Credit Frictions and Optimal Monetary Policy

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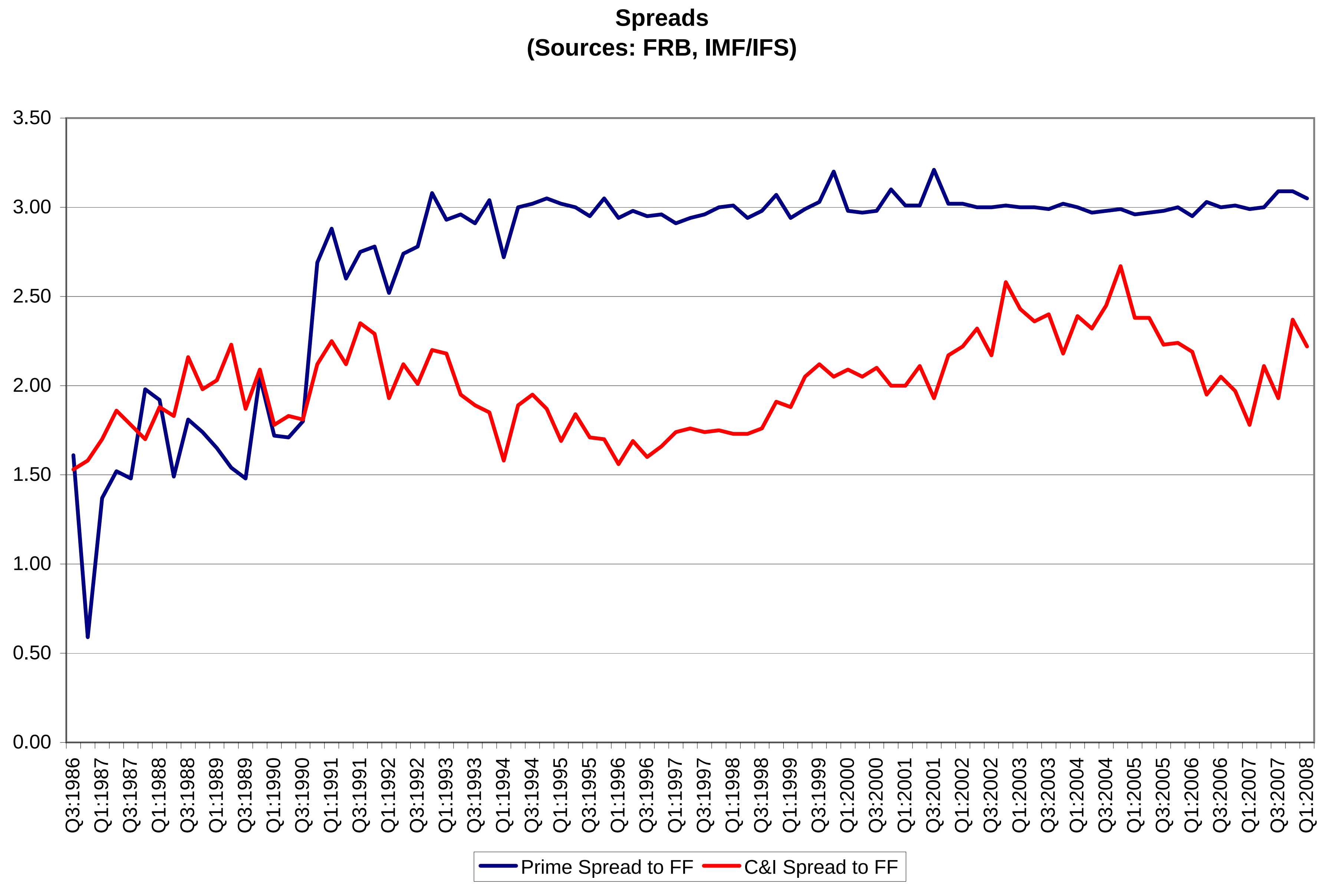
  - Single interest rate (which is also the policy rate) relevant for all decisions

- But in actual economies (even financially sophisticated), there are different interest rates, that do not move perfectly together


Spreads
(Sources: FRB, IMF/IFS)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Q3:1986
Q1:1987
Q3:1987
Q1:1988
Q3:1988
Q1:1989
Q3:1989
Q1:1990
Q3:1990
Q1:1991
Q3:1991
Q1:1992
Q3:1992
Q1:1993
Q3:1993
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Q1:2006
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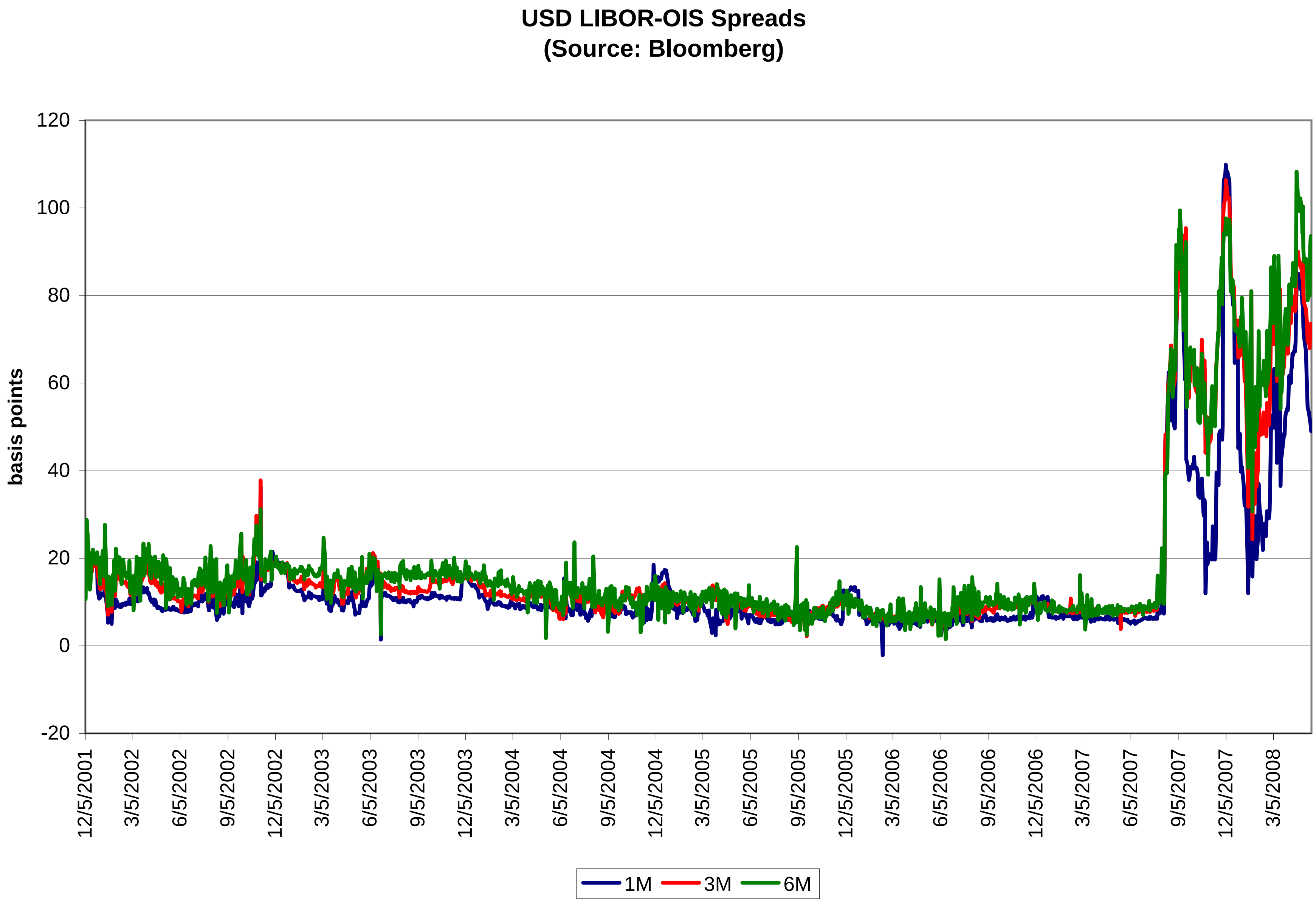
Q1:2007
Q3:2007
Q1:2008
Prime Spread to FF
C&I Spread to FF



USD LIBOR-OIS Spreads
(Source: Bloomberg)
basis points
120
100
80
60
40
20
0
-20
12/5/2001
3/5/2002
6/5/2002
9/5/2002
12/5/2002
3/5/2003
6/5/2003
9/5/2003
12/5/2003
3/5/2004
6/5/2004
9/5/2004
12/5/2004
3/5/2005
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12/5/2005
3/5/2006
6/5/2006
9/5/2006
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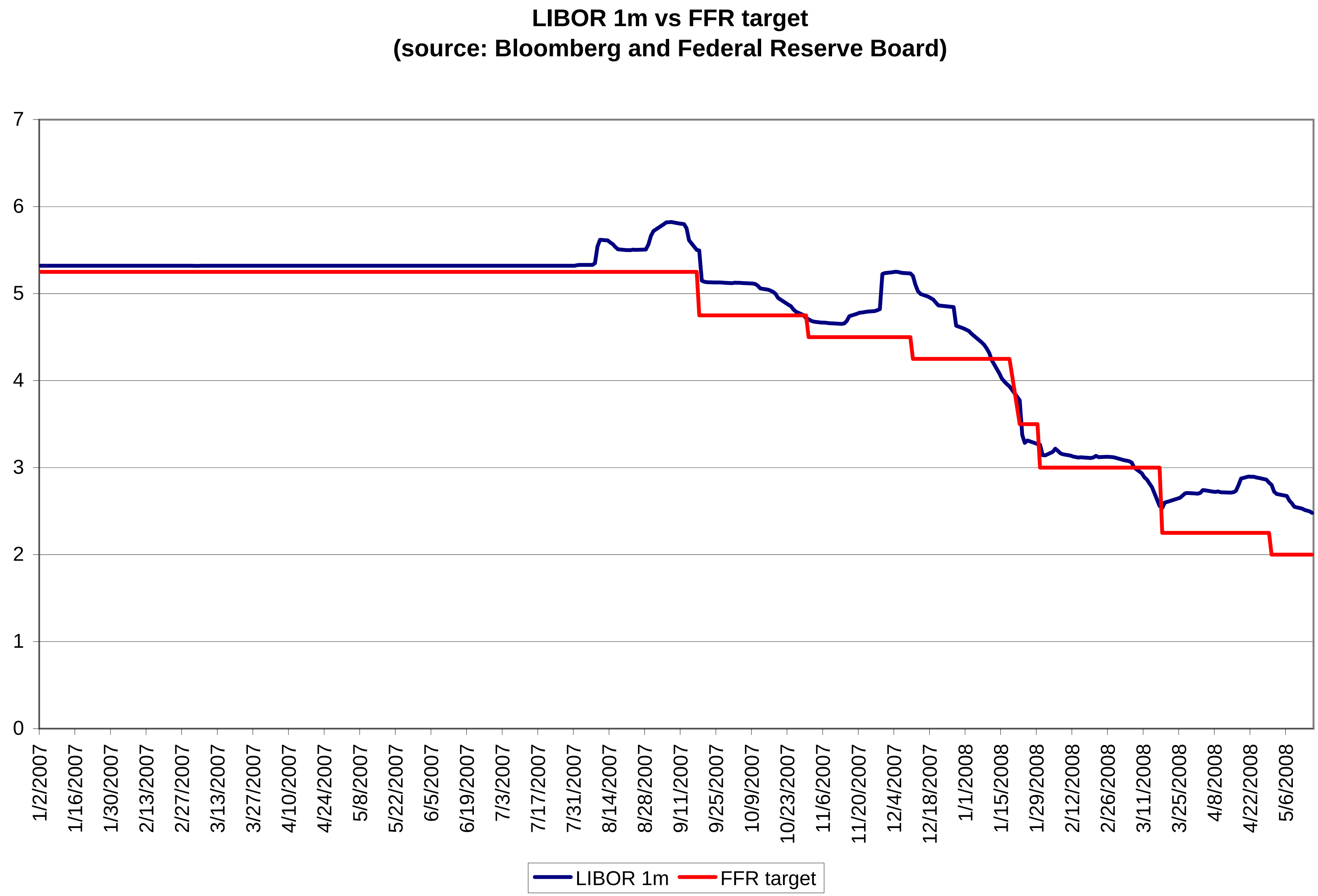
12/5/2007
3/5/2008
1M
3M
6M



LIBOR 1m vs FFR target
(source: Bloomberg and Federal Reserve Board)
7
6
5
4
3
2
1
0
1/2/2007
1/16/2007
1/30/2007
2/13/2007
2/27/2007
3/13/2007
3/27/2007
4/10/2007
4/24/2007
5/8/2007
5/22/2007
6/5/2007
6/19/2007
7/3/2007
7/17/2007
7/31/2007
8/14/2007
8/28/2007
9/11/2007
9/25/2007
10/9/2007
10/23/2007
11/6/2007
11/20/2007
12/4/2007
12/18/2007
1/1/2008
1/15/2008
1/29/2008
2/12/2008
2/26/2008
3/11/2008
3/25/2008
4/8/2008
4/22/2008
5/6/2008
LIBOR 1m
FFR target

Motivation

Questions:

- How much is monetary policy analysis changed by recognizing existence of spreads between different interest rates?
- How should policy respond to "financial shocks" that disrupt financial intermediation, dramatically widening spreads?

The Model

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  - heterogeneity in spending opportunities
  - costly financial intermediation

The Model: Heterogeneity

- Each household has a type $\tau_t(i) \in \{b, s\}$, determining preferences (opportunities for spending, productive work)
  — varies exogenously, remaining same each period with probability $\delta < 1$

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- Consequence: long-run marginal utility of income same for all households, regardless of history of spending opportunities

The Model: Credit Frictions

- Financial intermediation technology: in order to supply loans in (real) quantity b_t, must obtain (real) deposits

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- More generally, we allow

$$1 + \omega_t(b_t) = \mu_t^b(b_t)(1 + \Xi_{bt}(b_t)),$$

where $\{\mu_t^b\}$ is a markup in the banking sector (perhaps a risk premium)

Log-Linear Equations

- Intertemporal IS relation:

$$\hat{Y}_t = E_t \hat{Y}_{t+1} - \bar{\sigma}[\hat{\imath}_t^{avg} - \pi_{t+1}] - E_t[\Delta g_{t+1} + \Delta\hat{\Xi}_{t+1} - \bar{\sigma} s_\Omega \Delta\hat{\Omega}_{t+1}]$$

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- Variation in marginal-utility gap $\hat{\Omega}_t$:

$$\hat{\Omega}_t = \hat{\omega}_t + \delta E_t \hat{\Omega}_{t+1},$$

where $\hat{\omega}_t$ is deviation of credit spread from its steady-state value

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- Hence the rate $\hat{\imath}_t^{avg}$ that appears in IS relation is determined by

$$\hat{\imath}_t^{avg} = \hat{\imath}_t^d + \pi_b \hat{\omega}_t$$

Log-Linear Equations

- Log-linear AS relation: generalizes NKPC:

$$\pi_t = \kappa(\hat{Y}_t - \hat{Y}_t^n) + u_t + \xi(s_\Omega + \pi_b - \gamma_b)\hat{\Omega}_t - \xi\bar{\sigma}^{-1}\hat{\Xi}_t + \beta E_t \pi_{t+1}$$

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where definition of natural rate $\hat{Y}_t^n$, cost-push shock u_t, are same as in basic NK model

What Difference Do Frictions Make?

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- Then the usual 3-equation model suffices to determine paths of $\{\hat{Y}_t, \pi_t, \hat{\imath}_t^{avg}\}$:
  - AS relation
  - IS relation
  - MP relation (written in terms of implication for $\hat{\imath}_t^{avg}$, given exogenous spread)

What Difference Do Frictions Make?

- Responses of output, inflation, interest rates to non-financial shocks (under a given monetary policy rule, e.g. Taylor rule) are identical to those predicted by basic NK model
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- But how robust this conclusion? For more general credit frictions, we resort to numerical solution of calibrated examples

Calibrated Model

- Calibration of preference heterogeneity: assume equal probability of two types, $\pi_b = \pi_s = 0.5$, and $\delta = 0.975$ (average time that type persists $=$ 10 years)

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  - Assume $\sigma_b/\sigma_s = 5$

    — implies credit contracts in response to monetary policy tightening (consistent with VAR evidence)

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- Zero steady-state markup; resource costs imply steady-state credit spread $\bar{\omega} = 2.0$ percent per annum (median spread between FRB C&I loan rate and FF rate)

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- Calibrate η so that 1 percent increase in volume of bank credit raises credit spread by .10 percent [relative VAR responses of credit, spread]

  — requires $\eta = 6.06$

Numerical Results: Taylor Rule

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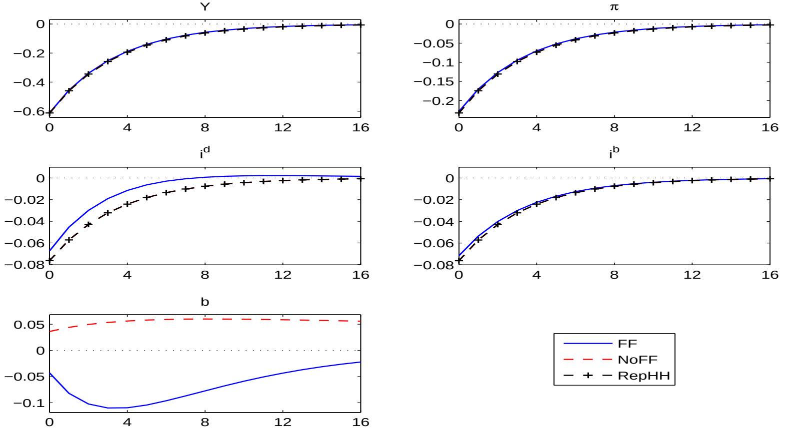
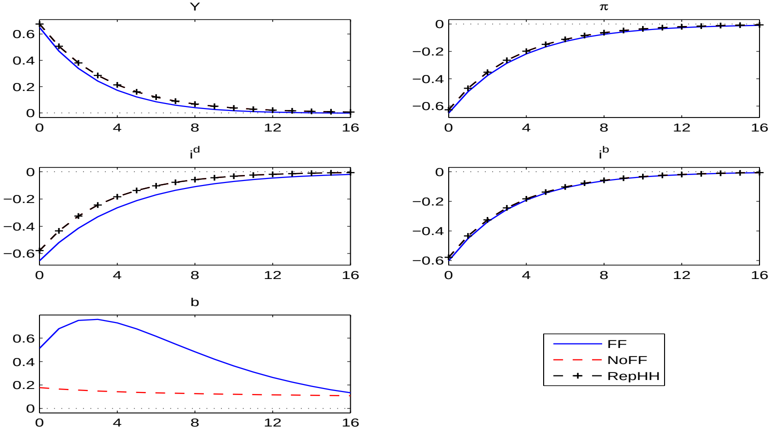
- Compare the predicted effects of policy for 3 alternative model specifications:
  - FF model: model with heterogeneity and credit frictions, as above
  - No FF model: same heterogeneity, but $\omega_t = \Xi_t = 0$ at all times
  - RepHH model: representative household with intertemporal elasticity $\bar{\sigma}$

Numerical Results: Taylor Rule



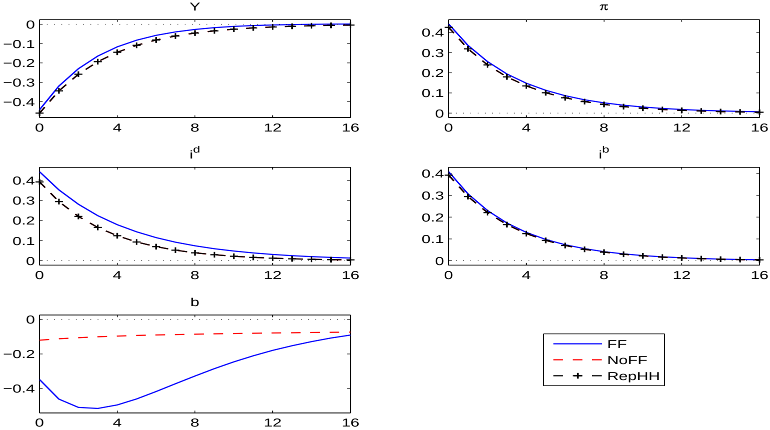
Responses to monetary policy shock: convex technology

Numerical Results: Taylor Rule



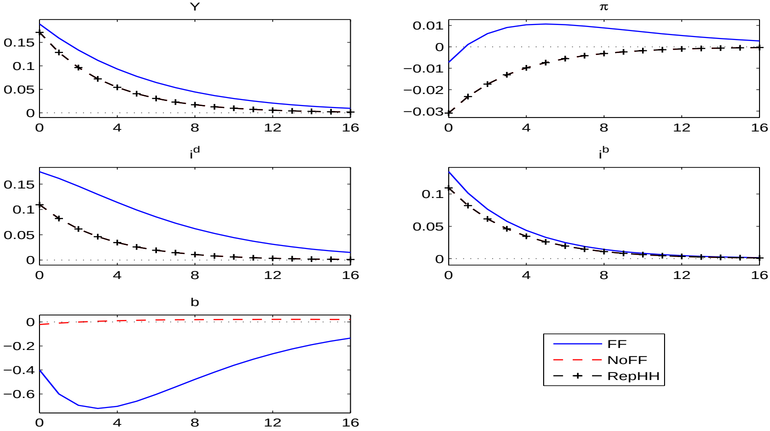
Responses to technology shock: convex technology

Numerical Results: Taylor Rule

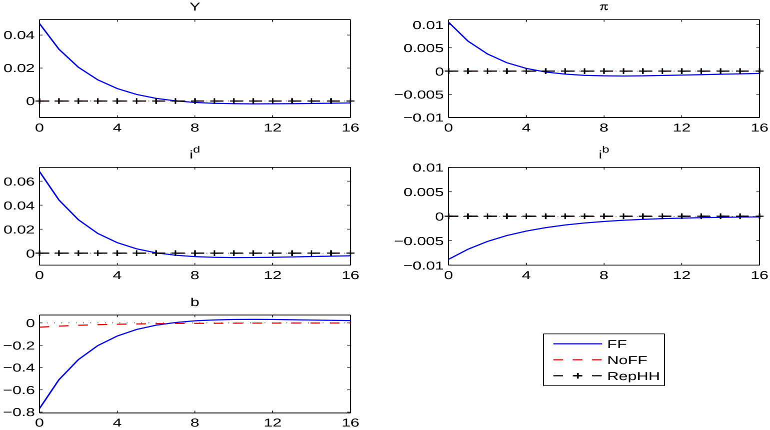


Responses to wage markup shock: convex technology

Numerical Results: Taylor Rule

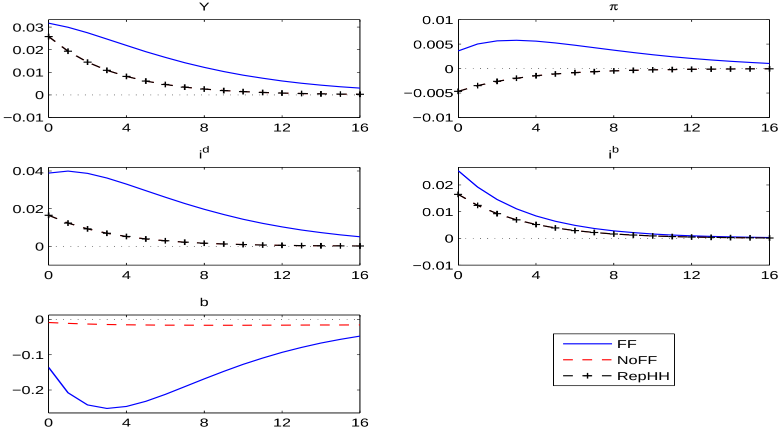


Responses to shock to government purchases: convex technology



Responses to shock to government debt: convex technology

Numerical Results: Taylor Rule



Responses to shock to demand of savers: convex technology

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- Results especially simple in special case:
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    —Note, however, that we do allow for shocks to the size of credit frictions

Optimal Policy: LQ Approximation

- Approximate objective: max of expected utility equivalent (to 2d order) to minimization of quadratic loss function

$$\sum_{t=0}^{\infty} \beta^t [\pi_t^2 + \lambda_y (\hat{Y}_t - \hat{Y}_t^n)^2 + \lambda_\Omega \hat{\Omega}_t^2 + \lambda_\Xi \Xi_{bt} \hat{b}_t]$$

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  - New weights $\lambda_\Omega, \lambda_\Xi > 0$

- LQ problem: minimize loss function subject to log-linear constraints: AS relation, IS relation, law of motion for $\hat{b}_t$, relation between $\hat{\Omega}_t$ and expected credit spreads

Optimal Policy: LQ Approximation

- Consider special case:
  - No resources used in intermediation ($\Xi_t(b) = 0$)
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- However, state-contingent path of policy rate required to implement the target criterion is not the same

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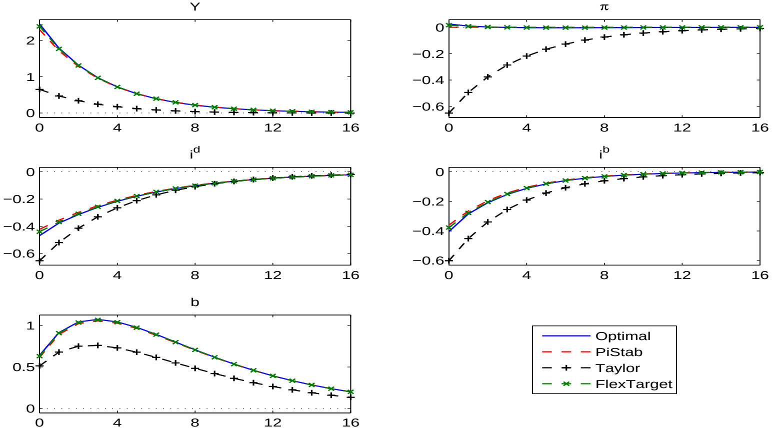
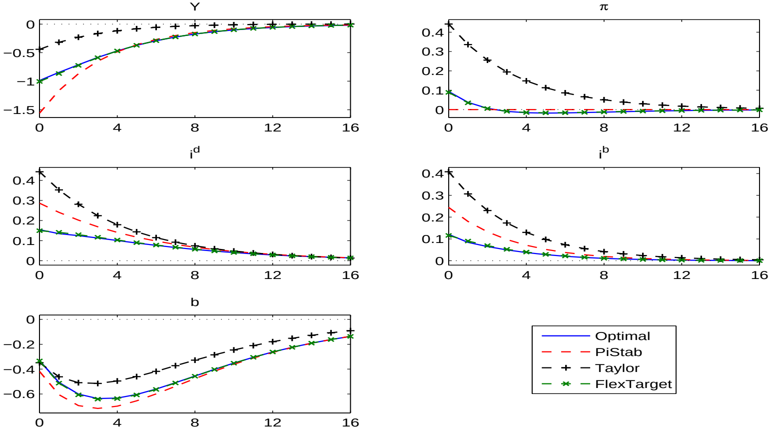
- This is no longer an exact characterization of optimal policy, in more general case in which ω_t and/or Ξ_t depend on the evolution of b_t
- But numerical results suggest still a fairly good approximation to optimal policy

Numerical Results: Optimal Policy



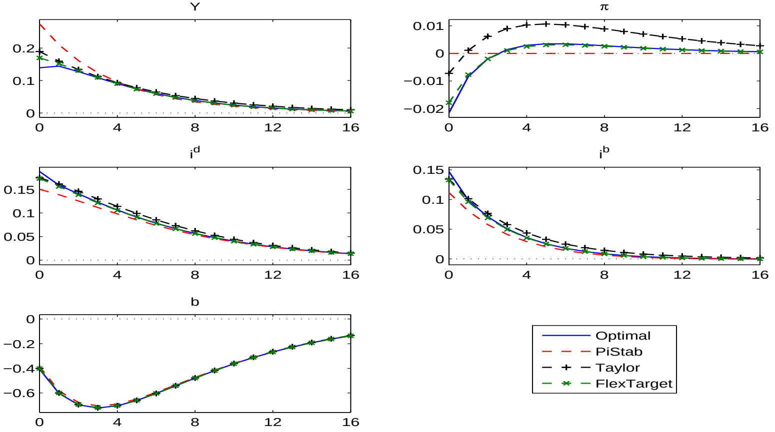
Responses to technology shock, under 4 monetary policies

Numerical Results: Optimal Policy



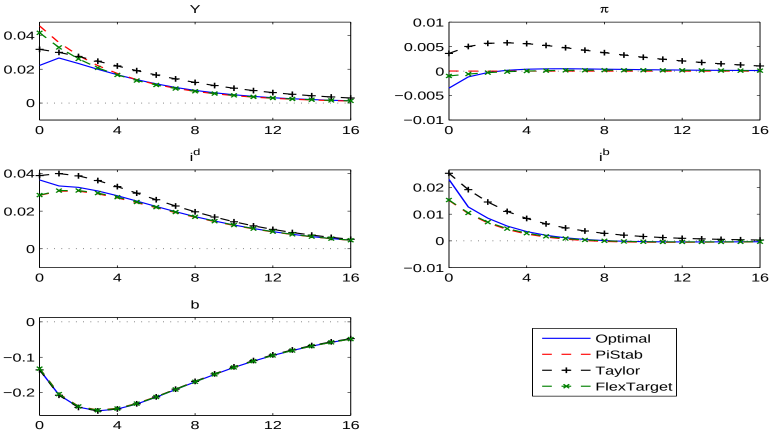
Responses to wage markup shock, under 4 monetary policies

Numerical Results: Optimal Policy



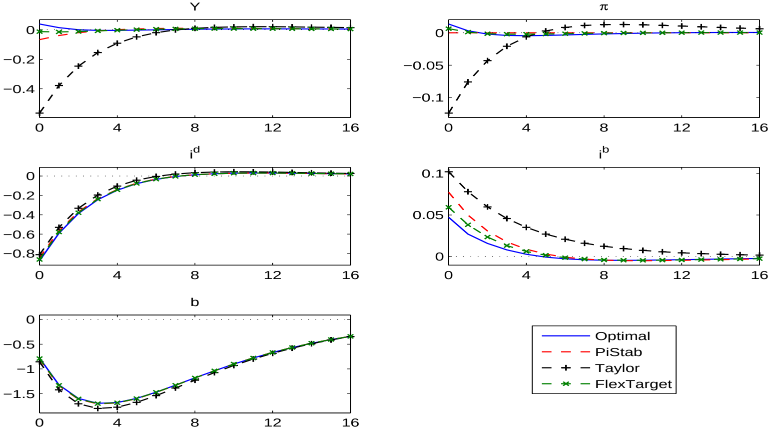
Responses to shock to government purchases, under 4 monetary policies

Numerical Results: Optimal Policy



Responses to shock to demand of savers, under 4 monetary policies

Numerical Results: Optimal Policy



Responses to financial shock, under 4 monetary policies

Spread-Adjusted Taylor Rule

- Rule of thumb suggested by various authors (McCulley and Toloui, 2008; Taylor, 2008): adjust the intercept of the Taylor rule in proportion to changes in spreads:

$$\hat{\imath}_t^d = \phi_\pi \pi_t + \pi_y \hat{Y}_t - \phi_\omega \hat{\omega}_t$$

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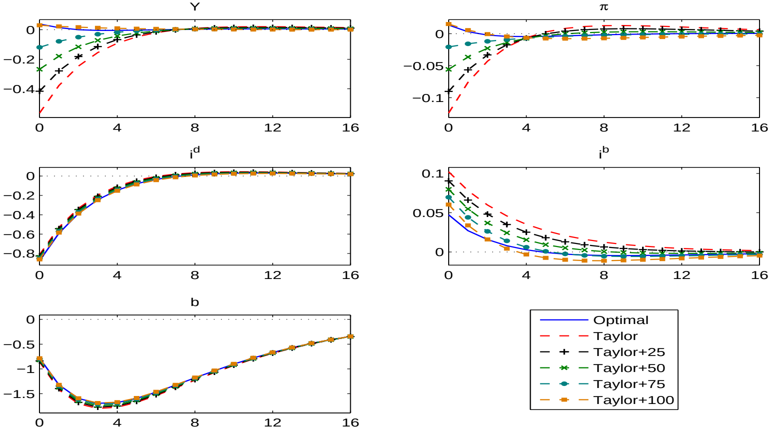
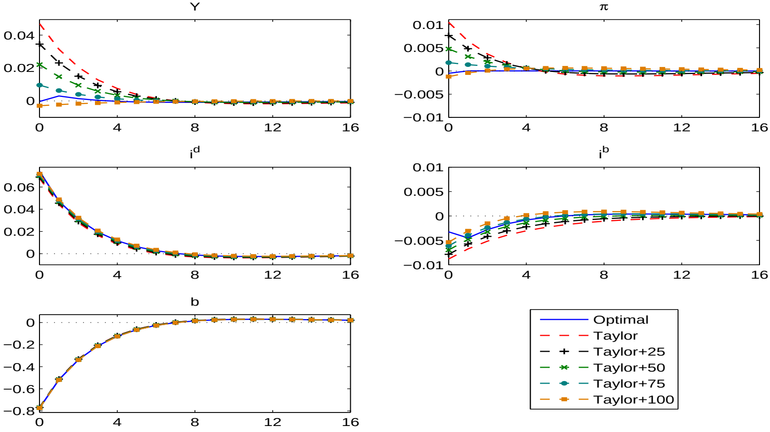
  - Equivalent to having a Taylor rule for the borrowing rate, rather than the interbank funding rate
- We allow for other possible values of ϕ_ω

Numerical Results: Spread-Adjusted Taylor Rules



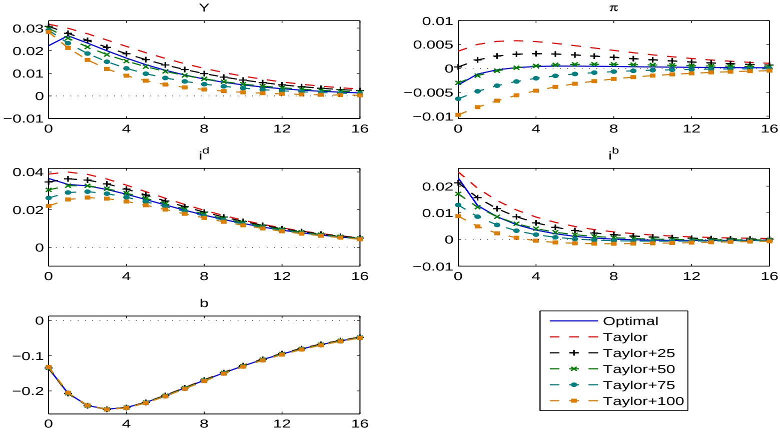
Responses to financial shock, under alternative spread adjustments

Numerical Results: Spread-Adjusted Taylor Rules



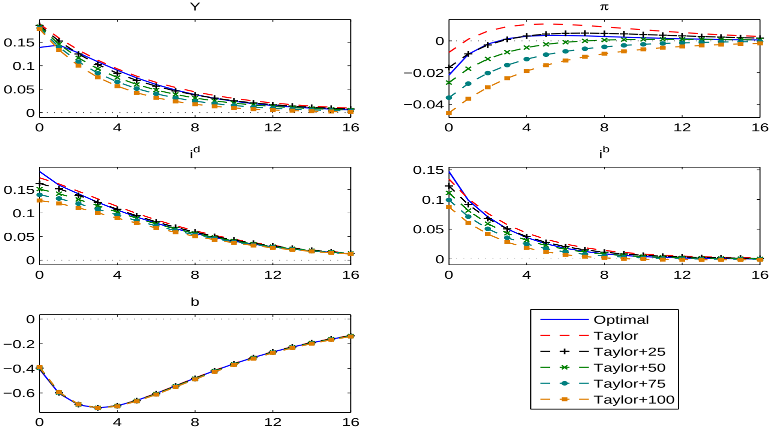
Responses to a shock to government debt

Numerical Results: Spread-Adjusted Taylor Rules



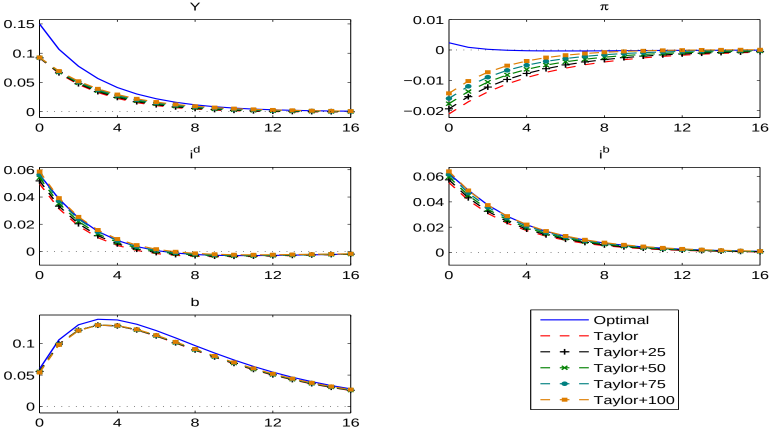
Responses to a shock to the demand of savers

Numerical Results: Spread-Adjusted Taylor Rules



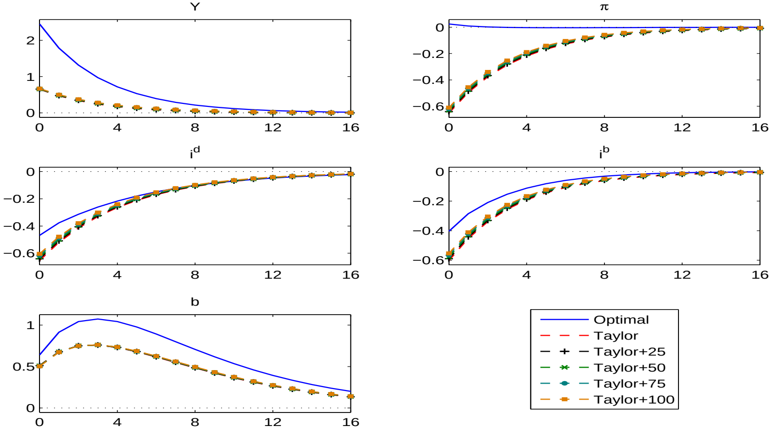
Responses to a shock to government purchases

Numerical Results: Spread-Adjusted Taylor Rules



Responses to a shock to the demand of borrowers

Numerical Results: Spread-Adjusted Taylor Rules



Responses to a technology shock

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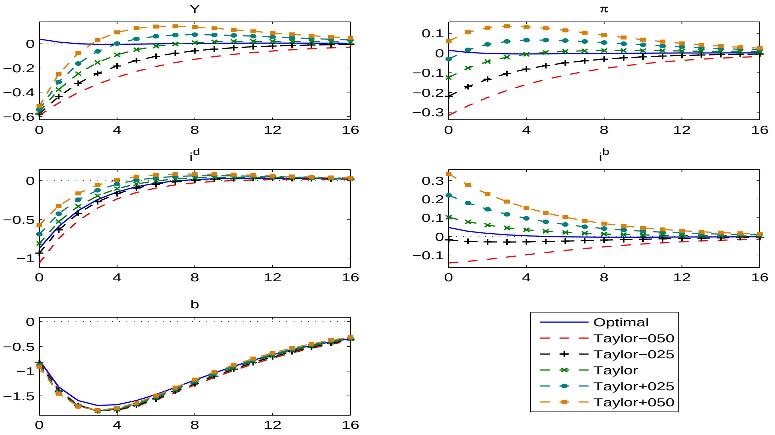
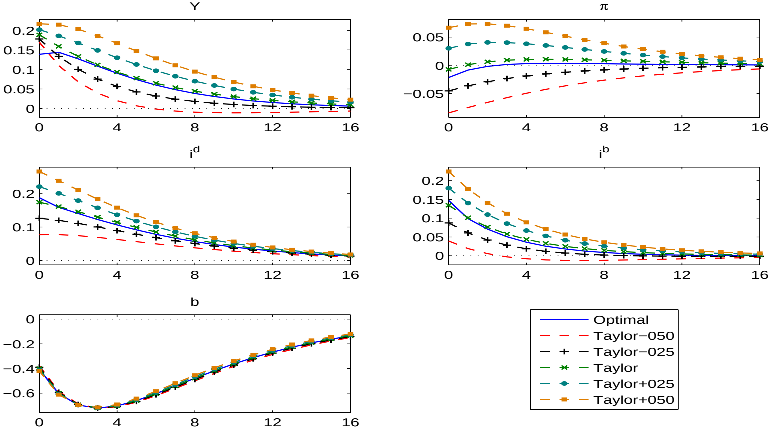


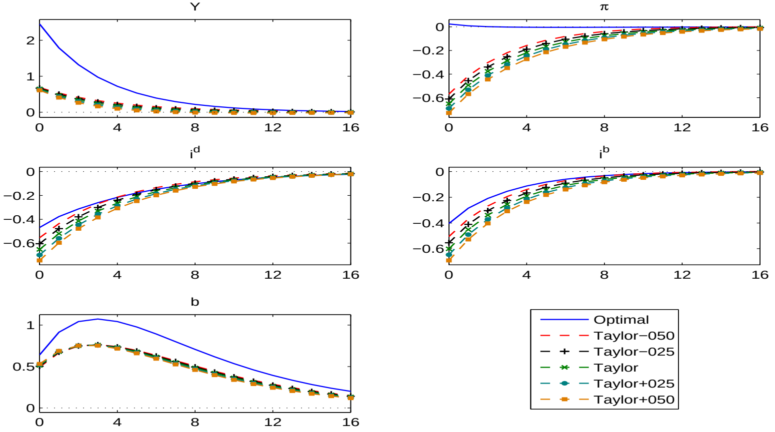
Responses to a "financial shock"

Numerical Results: Responding to Credit



Responses to a shock to government purchases

Numerical Results: Responding to Credit



Responses to a technology shock

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  - More generally, a generalization of basic NK model that retains many qualitative features of that model of the transmission mechanism

  - Quantitatively, basic NK model remains a good approximation, esp. if little endogeneity of credit spreads

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  - However, interest-rate spreads really what matter more than variations in quantity of credit

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- Spread-adjusted Taylor rule can improve upon standard Taylor rule
    - However, optimal degree of adjustment not same for all shocks
    - And such a rule inferior to commitment to a target criterion
- Guideline for policy: base policy decisions on a target criterion relating inflation to output gap (optimal in absence of credit frictions)
    - Take account of credit frictions only in model used to determine policy action required to fulfill target criterion