longrightarrow$ profit per unit of capital:

$$Z_t = \frac{Y_t - W_t L_t}{K_t} = \alpha A_t \left(\frac{L_t}{K_t}\right)^{1-\alpha}$$

Goods producer sells security (equity) to banks of the same island in order to finance new investment. Each security pays dividend:

$\psi_{t+1} Z_{t+1}$, (1-δ) $\psi_{t+1}\psi_{t+2} Z_{t+2}$, (1-$\delta$)^2 $\psi_{t+1}\psi_{t+2}\psi_{t+3} Z_{t+3}$,..

Capital goods producer chooses investment goods supply in order to maximize the profit

Before the arrival of investment opportunity, each bank chooses an island to operate and raises funds from households by offering non-contingent deposit contract d_t

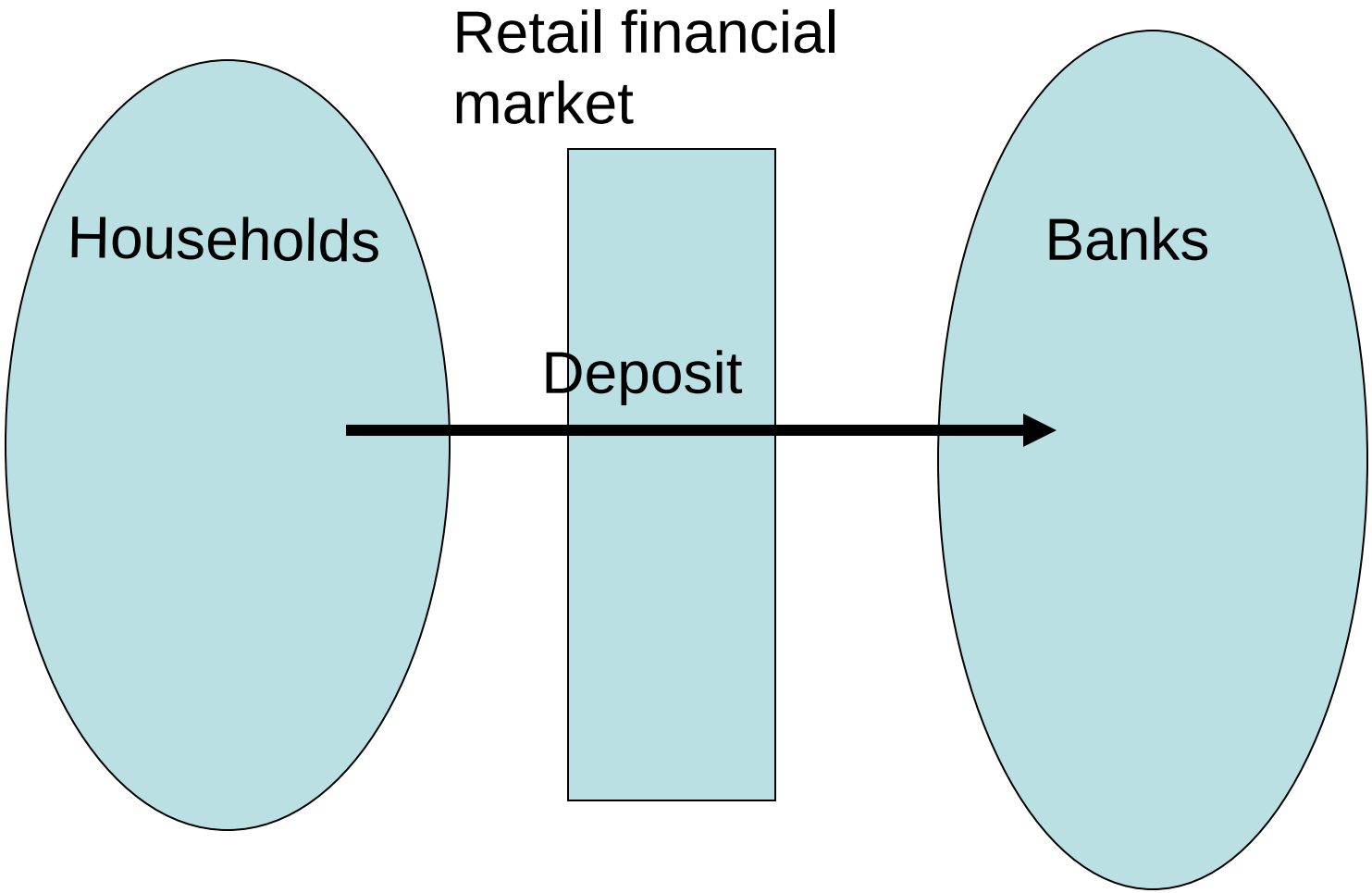
After the arrival of the investment opportunity, the bank borrows (or lends) b_t^h in the interbank market in order to purchase the security of the goods producers of the same island:

$$Q_t^h s_t^h = n_t^h + b_t^h + d_t, \text{ where } h = i, n$$

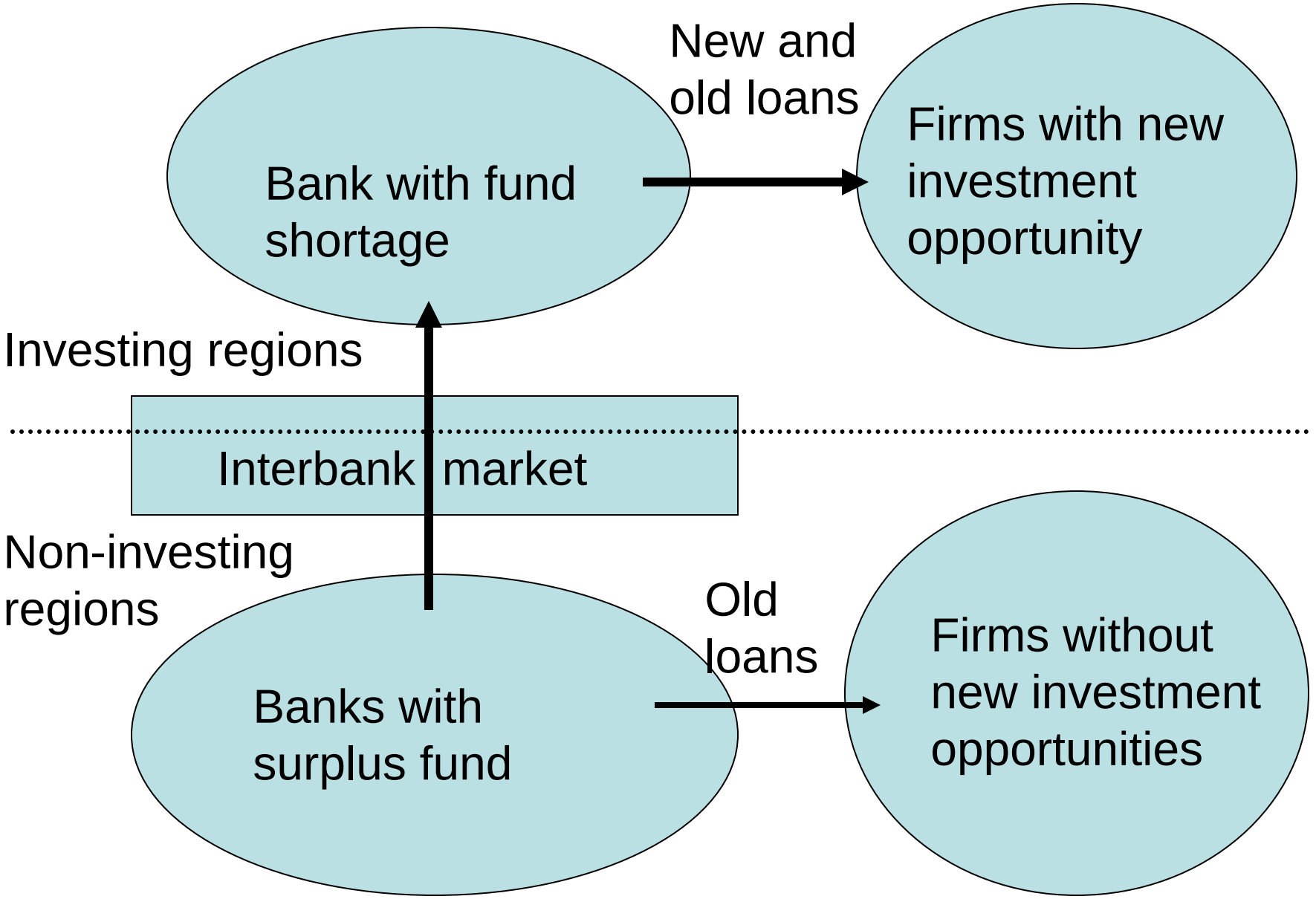
The net worth of the bank is

$$n_t^h = \left[Z_t + (1-\delta)Q_t^h\right] \psi_t s_{t-1} - R_{bt} b_{t-1} - R_t d_{t-1}$$

Beginning of the period



During the period



The value of the bank at the end of period t is

$$V_t = V\left(s_t^h, b_t^h, d_t\right) = E_t \sum_{\tau=t+1}^{\infty} (1-\sigma)\sigma^{\tau-t}\Lambda_{t,\tau} n_\tau^h$$

After the bank obtains funds, the banker may steal a fraction θ of "divertable" funds - total assets minus ω fraction of interbank borrowing. The incentive constraint for the bank not to divert the asset is

$$V\left(s_t^h, b_t^h, d_t\right) \geq \theta\left(Q_t^h s_t^h - \omega b_t^h\right)$$

Case of $\omega = 1$ is no friction of interbank market. Case of $\omega = 0$ is symmetric moral hazard between retail and interbank financial markets

Bellman equation

$$V\left(s_t, b_t, d_t\right) = \nu_{st} s_t - \nu_{bt} b_t - \nu_t d_t$$

$$= E_t \Lambda_{t,t+1} \sum_{h=i,n} \pi^h \left\{ \begin{array}{c} (1-\sigma) n_{t+1}^h \\ + \sigma \underset{d_{t+1}}{Max} \left[\underset{s_{t+1}^h, b_{t+1}^h}{Max} V\left(s_{t+1}^h, b_{t+1}^h, d_{t+1}\right) \right] \end{array} \right\}$$

The optimization of bank implies

$$\begin{aligned}
\nu_t &= E_t \left[\Lambda_{t,t+1} R_{t+1} (\pi^i \Omega_{t+1}^i + \pi^n \Omega_{t+1}^n \right] \\
\mu_t^h &= E_t [\Lambda_{t,t+1} (\pi^i R_{kt+1}^{hi} \Omega_{t+1}^i + \pi^n R_{kt+1}^{hn} \Omega_{t+1}^n)] \; - \; \nu_t \\
\phi_t^h &= \frac{\nu_t}{\theta - \mu_t^h} \\
\Omega_{t+1}^{h'} &= 1 - \sigma + \sigma (\nu_{t+1} + \mu_{t+1}^{h'} \phi_{t+1}^{h'}) \\
R_{kt+1}^{hh'} &= \psi_{t+1} \frac{Z_{t+1} + (1-\delta) Q_{t+1}^{h'}}{Q_t^h}
\end{aligned}$$

The security market equilibrium implies

$$\begin{aligned} I_t + \pi^i(1-\delta)K_t &= S_t^i = S_{pt}^i + S_{gt}^i \\ Q_t^i S_{pt}^i - \omega B_t &= \phi_t^i N_t^i \\ \pi^n(1-\delta)K_t &= S_t^n = S_{pt}^n + S_{gt}^n \\ Q_t^n S_{pt}^n + \omega B_t &\leq \phi_t^n N_t^n \end{aligned}$$

The aggregate net worth of banks in islands of type h is

$$N_t^h = \pi^h \left\{ (\sigma+\xi)[Z_t + (1\text{-}\delta)Q_t^h]\psi_t \left(S_{pt-1}^i + S_{pt-1}^n \right) - \sigma R_t D_{t-1} \right\}$$

The aggregate deposit D_t is

$$Q_t^i S_{pt}^i + Q_t^n S_{pt}^n = N_t^i + N_t^n + D_t$$

Credit Policies

Direct Lending: Central bank purchases a fraction φ_t^h of securities of goods producers of type h islands with the administrative cost of τ per unit

$S_{gt}^h = \varphi_t^h S_t^h$, where $\varphi_t^h = v_g \left[E_t \left(R_{kt+1}^{hh'} \right) - R_{t+1} - (R_k^h - R) \right]$

$\longrightarrow$ The lending in investing islands expands

Discount Window Lending: Central bank lends to bank in the interbank market at interest rate R_{mt+1}

$$\begin{aligned} Q_t^h s_t^h &= n_t^h + b_t^h + m_t^h + d_t \\ V(s_t^h, b_t^h, m_t^h, d_t) &\geq \theta \left(Q_t^h s_t^h - \omega b_t^h - \omega_g m_t^h \right) \end{aligned}$$

$\longrightarrow$ To the extent that the central bank is better in preventing the diversion of asset $\omega_m > \omega$, the central bank has to charge

a rate $R_{mt+1} > R_{bt+1}$ in order to keep the interbank market active

$$Q_t^i S_t^i = \phi_t^i N_t^i + \omega B_t + \omega_g M_t.$$

Equity injection: Fiscal authority coordinate with the central bank to acquire ownership position in banks

$\longrightarrow$ The effects $\simeq$ gift to banks + direct lending (Formal analysis is in paper)

Government budget constraint:

$$\begin{aligned} & \tau \sum_{h=i,n} S_{gt}^h + \sum_{h=i,n} Q_t^h \left[S_{gt}^h - (1-\delta)\psi_t \pi^h S_{gt-1} \right] \\ = \; & T_t + Z_t \psi_t S_{gt-1} + R_{mt} M_{t-1} - M_t + D_{gt} - R_t D_{gt-1} \end{aligned}$$

Figure 1. Crisis Experiment: Perfect Interbank Market

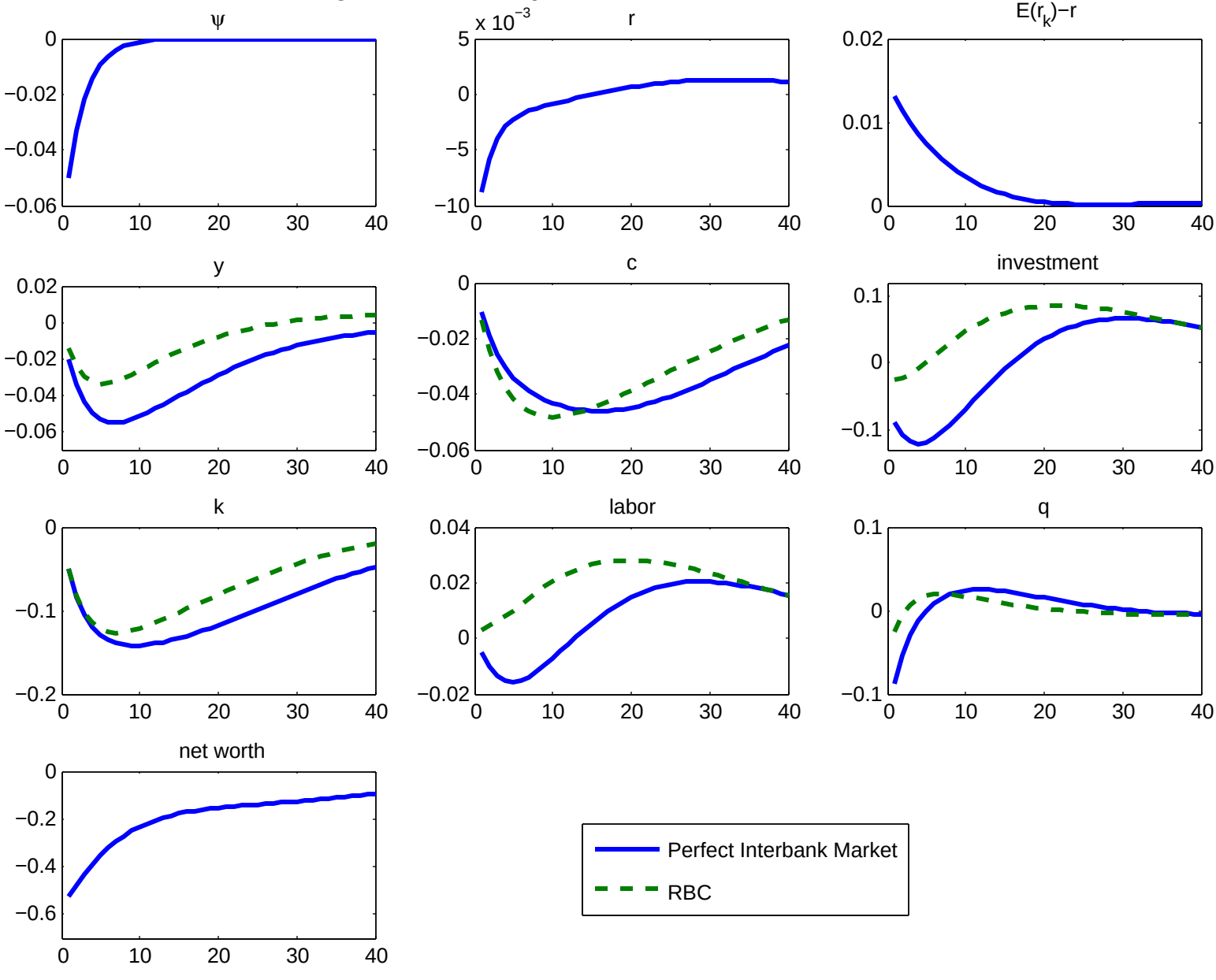


Figure 2. Crisis Experiment: Imperfect Interbank Market

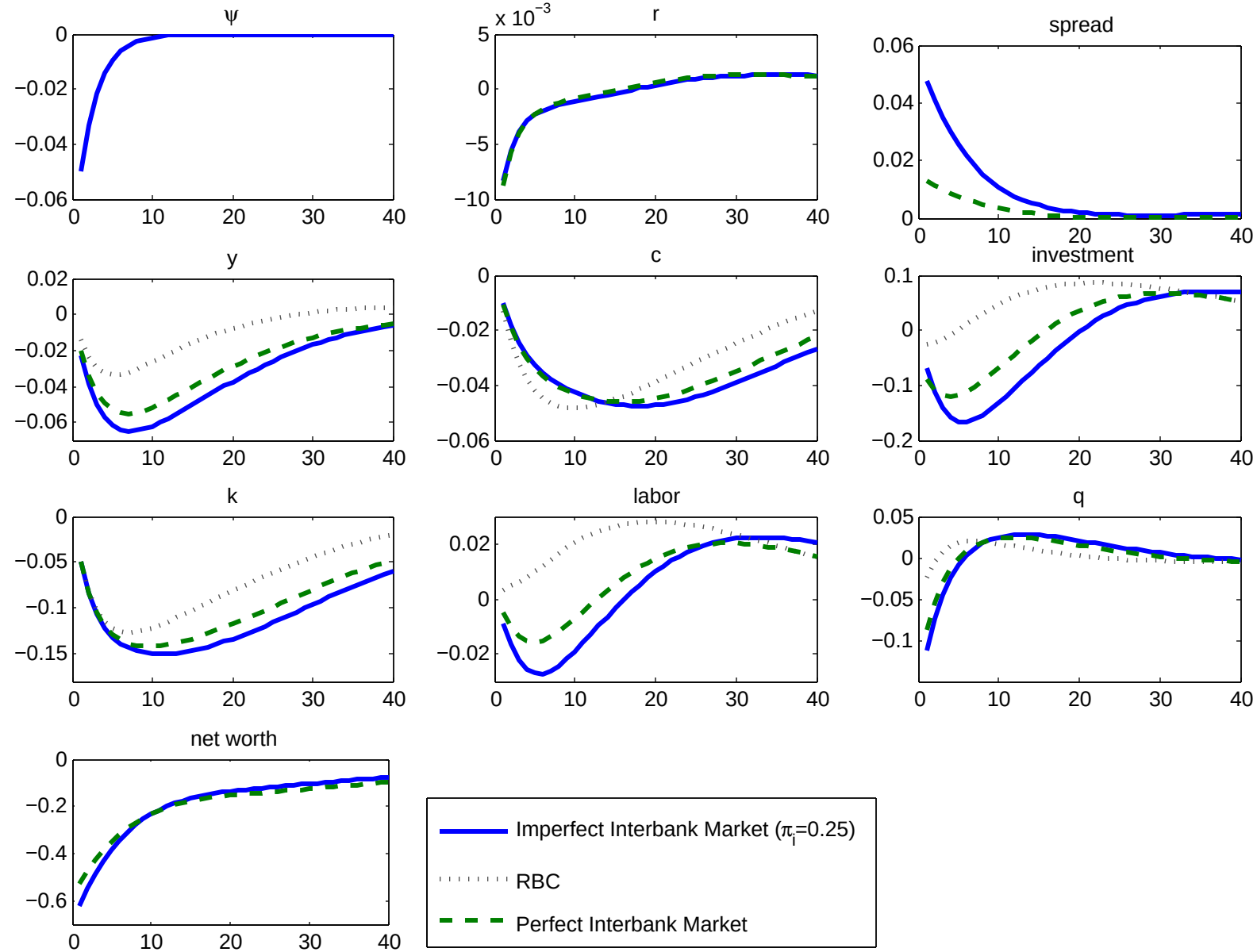


Figure 3. Lending Facilities: Perfect Interbank Market

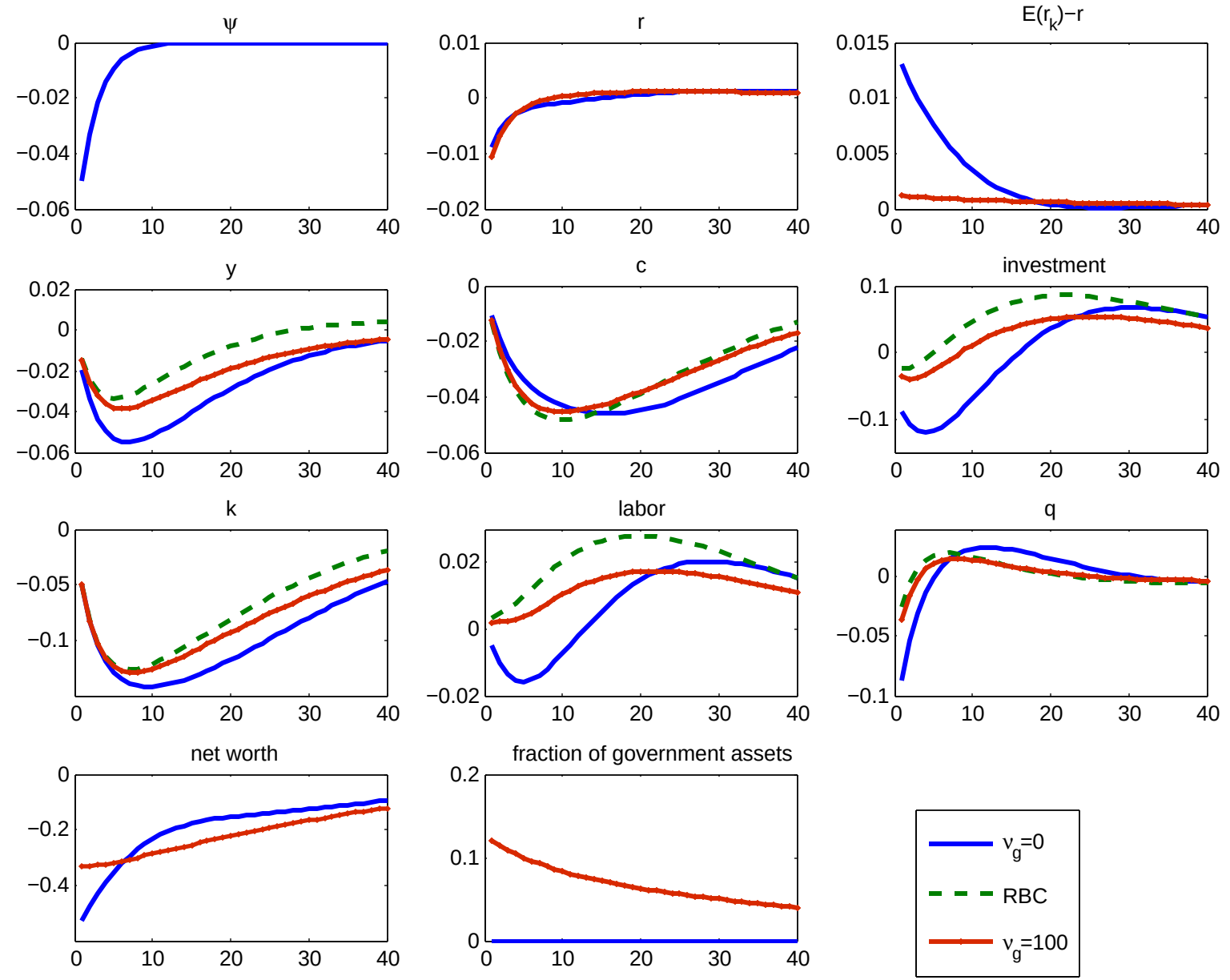
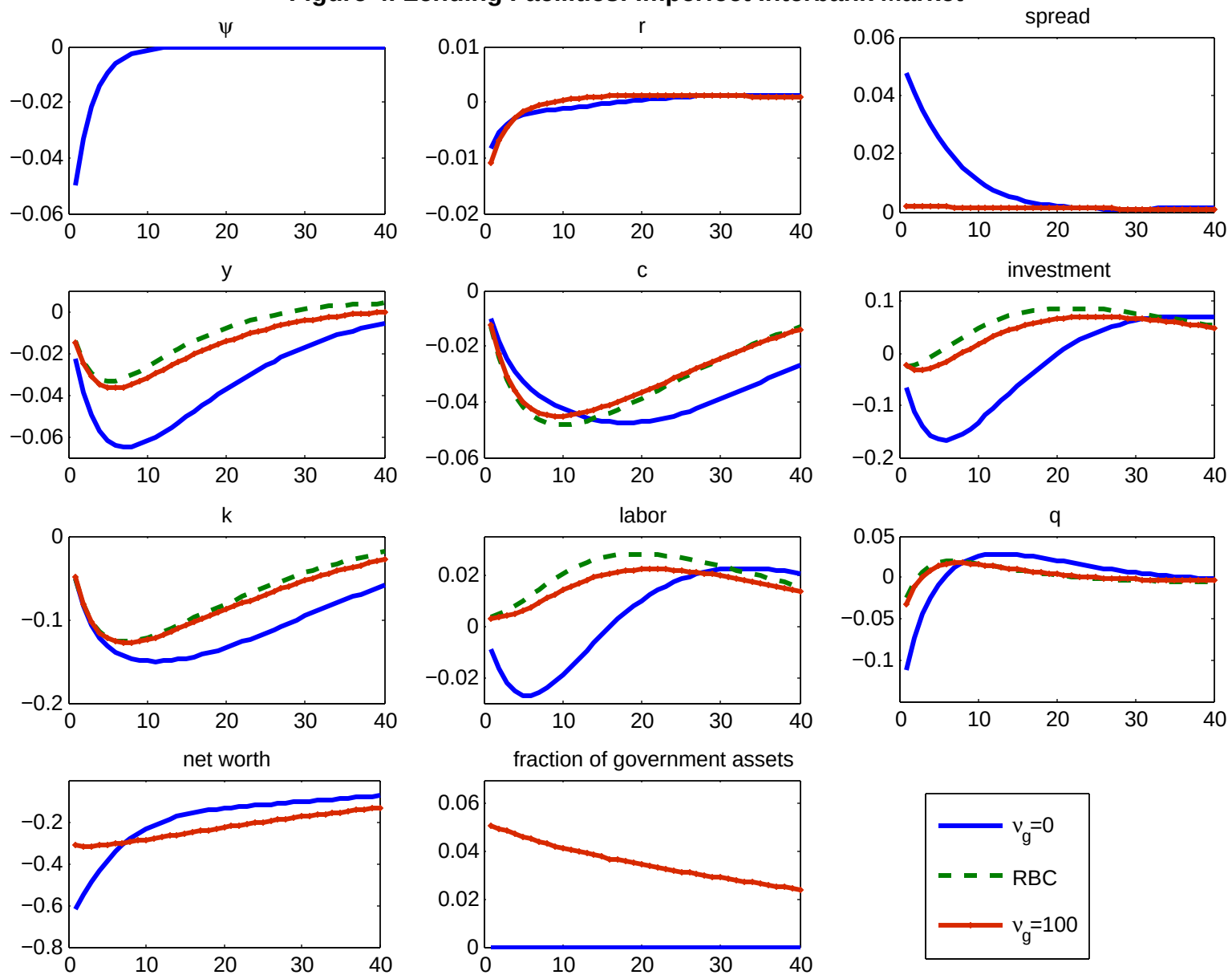


Figure 4. Lending Facilities: Imperfect Interbank Market



Issues for Further Study

Tightening margins

Outside equity issue of banks

Capital requirement and the other regulations

Moral hazard from anticipated policy interventions