(Un)conventional Policy and the Zero Lower Bound

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All opinions expressed are personal and do not necessarily reflect those of the ECB or the Eurosystem

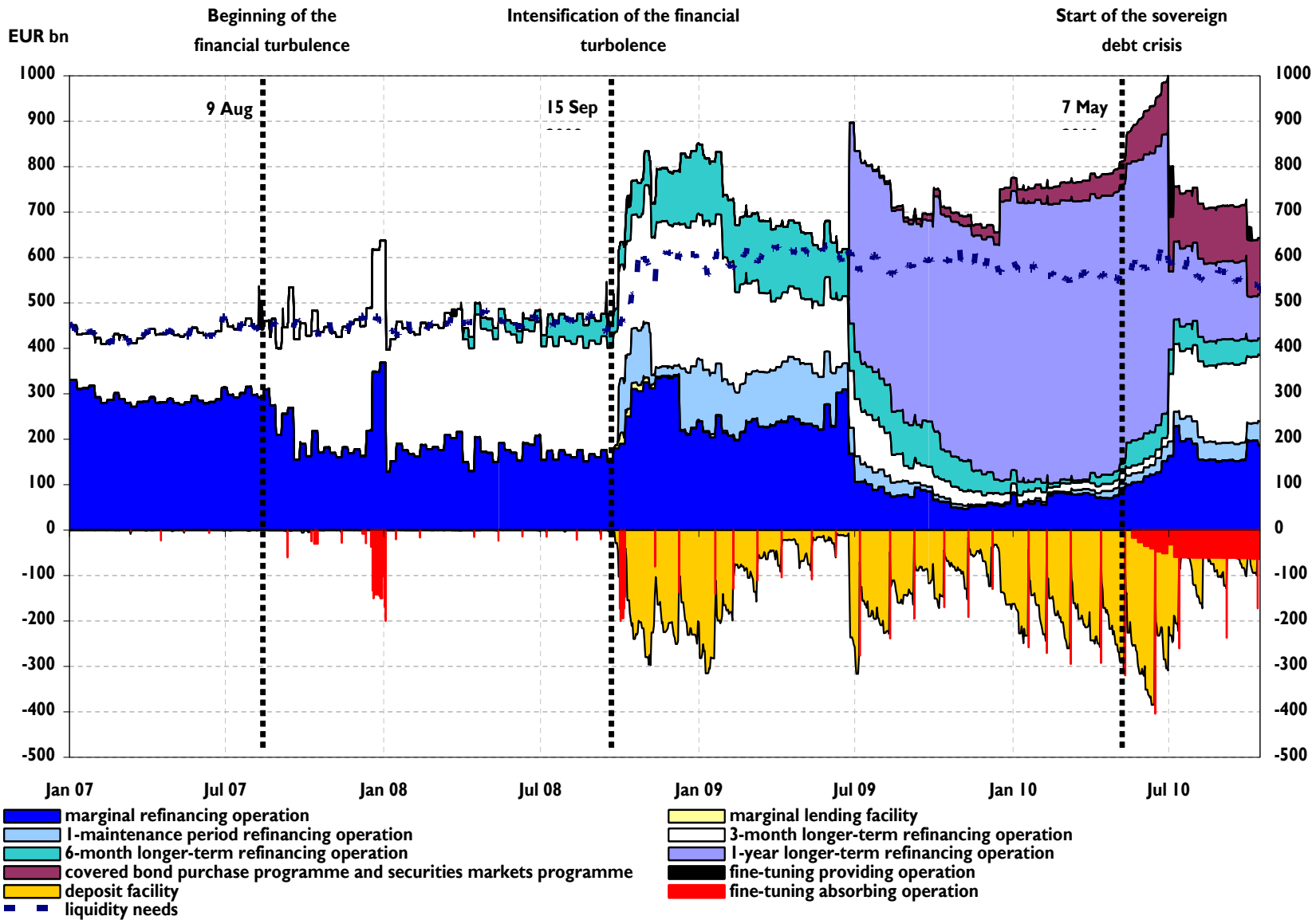
Motivation

- During 2008-09, most central banks aggressively cut interest rates and implemented NSMs.
- Timeline was different.

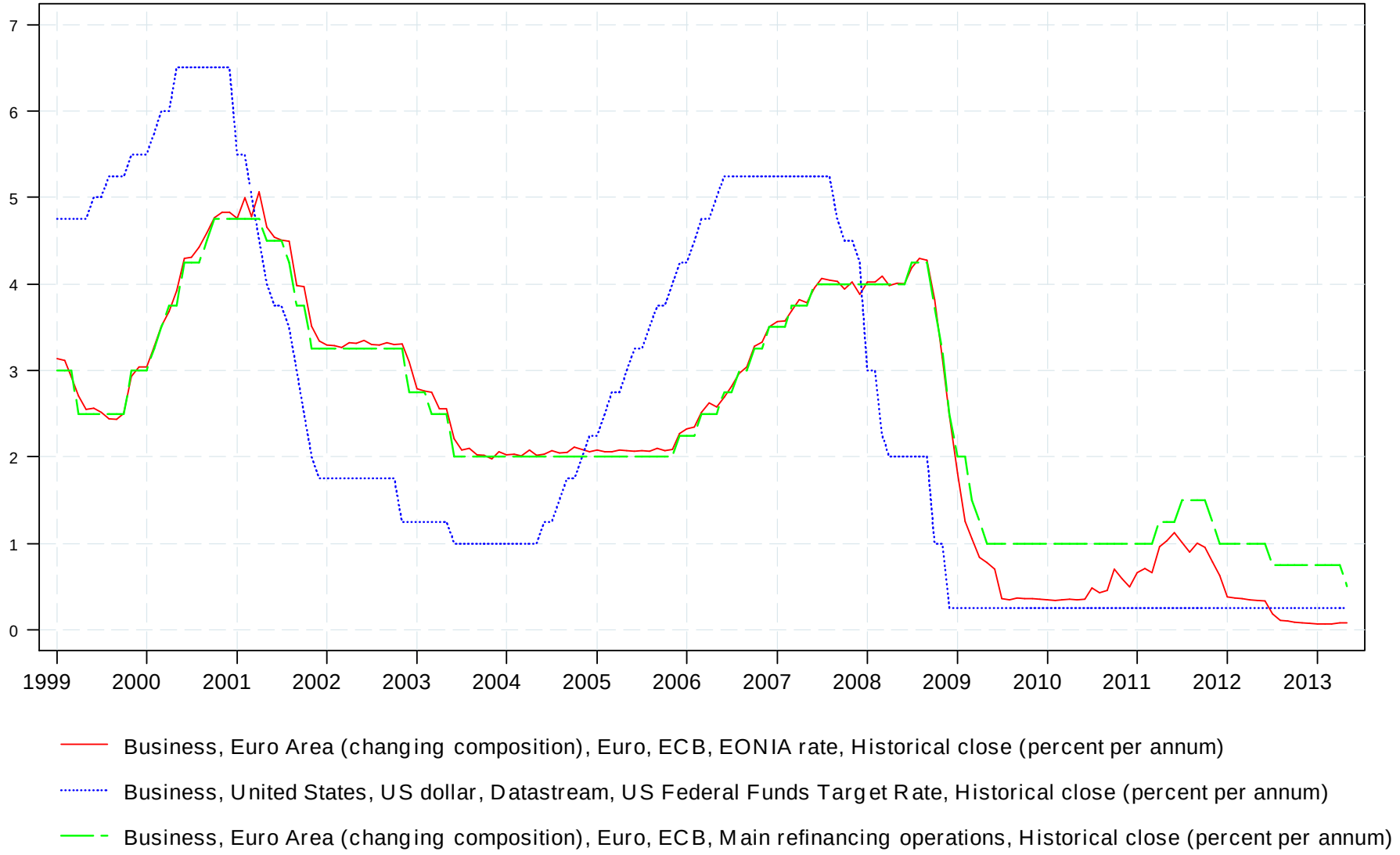
  FED: Large asset purchases (Nov ’08) and Fed target rate down to ZLB (Dec ’08).

  ECB: Fixed-rate full allottment (Oct ’08) when MRO at its highest.

Timeline of ECB non-standard measures

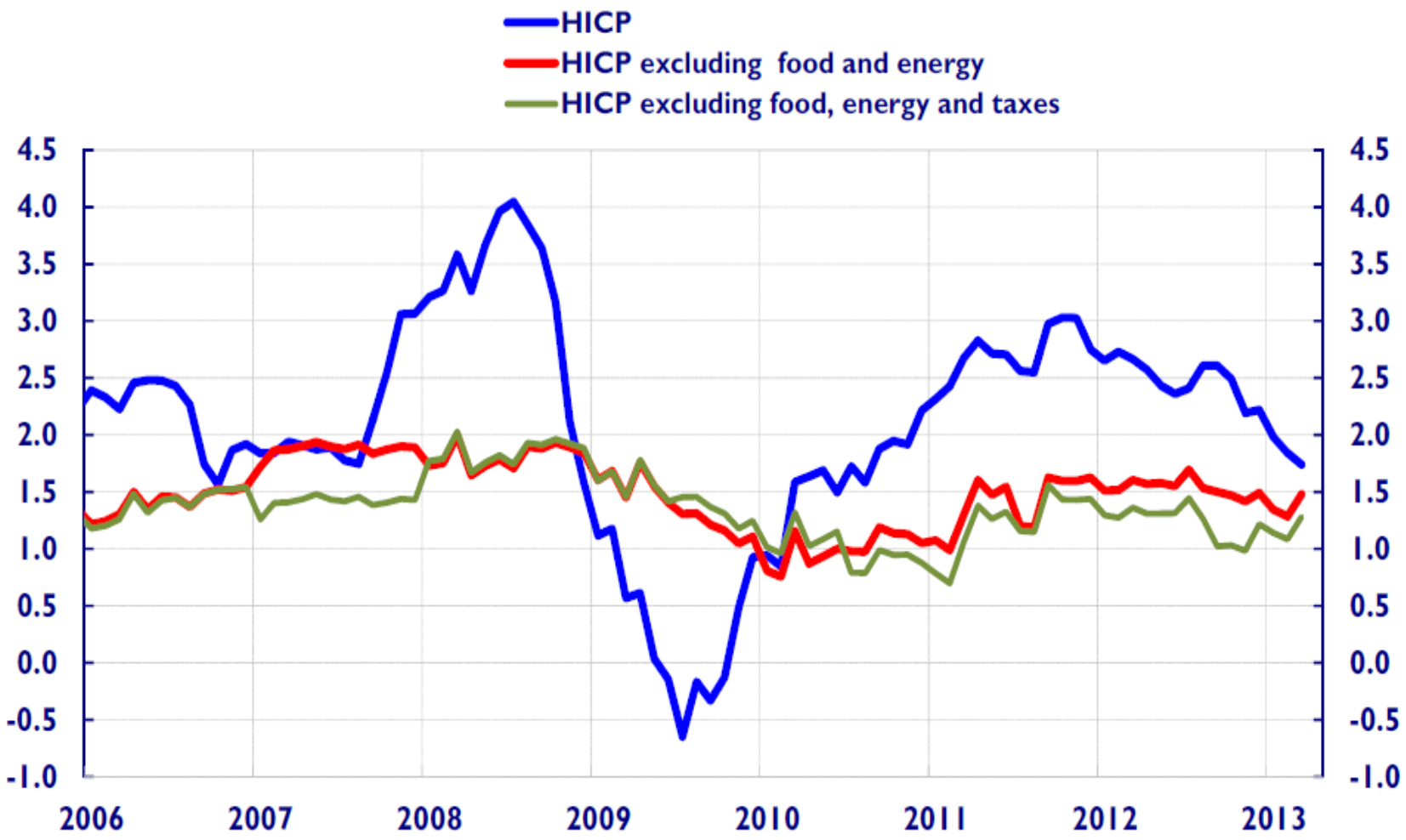


MRO vs Fed Funds target rate



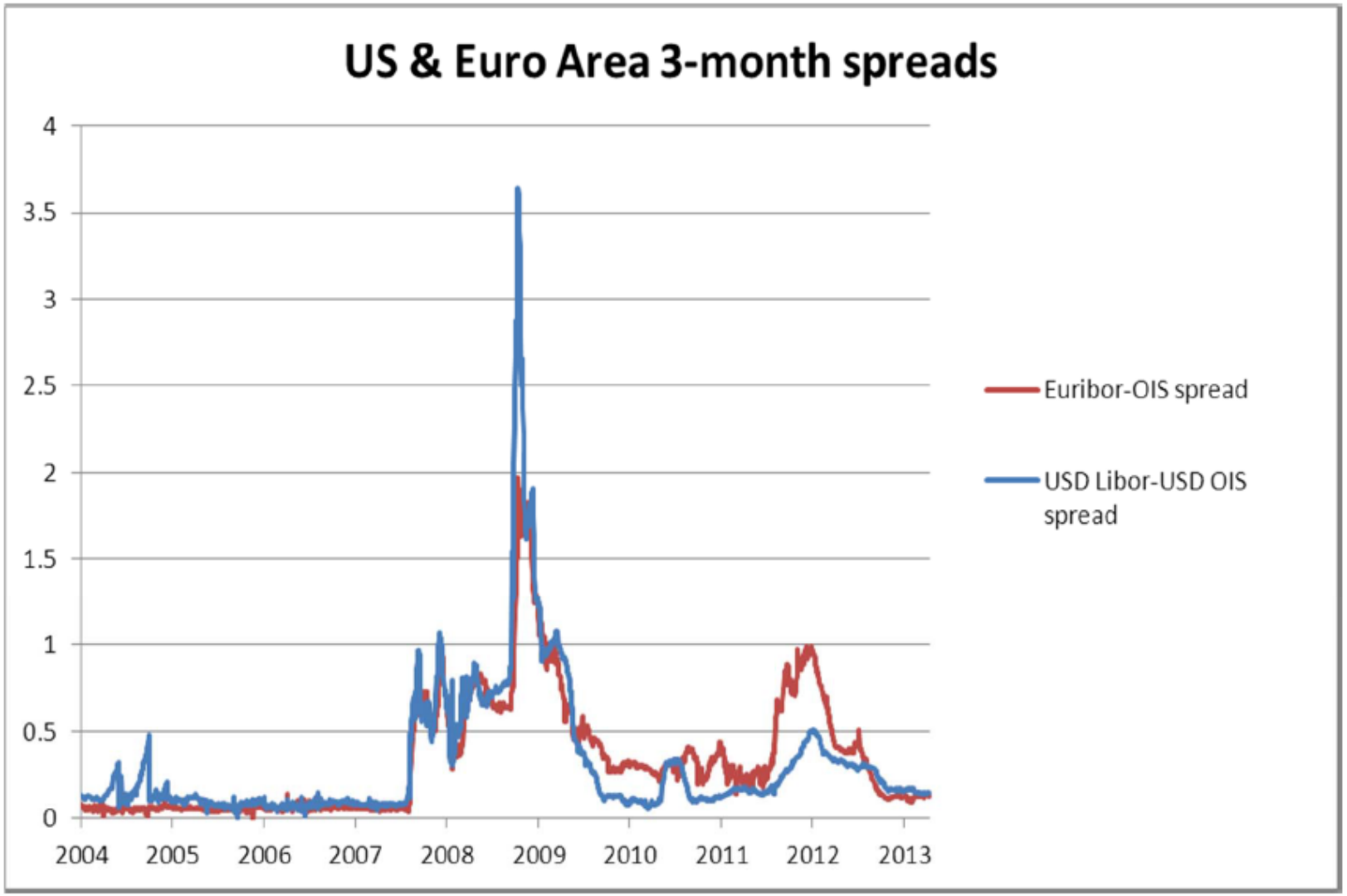
HICP Inflation in the EA

(annual rates of change)



Sources: Eurostat and ECB.
Latest observation: September 2012 for overall HICP and August 2012 for HICP excluding food and energy.

Credit spreads in the EA and US



Our questions

- What is the optimal combination of standard and non-standard measures?
  - Can it be desirable to use NSMs before reaching the ZLB?
  - Should NSMs be discontinued before increasing i ?
- Are the lessons for optimal policy from NK-ZLB literature robust to episodes characterised by high credit spreads and lack of deflation?

Our paper

- Simple extension of NK-model.
  - Financial frictions at the firm level – Gilchrist-Schoenle-Sim-Zakrajsek (2012).
  - NSMs are direct CB intermediation – abstract from fiscal/zombie-lending issues.
  - ZLB is a(n occasionally binding) constraint.

Main results

- In the face of certain financial shocks, once NSMs have been deployed it may be optimal not to reduce i to zero.
- NSM may have to remain in place long after policy rates have returned to long-run levels.
- When NSMs are not deployed:
  - Optimal monetary policy keeps interest rates at zero in spite of mild inflationary pressure.
  - "Low for longer" result remains valid.

Why unconventional measures?

- Model with financial frictions at the corporate level

$$x_t = E_t x_{t+1} - \frac{1}{\sigma}\left(\widehat{R}_t - E_t \widehat{\pi}_{t+1}\right)$$

$$\widehat{\pi}_t = \lambda\left[(\sigma+\varphi)\, x_t + \widehat{R}_t + \alpha_1 \widehat{\Lambda}_t + \alpha_2 \widehat{\mu}_t\right] + \beta E_t \widehat{\pi}_{t+1}$$

- Shocks that increase lending rates $\widehat{R}_t^l \equiv \widehat{R}_t + \widehat{\Lambda}_t$ can be offset by a reduction in $\widehat{R}_t$ as long as ZLB does not bind. Why use NSMs instead?

- Any reduction in lending rates through a reduction in $\widehat{R}_t$ is inefficient for savers. Measures which can directly cap the increase in the spread, if available, are preferable.

Why unconventional measures?

- “More than half of all euro area households are not indebted at all. Only 43.7% of euro area households participate in the credit market” (The Eurosystem Household Finance and Consumption Survey. ECB Statistics Paper Series No. 2, April 2013)

Literature

- Models with frictionless financial market (Eggertsson-Woodford, 2003):
  - At the ZLB, use forward guidance.
  - NSM (QE) not effective.
- Models with imperfect financial markets (Curdia-Woodford, 2011, Gertler-Karadi, 2011):
  - NSM should be used to address specific financial market impairments.
  - Most effective at the ZLB.

The model

Households: Representative, risk-averse. Utility $u(c) - v(h)$. Hold money, bonds and deposits at banks. Consume and work.

Wholesale firms: Produce a homogeneous good $y_{i,t}$ using labor. Face iid productivity shock $\omega_{i,t}$ and need to pay wages before observing. Receive govt transfer τ_t at beginning of each period. Raise external finance from intermediaries.

The environment

Entrepreneurs: Risk-neutral. Face death probability. Patient. Consume before they die. Their consumption is taxed at rate v_t.

Retail firms: Monopolistically competitive. Buy and differentiate wholesale goods bought at price $\overline{P}_t$. Final good Y_t is a CES composite which sells at price P_t. Markup from monopolistic competition: $\chi_t = P_t/\overline{P}_t$.

Nominal rigidities: Retail firms can adjust prices with prob $1-\theta$, as in Calvo (1983).

The environment

Intermediaries: Credit can be obtained from either a commercial bank or the central bank. The former is a better monitor, $\mu^b < \mu^c$.

Commercial banks: Collect deposits D_t. Uses a fraction γ_t of deposits to finance loans to firms, and $1 - \gamma_t$ as reserves at the central bank. These reserves are remunerated at the deposit rate R_t.

Central bank: Uses all its funds (reserves) to satisfy firms' demand for credit.

Financial frictions

Credit constraint: Wholesale firms have internal funds $P_t \tau_t$. Raise external funds from banks for total funds $P_t x_{i,t}$

$$W_t N_{i,t} \leq P_t x_{i,t}.$$

Agency costs: Wholesale firms face an iid shock $\omega_{i,t}$ that is private information

$$y_{i,t} = \omega_{i,t} N_{i,t}.$$

If firms default, intermediaries pay $\mu_t^j y_{i,t}$, for $j = b, c$. Wholesale firms must sell at a mark-up over marginal costs: $\mathcal{E}(y_t) = \chi_t q_t x_t$.

The optimal financial contract

Definitions:

- $\overline{\omega}_t^j$ is the threshold for the iid productivity shock set by intermediary j. If $\omega_{i,t} < \overline{\omega}_t^j$, the firm defaults on the debt.
- $f\left(\overline{\omega}_t^j\right)$ and $g\left(\overline{\omega}_t^j; \mu_t^j\right)$ are the share of profits accruing to wholesale firms and to lender j, respectively, under a contract $\overline{\omega}_t^j$.

The optimal financial contract

- CSV problem:

$$\max_{\overline{\omega}_t^b, \overline{\omega}_t^c, x_t, \gamma_t} \left[\gamma_t f(\overline{\omega}_t^b) + (1-\gamma_t) f(\overline{\omega}_t^c)\right] q_t x_t$$

subject to, for $j = b, c$,

$$\begin{aligned} q_t g\left(\overline{\omega}_t^j; \mu_t^j\right) x_t &\geq R_t (x_t - \tau_t) \\ q_t x_t \left[\gamma_t f(\overline{\omega}_t^b) + (1-\gamma_t) f(\overline{\omega}_t^c)\right] &\geq \tau_t \\ 0 &\leq \gamma_t \leq 1. \end{aligned}$$

The optimal financial contract

- The optimal contract requires that

$$\gamma_t = \begin{cases} 1 \text{ if } \overline{\omega}_t^c \geq \overline{\omega}_t^b \\ 0 \text{ if } \overline{\omega}_t^c < \overline{\omega}_t^b \end{cases} .$$

- Lending rates R_t^j and credit spreads $\Lambda_t^j = \frac{R_t^j}{R_t}$ can be backed up from the optimal $\overline{\omega}_t^j$.

Key features of NSM in the model

- Credit provision is demand determined (as in full-allotment operations).
- Central bank liquidity is financed through an increase in bank reserves $\longrightarrow$ NSM lead to an expansion in the central bank balance sheet.
- Central bank takes no risk. No fiscal implications and no implications for price stability.

Solution procedure

- As in model without NSMs, we focus on the non-linearity introduced by the ZLB.
- The binary choice of γ_t provides an additional non-linearity which cannot be eliminated through linear approximation. We approximate γ_t through a continuous function $\Psi\left(\widehat{\mu}_t^c - \widehat{\mu}_t^b\right)$, where

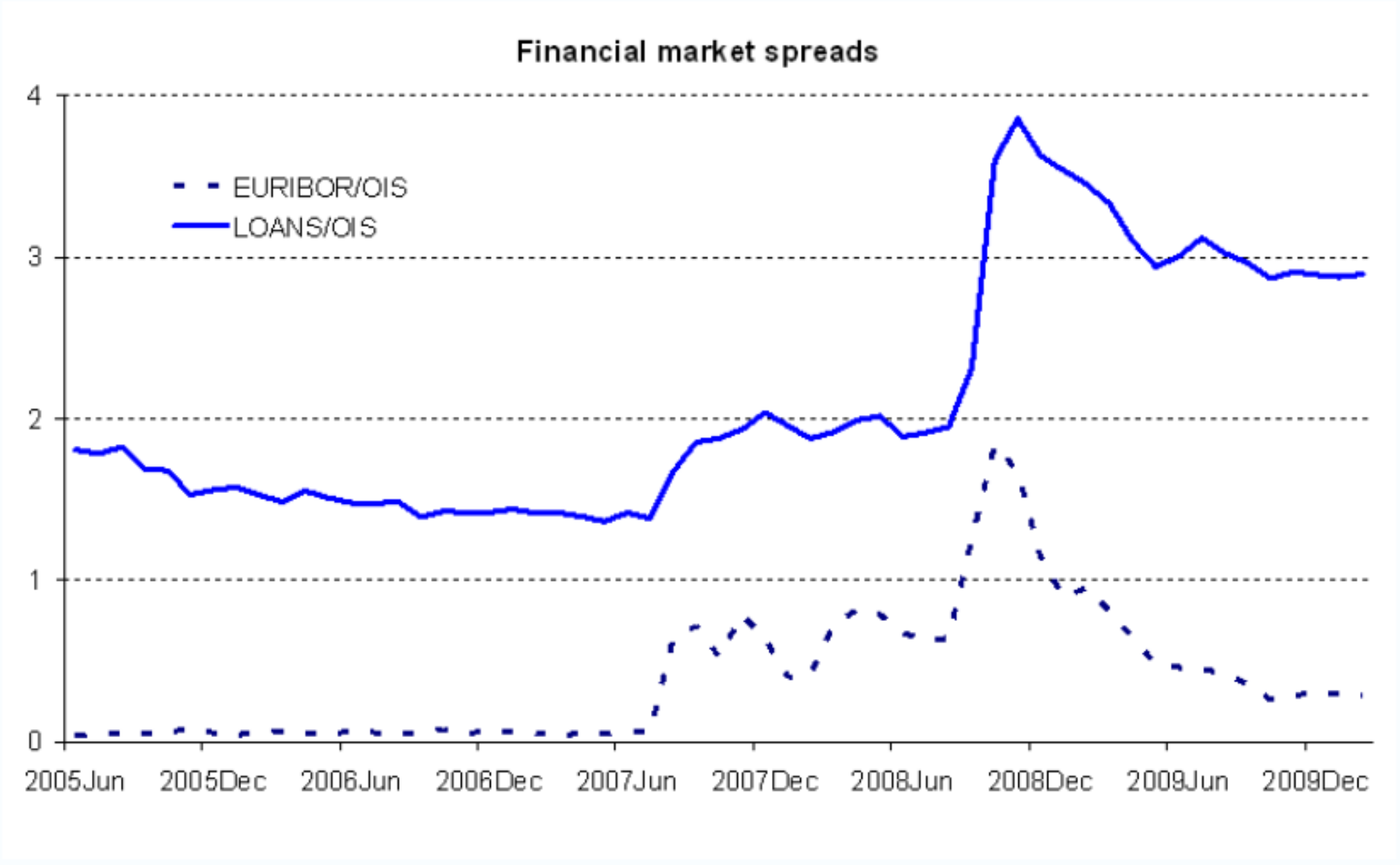
$$\Psi(x) = \frac{1}{2}\frac{e^{(\kappa x)} - e^{(-\kappa x)}}{e^{(\kappa x)} + e^{(-\kappa x)}} + \frac{1}{2}.$$

- Non-linear, deterministic simulation methods.

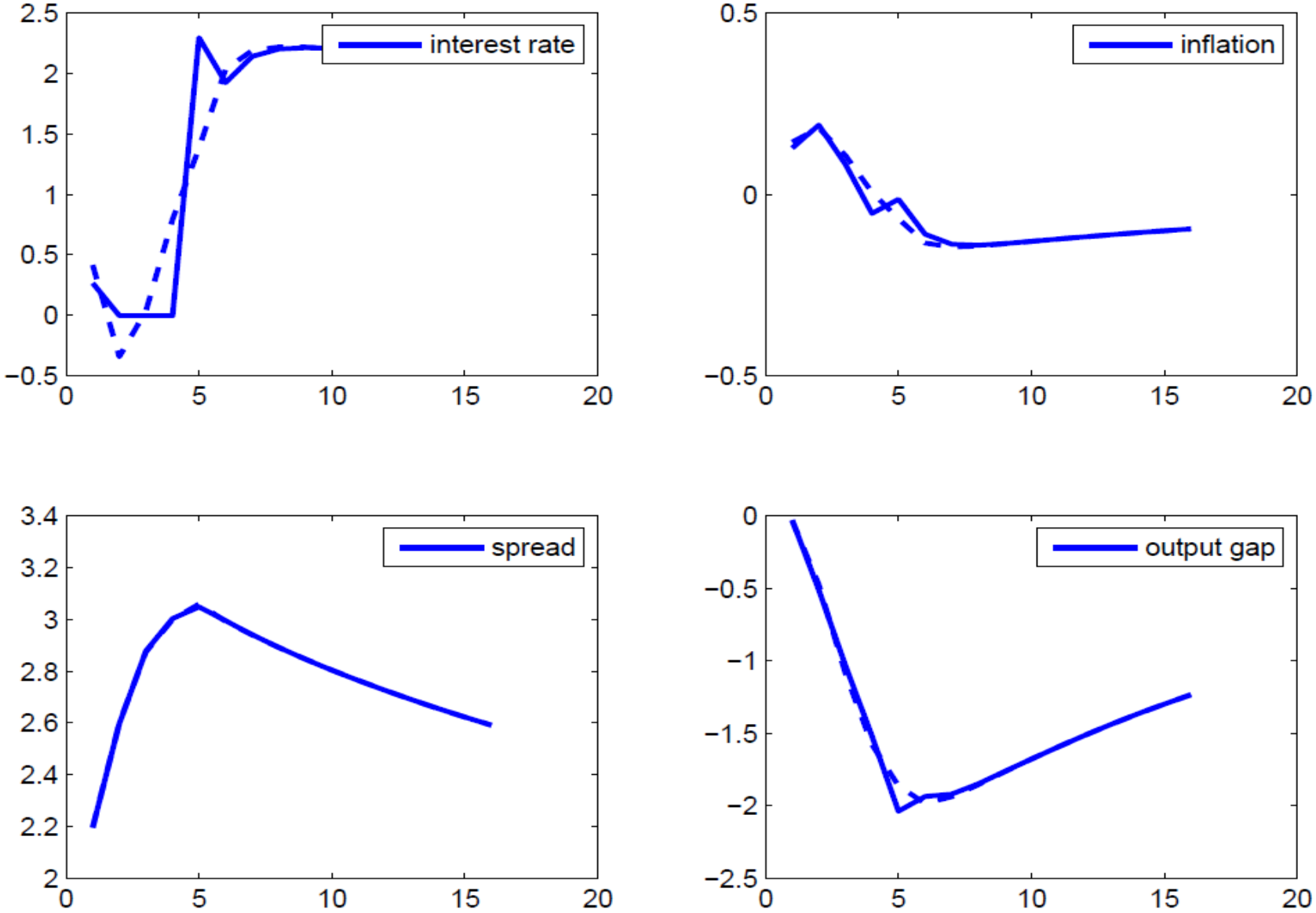
Calibration

- Relative inefficiency of the CB: μ^c set to generate a steady state spread between ECB and bank loan rates of 50 bps.
- Shock to monitoring costs: ρ_μ=0.95; σ_{ε_μ} to match the unconditional SD estimated by Levin et al (2004) over 1997-2003.
- Standard calibration for preference parameters ($\beta = 0.995$, $\sigma = 1.0$ and $\phi = 0.0$), Calvo pricing ($\theta = .66$ and $\lambda = 0.024$), and financial frictions (τ and σ_ω set to match Λ^b=2% and $\Phi\left(\overline{\omega}^b\right) = 4\%$).

Shock pattern: AR(2) as in 2008Q4



Optimal response with and w/o ZLB



Optimal monetary policy with (solid line) and w/o (dashed line) ZLB

Optimal response with and w/o NSM

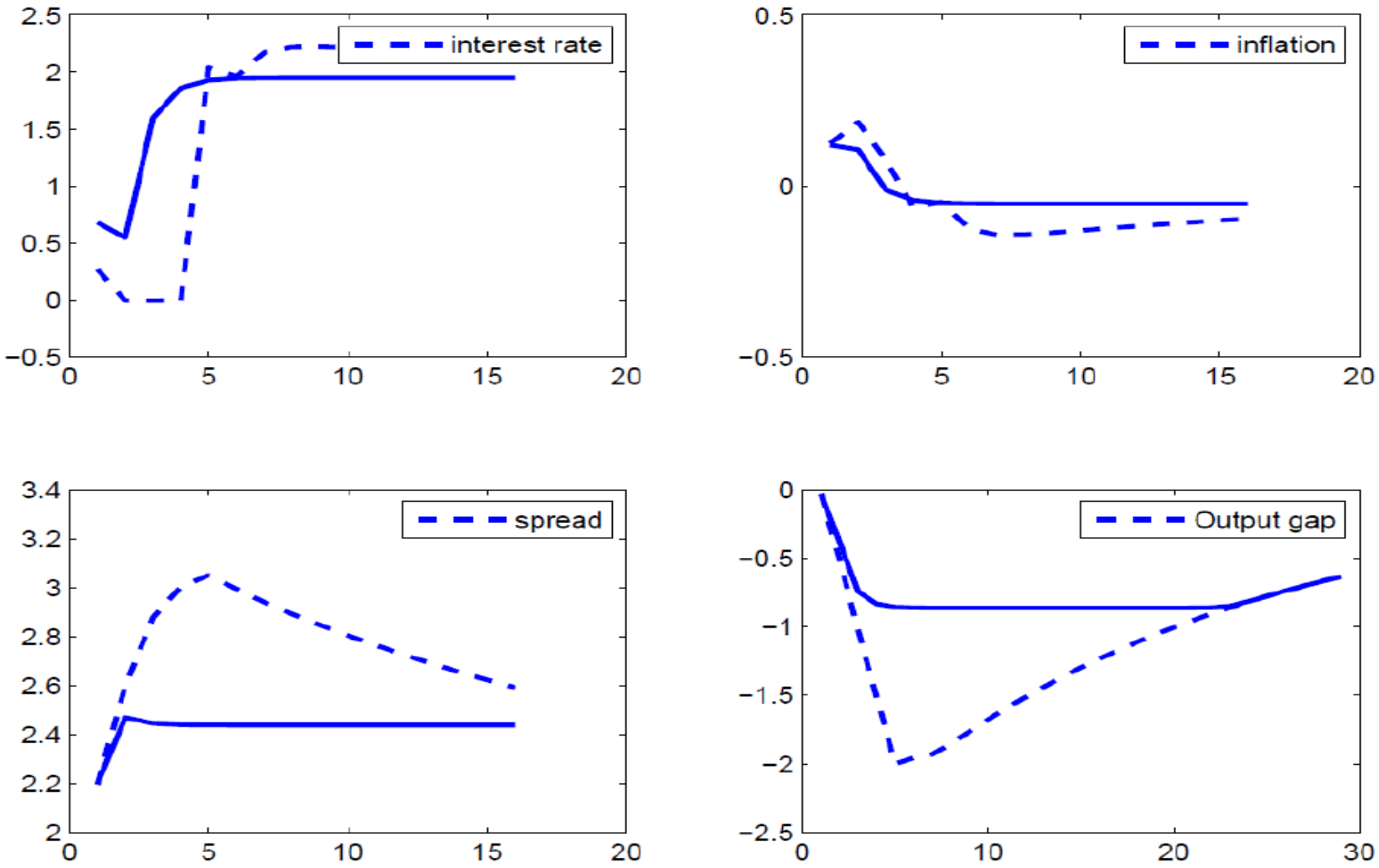


Figure 1: Optimal monetary policy with standard (dashed) and non-standard (solid) measures

Conclusions

- In our model, under a shock pattern like in 2008Q4, i is lowered first, then NSM are introduced.
- If NSM are deployed, it is not necessary to reduce policy rates to the ZLB.
- On an "exit "path, it can be optimal to increase policy rates well before NSM are discontinued.
- In the absence of NSM, forward guidance remains optimal in the presence of financial market disruptions.

Model extension (in progress)

- Key features:
  - Accumulation of net worth to generate richer dynamics of spreads and propagation of shocks.
  - Predetermination of financial decisions to modify cyclical property of spreads in response to demand shocks.