The Signalling Channel of Negative Interest Rates

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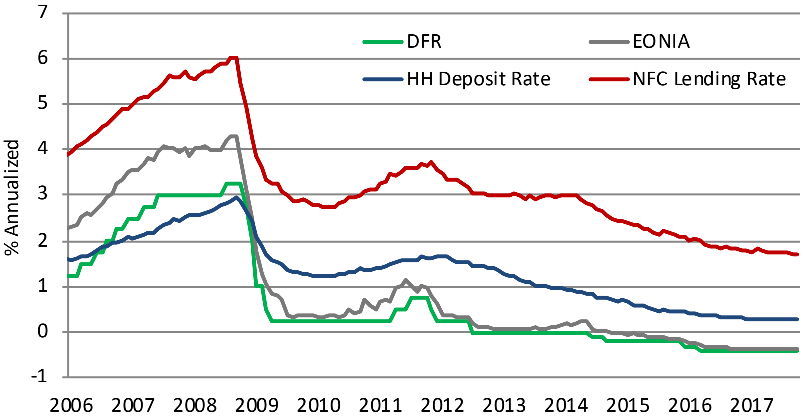
Motivation

(1) DFR & EONIA negative since 2014

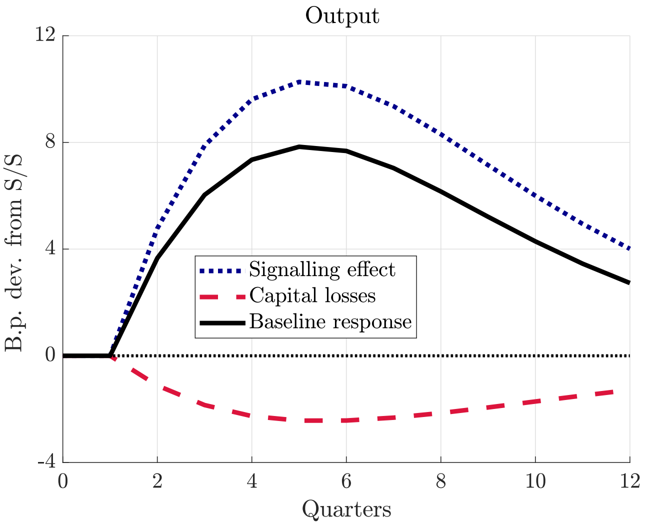


Overview I

Two questions, one positive, one normative:

1. Are Negative Interest Rates (NIRs) effective?
   - With policy inertia, NIRs *signal* zero-for-longer deposit rates, thus boosting economic activity today.
   - However, NIRs also have a (partial equilibrium) contractionary effect on bank net worth.
   - **In medium-scale NK model, quantitatively, the signalling effect dominates bank net worth channel and NIR boost output/inflation.**
   - In general equilibrium, bank profitability rises as a result of stronger aggregate demand.

Overview II


Output
B.p. dev. from S/S
Quarters
12
8
4
0
-4
0
2
4
6
8
10
12
Signalling effect
Capital losses
Baseline response

Overview II

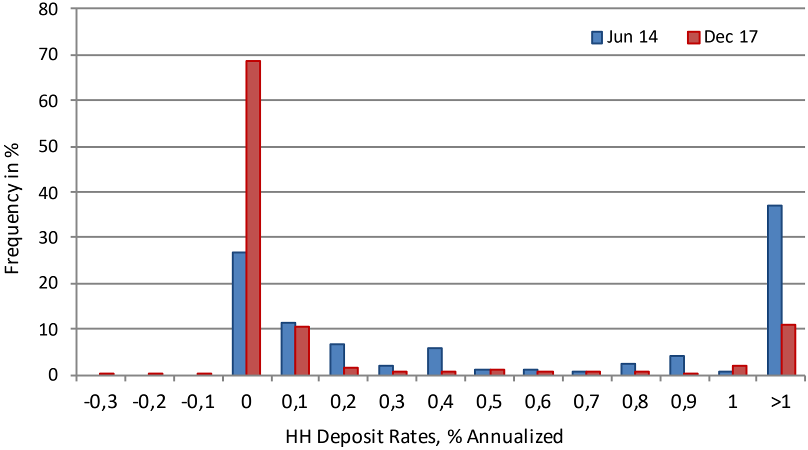
2. Are NIRs optimal?
   - Policymaker with full commitment can credible promise a future path of interest rates and therefore doesn't use (costly) NIRs.
   - Time-consistent (discretionary) policymaker cannot signal and therefore doesn't use (costly) NIRs.
   - Necessary conditions:
     - Policy is time-consistent (discretionary), &
     - The policymaker has an intrinsic preference for smoothing policy.

Literature review

- Effect of NIRs — empirical
  - Jobst & Lin (2016), Eisenschmidt & Smets (2017), Altavilla et al. (2017), Demiralp et al. (2017), Heider et al. (2017)
- Effects of NIRs — theoretical
  - Eggertsson et al. (2018), Brunnermeier & Koby (2018)
- Optimal policy & NIRs
  - Rognlie (2017), Porcellacchia (2018)
- Costly signalling
  - Bhattacharya (1979), Bhattarai et al. (2015)
- Policy smoothing
  - Orphanides & Williams (2002), Woodford (2003), Coibion & Gorodnichenko (2012), Nakata & Schmidt (2018)

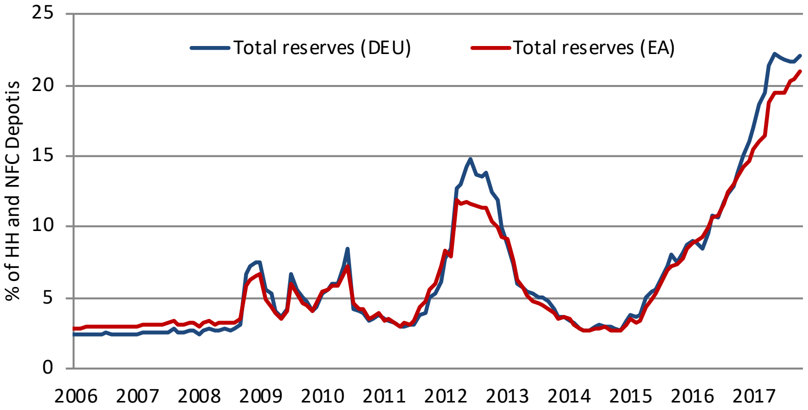
Stylized facts I

Household deposit rates are bounded by zero



Stylized facts II

2. Banking system is awash with reserves



Outline

- **Are NIRs effective**?
- Are NIRs optimal?

The model

More or less the Gertler & Karadi (2011, JME) model.

- Households
  - Habits in consumption
  - Endogenous labor supply
- Firms
  - Monopolistic competition
  - Calvo-type pricing
  - Endogenous investment spending & capital accumulation & endogenous capital utilization
- Banks
  - Next slide
- Monetary policy
  - Next slide + 1

Banks

The representative bank's decision problem

$\nu_t = \max_{S_t, H_t, D_t} \mathbb{E}_t \Lambda_{t,t+1} \left((1-\theta) n_{t+1} + \theta \nu_{t+1} \right),$	max PDV of profits
s.t.	s.t.
$Q_t S_t + H_t \leq n_t + D_t,$	Balance sheet,
$\lambda Q_t S_t \leq \nu (n_t),$	Incentive constraint,
$\alpha D_t \leq H_t,$	Reserve ratio,
$n_{t+1} = R_{K,t+1} Q_t S_t + \frac{R_{R,t}}{\Pi_{t+1}} H_t - \frac{R_{D,t}}{\Pi_{t+1}} D_t.$	Evolution of net worth.

Monetary policy

Taylor rule

$$R_{T,t} = \left(R \left(\frac{\Pi_t}{\Pi} \right)^{\phi_\pi} \left(\frac{X_t}{X} \right)^{\phi_y} \right)^{1-\rho} R_{R,t-1}^{\rho} \mathrm{e}^{\sigma_m \varepsilon_{m,t}}, \quad \varepsilon_{m,t} \sim \text{iid.}$$

- Case I: Unconstrained scenario

$$R_{T,t} = R_{R,t} = R_{d,t}$$

- Case II: Deposit rate ZLB scenario

$$R_{R,t} = R_{T,t} \quad \text{and} \quad R_{D,t} = \max\{1, R_{T,t}\}$$

- Case III: Standard ZLB scenario

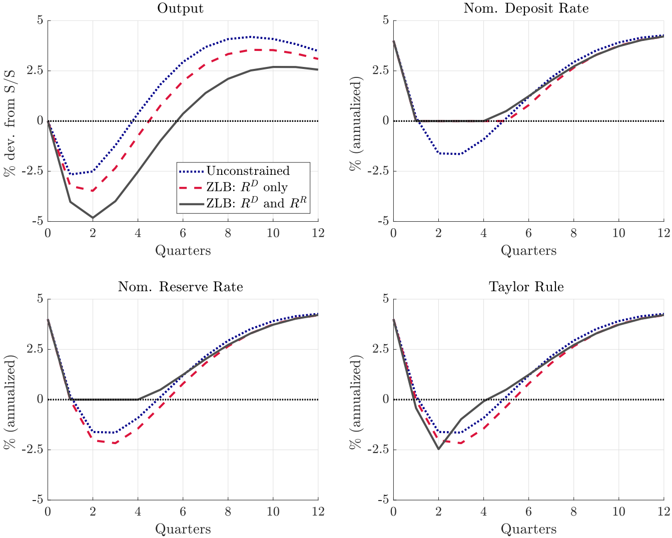
$$R_{D,t} = R_{R,t} = \max\{1, R_{T,t}\}$$

The experiment

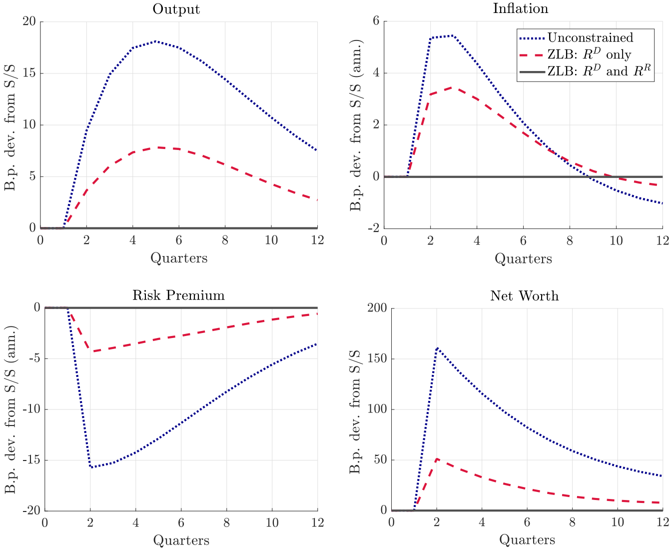
- Economy is at the ZLB (from a negative AD shock)
- Add a -25bp iid MP shock
- Baseline calibration:

α	reserve-to-deposit ratio	0.2
ρ	persistence in the Taylor rule	0.8

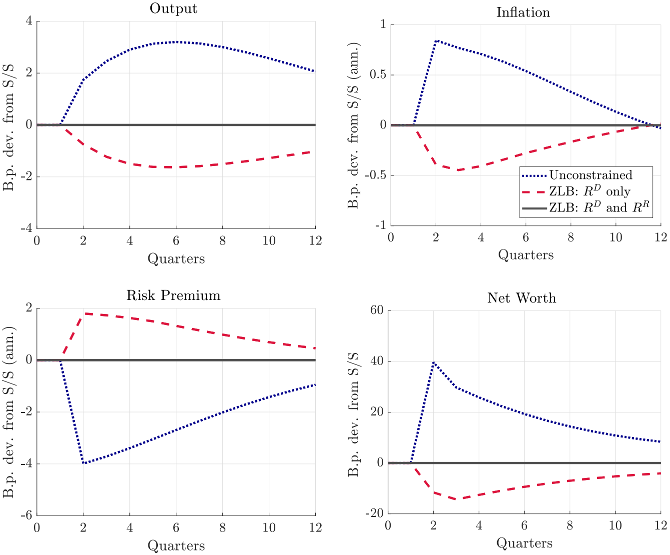
NIRs are expansionary in baseline calibration



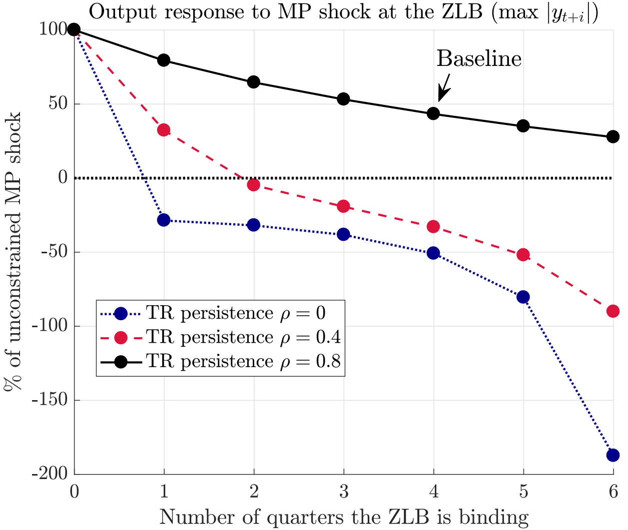
25bp MP shock: Expansionary



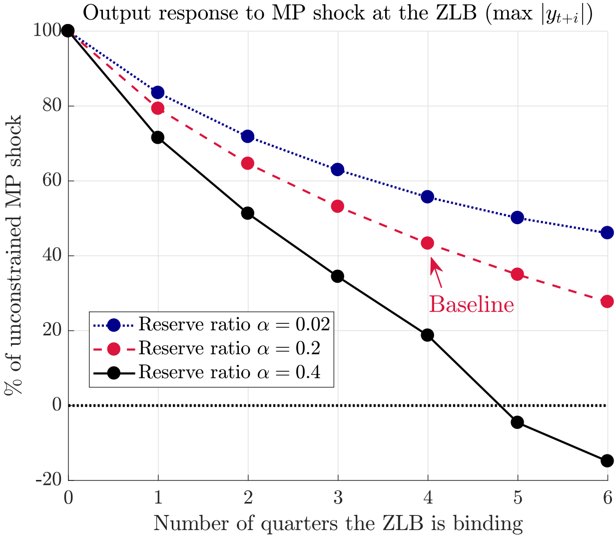
25bp MP shock: Contractionary w/o persistence



Sensitivity: Taylor rule persistence



Sensitivity: Reserve-to-deposit ratio



Decomposition of bank profits

- Growth in a bank's nominal net worth

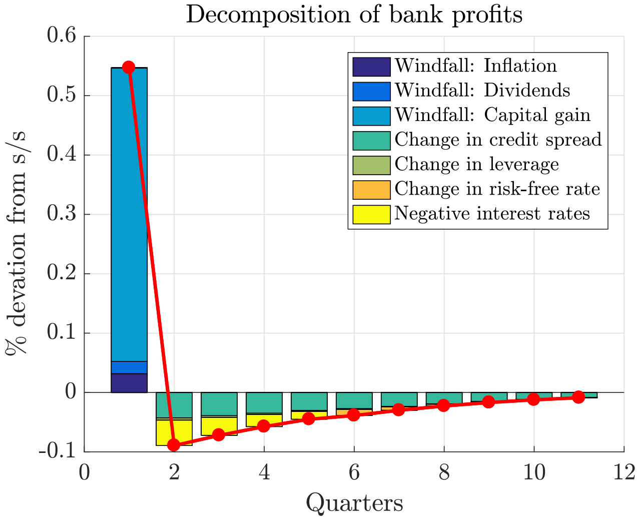
$$g_t^N = \underbrace{(\Pi_t R_{K,t} - \mathbb{E}_{t-1}\Pi_t R_{K,t})}_{\text{Surprise}}\phi_{t-1} + \underbrace{(\mathbb{E}_{t-1}\Pi_t R_{K,t} - R_{D,t-1})}_{\text{Spread}}\underbrace{\phi_{t-1}}_{\text{Leverage}}$$

$$+ \underbrace{R_{D,t-1}}_{\text{Risk-free rate}} - \frac{\alpha}{1-\alpha}\underbrace{(R_{D,t-1} - R_{R,t-1})}_{\text{Negative interest rates}}(\phi_{t-1} - 1),$$

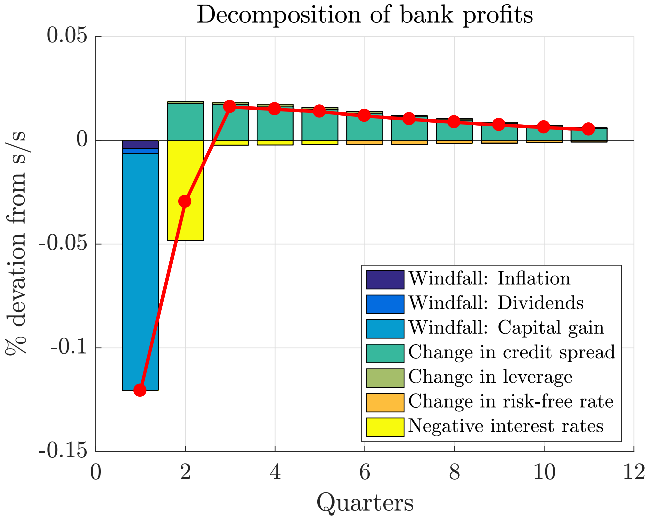
- Decompose the surprise return on assets into a Dividend and Capital gains component

$$R_{K,t} = \frac{\overbrace{MPK_t}^{\text{Dividend}} + \overbrace{(Q_t - \delta)}^{\text{Capital gain}}}{Q_{t-1}},$$

Bank profits w/ persistence



Bank profits w/o persistence



Outline

- Are NIRs effective?
- **Are NIRs optimal?**

Simplified model

- Study optimal policy using an augmented 3-equation NK model

$$V_t\left(i_{r,t-1},\varepsilon_t\right) = \max\left(\begin{array}{l} -\frac{1}{2}\left(\left(1-\alpha\right)\left(\pi_t^2+\lambda y_t^2\right)+\alpha\left(i_{r,t}-i_{r,t-1}\right)^2\right) \\ +\beta\mathbb{E}_t V_{t+1}\left(i_{r,t},\varepsilon_{t+1}\right) \\ +\zeta_{1,t}\left(\pi_t-\beta\mathbb{E}_t\pi_{t+1}-\kappa y_t\right) \\ +\zeta_{2,t}\left(y_t-\mathbb{E}_t y_{t+1}+\sigma\left(i_{d,t}-\mathbb{E}_t\pi_{t+1}-\varepsilon_t\right)+\phi\left(i_{d,t}-i_{r,t}\right)\right) \\ +\zeta_{3,t} i_{d,t} \\ +\zeta_{4,t}\left(i_{d,t}-i_{r,t}\right)\end{array}\right.$$

- Model solved using policy function iteration
- Baseline calibration:

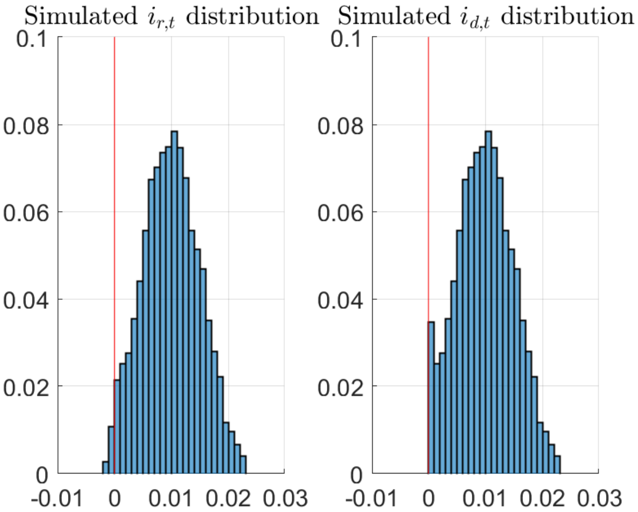
α	Smoothing preference	0.1
ϕ	Aggregate demand cost of NIR	2

Results

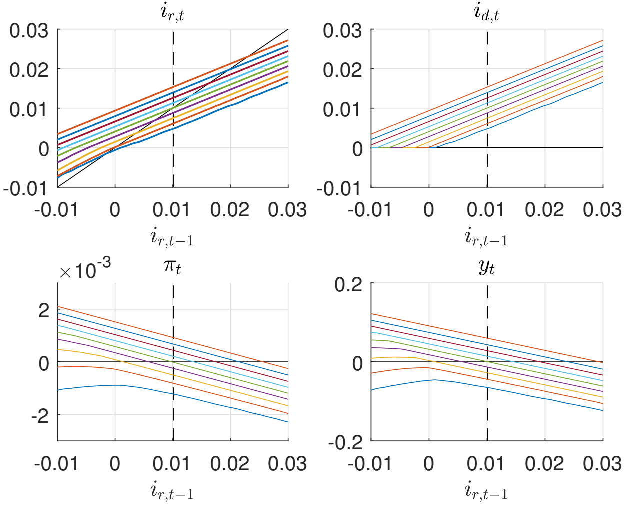
Necessary conditions for NIRs to be in the policymaker's toolkit:

	Commitment	**Discretion**
Smoothing	×	✓
No Smoothing	×	×

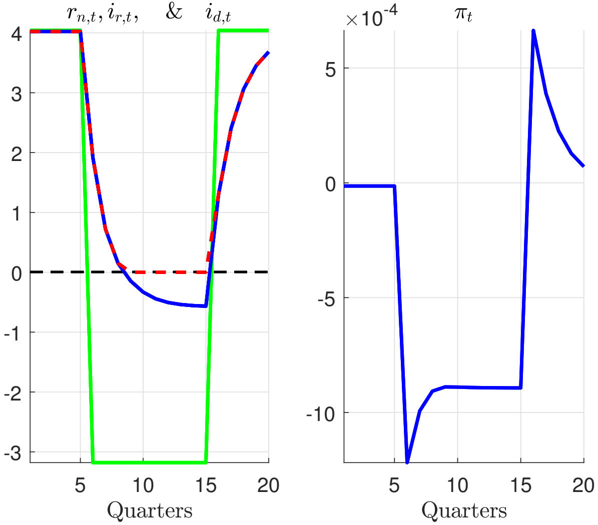
Simulated distribution



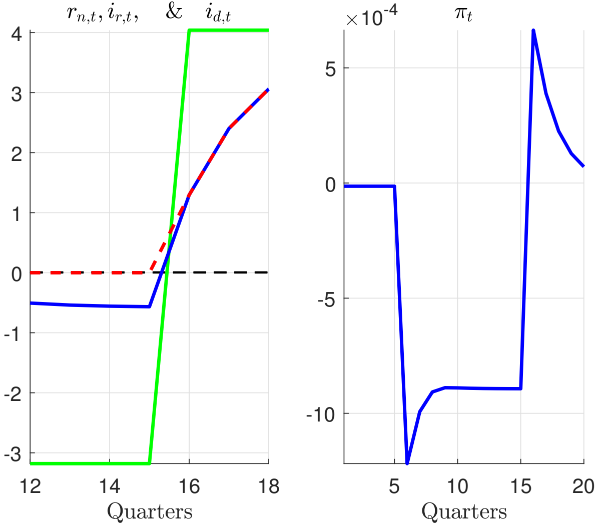
Policy functions



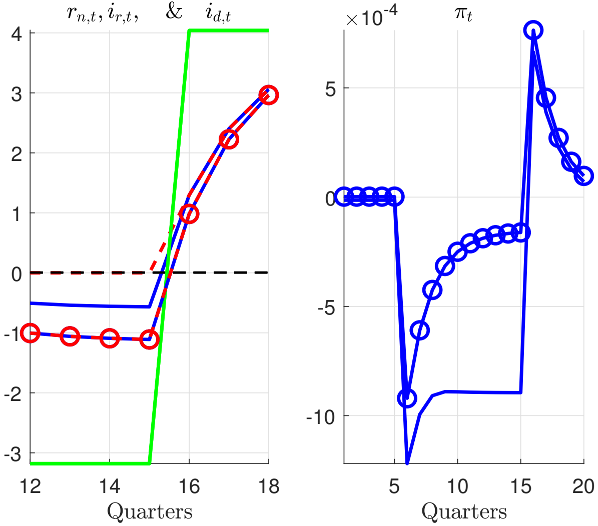
Scenario: Low natural rate



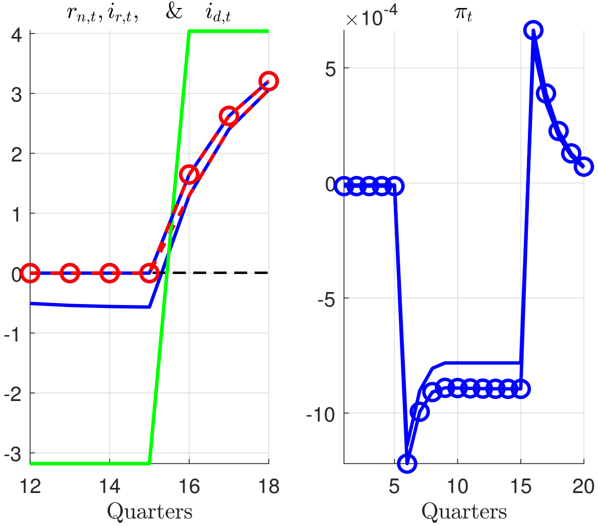
Scenario: Low natural rate



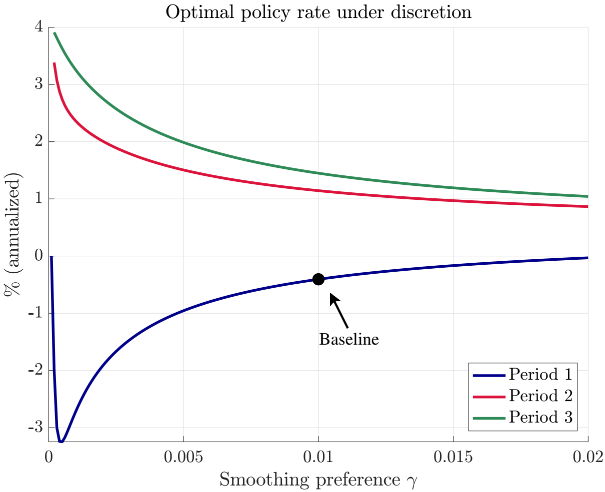
Scenario: Unconstrained



Scenario: ZLB



Sensitivity: Smoothing preference



Conclusion

- In a financial friction new-Keynesian model, the *signalling channel* of NIRs boosts output & inflation if the Taylor rule features inertia.
- The *inter*temporal effect of signalling is larger than the *intra*temporal contractionary effect on bank net worth.
- NIRs are optimal if 1) policy is time-consistent/discretionary and 2) there is a preference for smoothing.