Money and Banking in a New Keynesian Model

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Motivation

- Standard New Keynesian model
  - central bank controls interest rate on household savings
- Modern economies
  - central bank controls interest rate on interbank loans or reserves
  - interbank loans & reserves not held directly by households, but held by banks to back inside money
  - "short rate disconnect" between policy rate & rate on savings (dynamics of short rate decoupled from longer rates)
- This paper: NK model with banking sector
  - short rate disconnect from convenience yield on short safe bonds

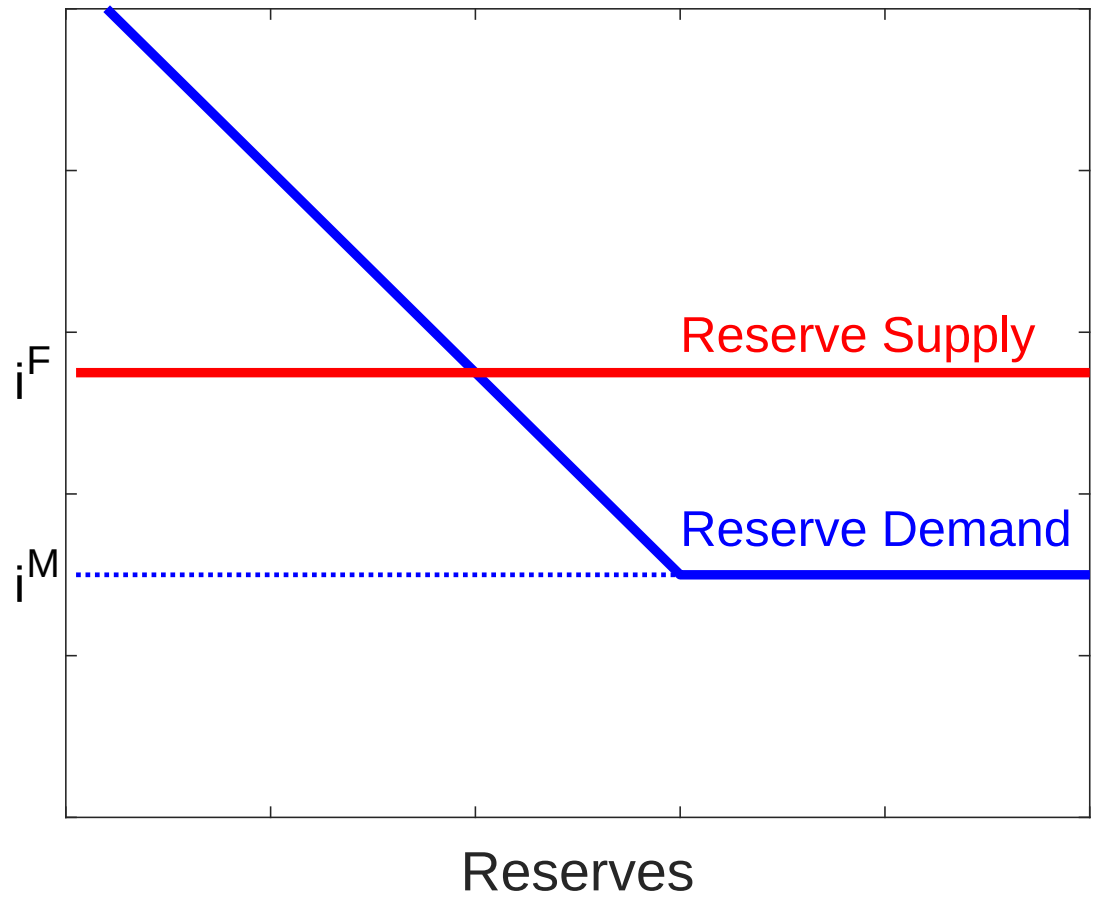
  $\rightarrow$ money & banking matter for policy transmission & determinacy

Model overview

- Standard NK household & firm sector
  - NK Phillips curve & Euler equation
  - money demand depends on spread between rates on savings & money = convenience yield on money
- Banks provide (interest-bearing) inside money
  - no special ability to lend; invest in securities
  - maximize shareholder value, no equity adjustment costs
  - face collateral constraints $\rightarrow$ value short bonds for safety;
    spread btw rates on savings & short safe bonds = banks' cost of safety
  - handle liquidity shocks $\rightarrow$ value reserves for liquidity *if scarce*;
    spread btw rate on fed funds & reserves = banks' cost of liquidity,
    depends on central bank operating procedures
  - convenience yield on money reflects banks' cost of safety & liquidity

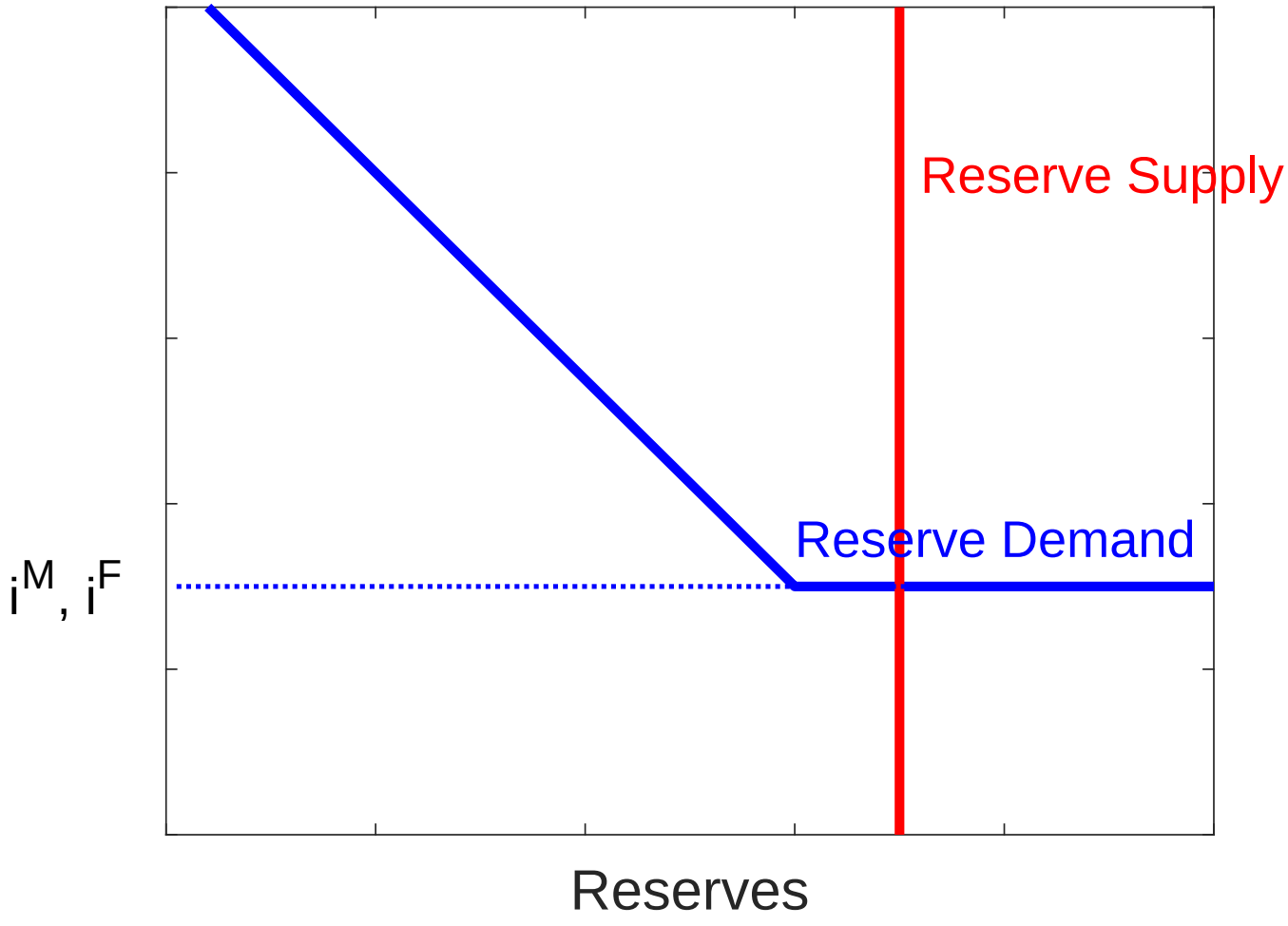
CB operating procedures & banks' cost of liquidity

- Corridor system with scarce reserves
  - monetary policy targets fedfunds rate, sets reserve rate
  - trading desk supplies reserves elastically to meet target
  - banks' cost of liquidity > 0, rises if central bank tightens



CB operating procedures & banks' cost of liquidity

- Floor system with abundant/ample reserves
  - monetary policy sets reserve rate & quantity of reserves
  - banks' cost of liquidity zero; remains zero after central bank tightens



What the paper does

1. Banking module
   - heterogenous banks, liquidity shocks, market power
2. Embed in New Keynesian model
   - interest rate pass-through (from bank optimization & money demand)

$$\text{rate on savings} = \text{policy rate} + \underbrace{\text{convenience yield}}_{\propto \text{ velocity} = \text{spending / money}}$$

     short bonds "inherit" convenience yield from money they back
   - policy rules & evolution of securities
3. Characterize equilibria: local dynamics conditional on policy regime
   - numerical examples for impulse response to monetary policy shock
   - conditions for local determinacy

- This talk: provide intuition for key effects

Interest rate policy

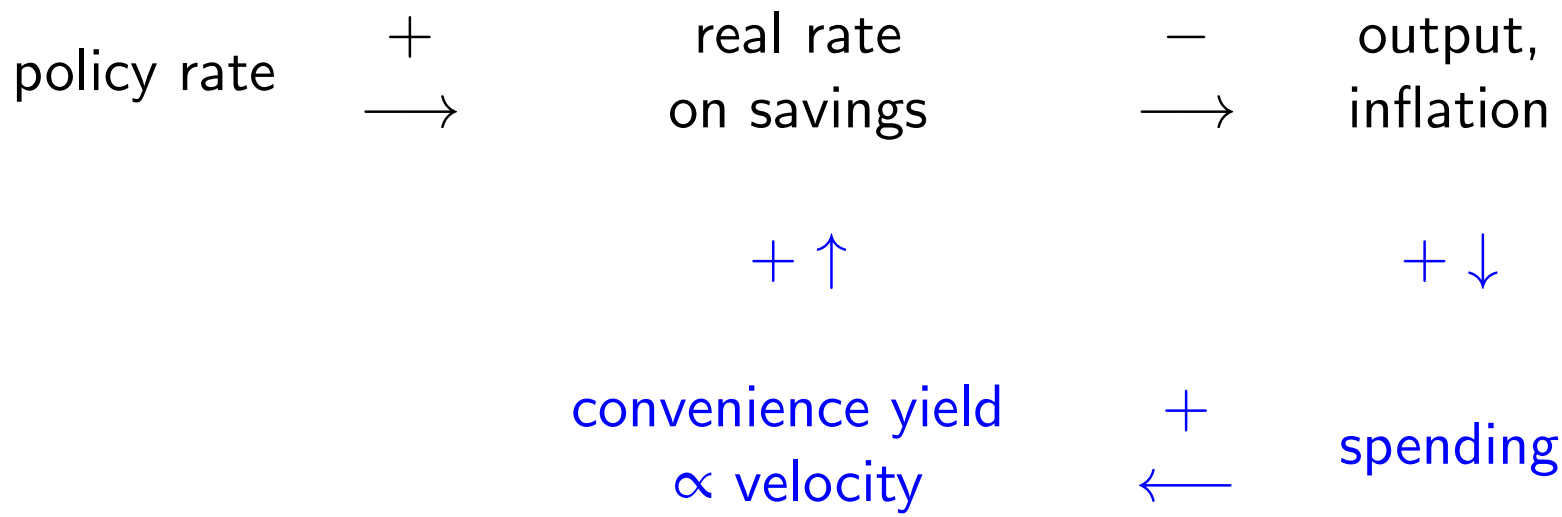
- Standard model: rate on savings = policy rate
- Transmission of interest rate policy

$$\text{policy rate} \overset{+}{\longrightarrow} \text{real rate on savings} \overset{-}{\longrightarrow} \text{output, inflation}$$

- Money supplied elastically to implement interest rate targets

Interest rate policy with short rate disconnect

- This paper: rate on savings = policy rate + convenience yield
  $\propto$ velocity
- Transmission in floor system



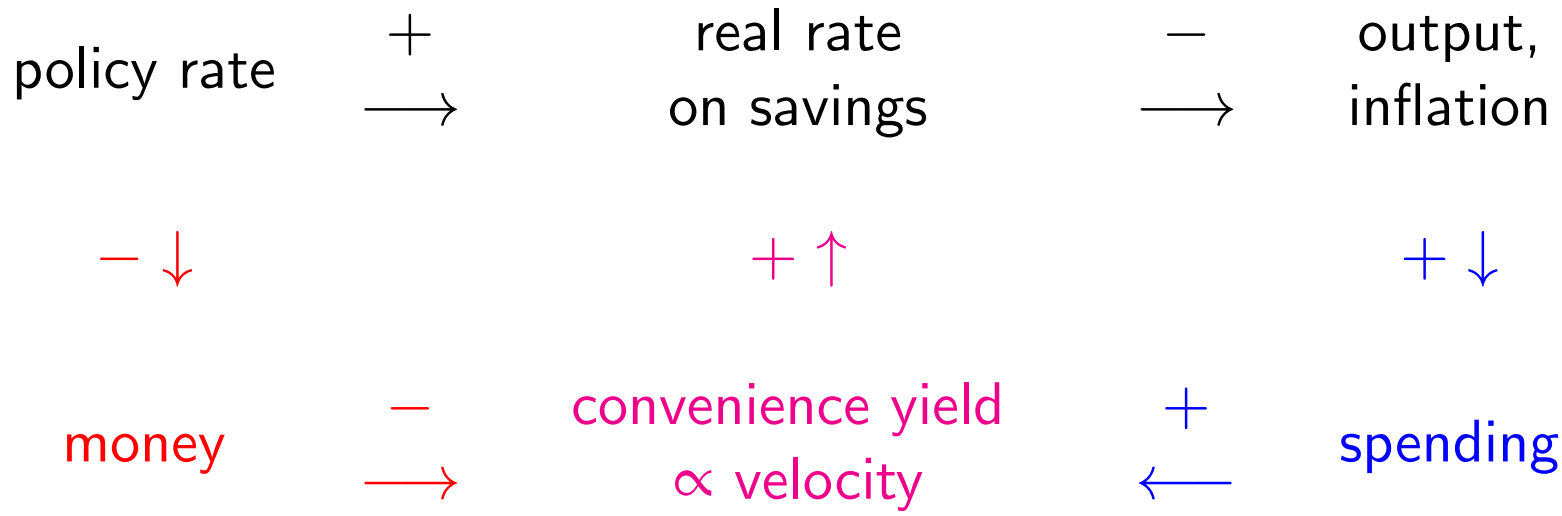
$\Rightarrow$ convenience yield dampens effect of interest rate policy

- lower spending, lower velocity, lower cost of safety for banks

- Reserve supply = extra policy instrument, here held fixed
  - but: quantitative tightening (lower reserves) may offset low policy rate!

Interest rate policy in corridor system

- This paper: rate on savings = policy rate + convenience yield
  $\propto$ velocity
- Transmission in corridor system



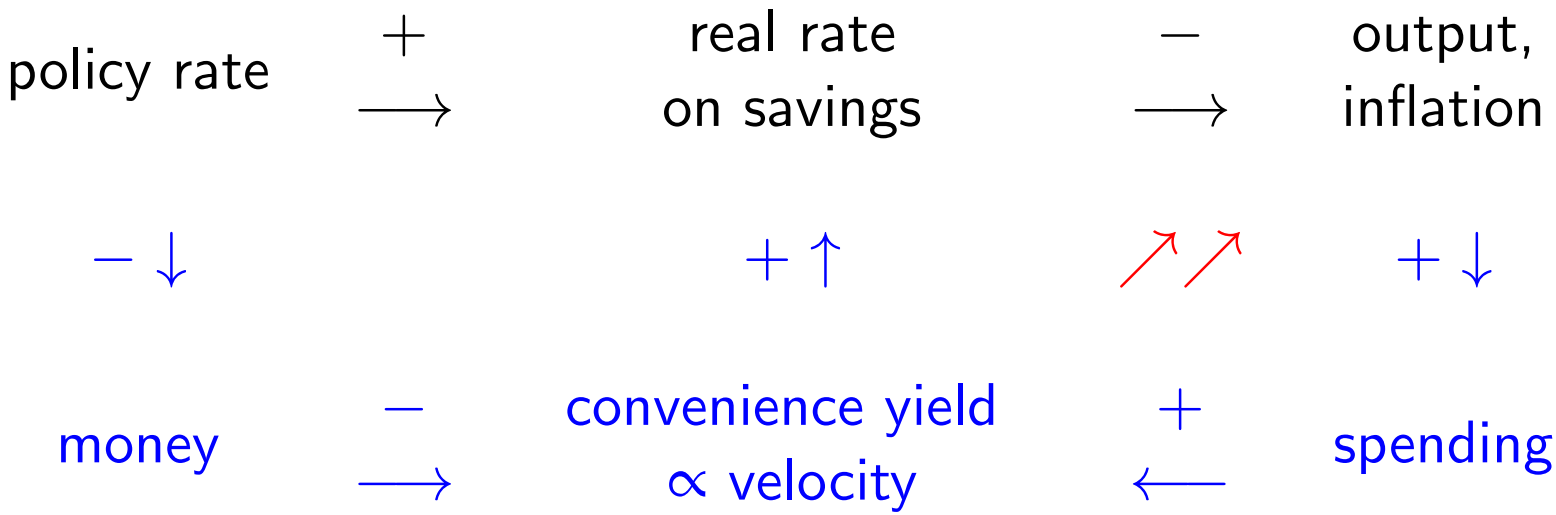
$\Rightarrow$ convenience yield dampens or amplifies interest rate policy

- lower spending, lower money demand, lower cost of safety for banks
- higher cost of liquidity for banks, lower money supply

- Reserves supplied elastically to implement interest rate targets

Interest rate policy & the cost channel

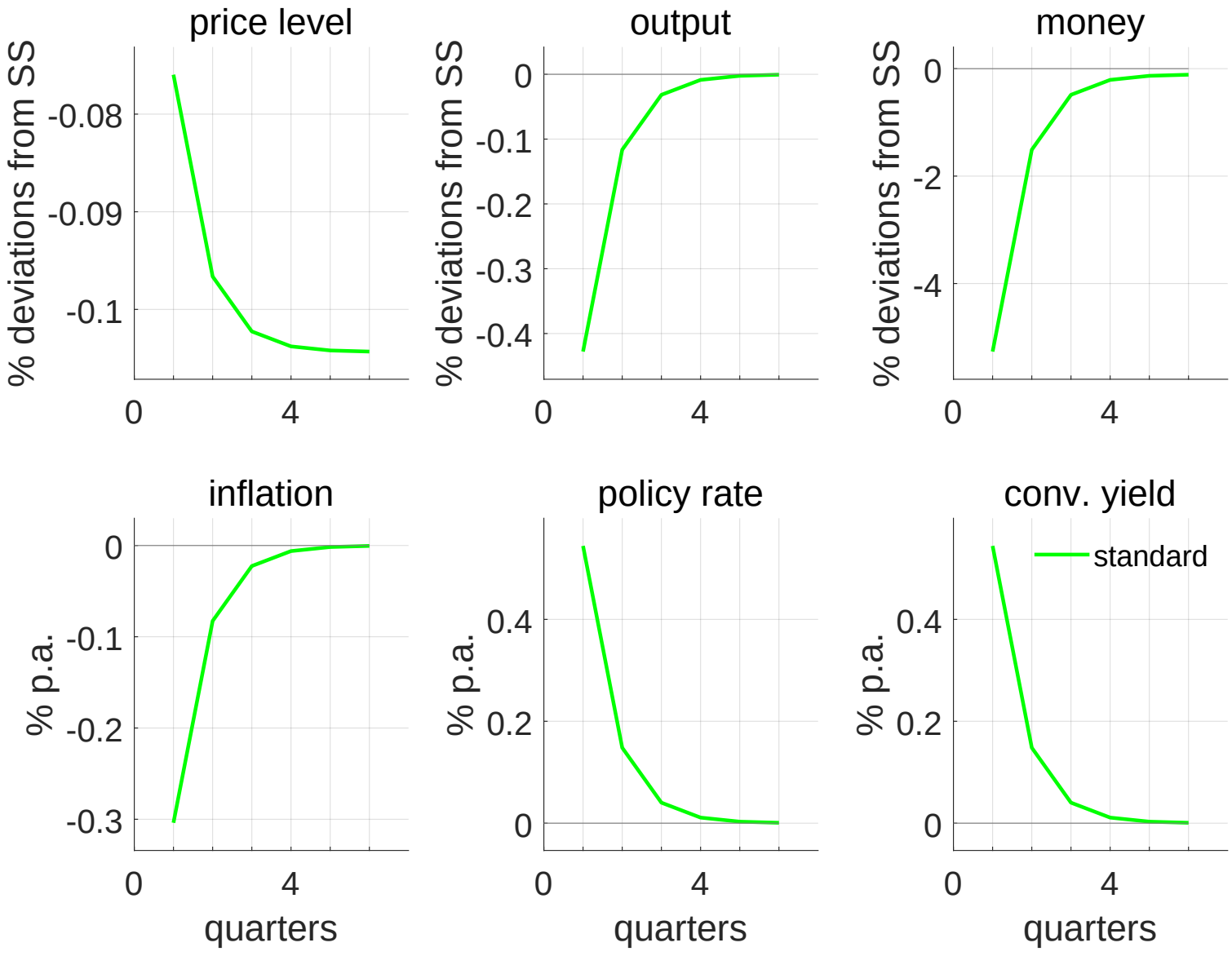
- This paper: rate on savings = policy rate + convenience yield
  $\propto$ velocity
- Transmission with cost channel



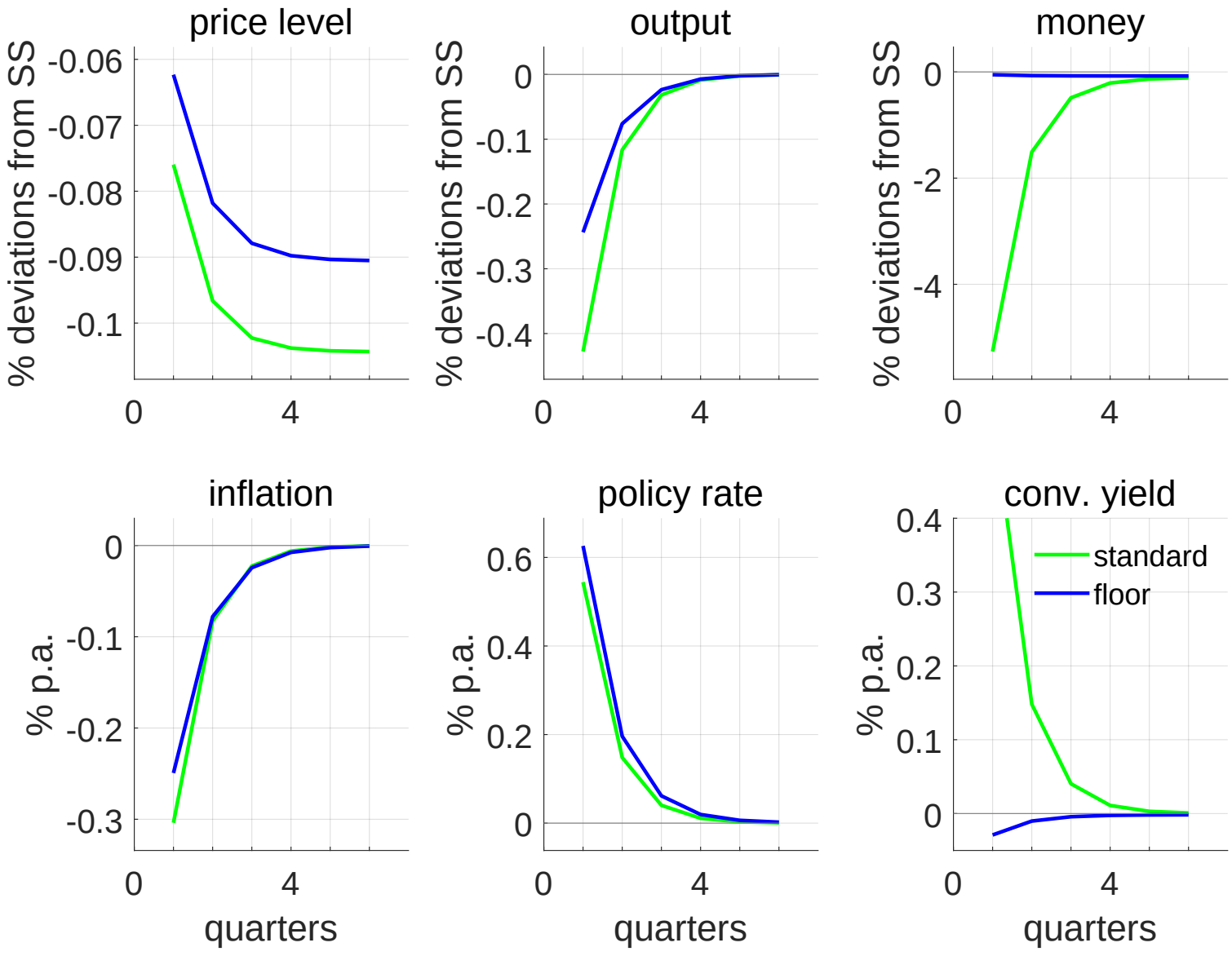
$\Rightarrow$ convenience yield dampens or amplifies interest rate policy

- Cost channel: money & consumption complements in utility
  - convenience yield of money directly affects production, demand
  - larger difference floor system vs corridor system
  - also vs standard NK model (convenience yield = rate on savings!)

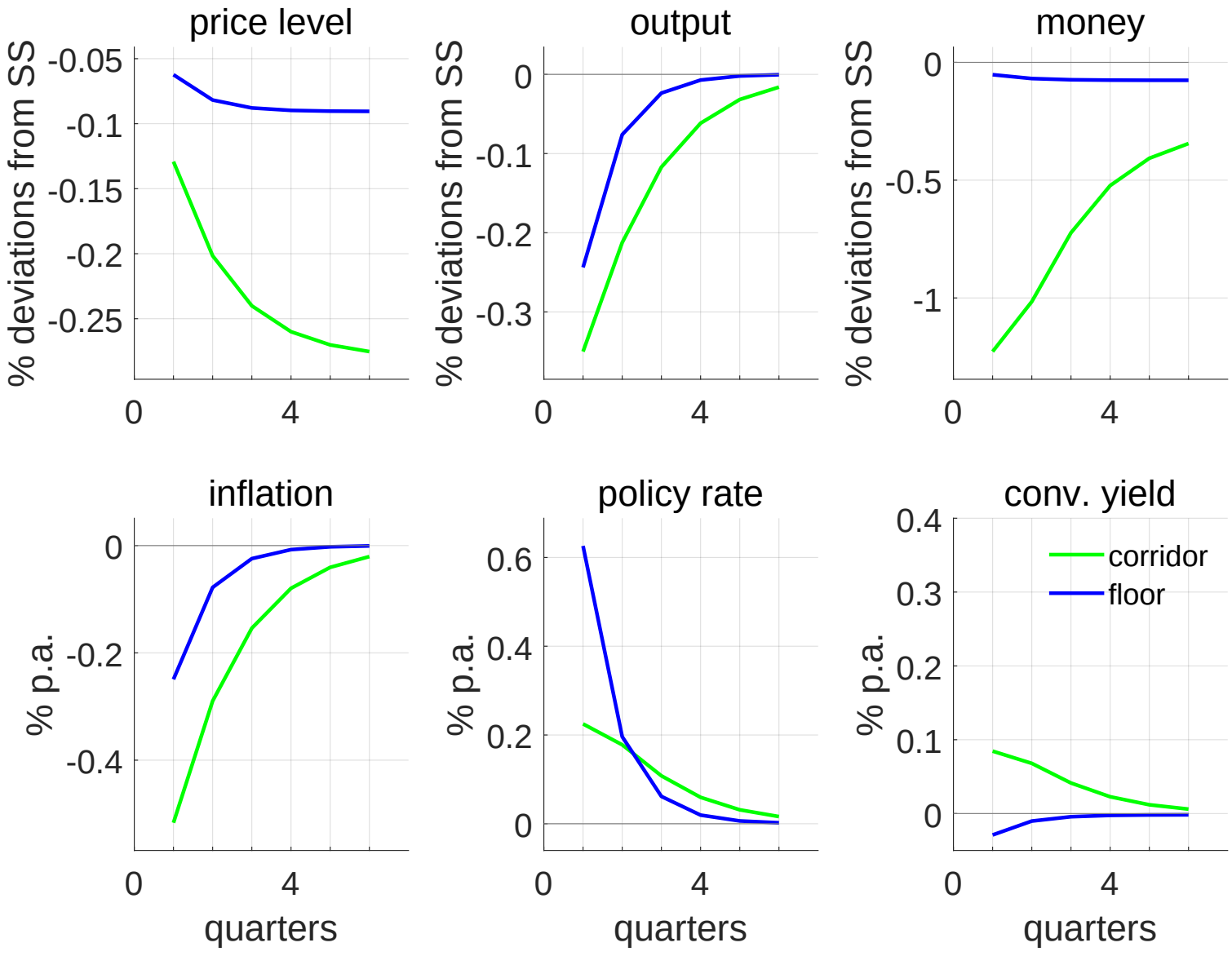
25 bp increase in policy rate: standard model



25bp increase in policy rate: standard vs floor system

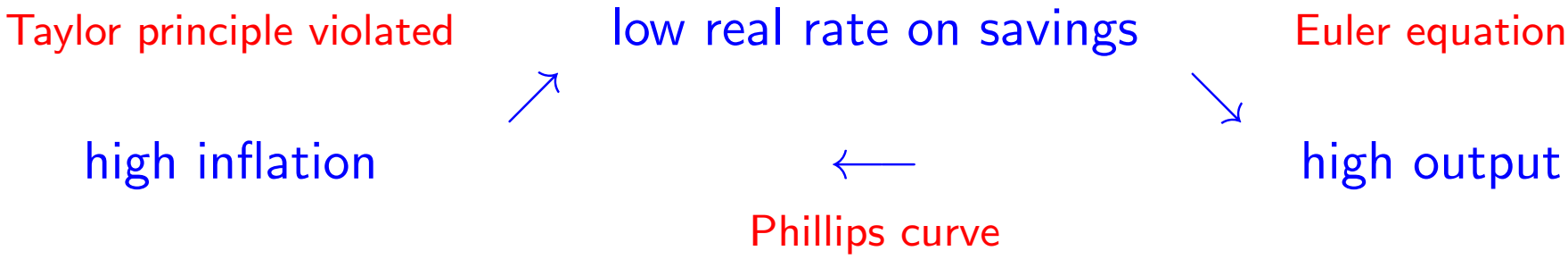


25bp increase in policy rate: corridor vs floor systems



Local determinacy

- Multiple bounded equilibrium paths



- Taylor principle: LR response of rate on savings to inflation > 1
  - standard model: rate on savings = policy rate
    $\rightarrow$ need high policy rate if high inflation
  - this paper: rate on savings = policy rate + convenience yield
    convenience yield endogenously increases with output, inflation
- When is stabilizing force from convenience yield strong?
  - money demand less elastic, prices stickier, bank market power lower
  - nominal rigidities in money supply (extreme case: money growth rule)

Main takeaways

- This paper: with short rate disconnect, money & banking matter
  - floor system: interest rate policy weaker,
    quantity of reserves extra policy instrument
  - corridor system: closer to standard NK model
  - local determinacy doesn't require aggressive response to inflation

- Can a model without banks capture mechanics of floor system?
  - central bank issues digital currency, sets interest rate & quantity

  $\rightarrow$ minimal setup with pass-through via convenience yield (see paper)

- Questions for future work
  - dynamics of non-reserve bank assets
    - here: exogenously given in real terms to focus on liability side
    - more generally, respond to activity, slowly if long term nominal debt...
  - bank liquidity management & monetary policy
    - here stable regimes: permanently ample reserves or "reserveless limit"
    - last month: life on the edge – floor system with occasional scarcity