

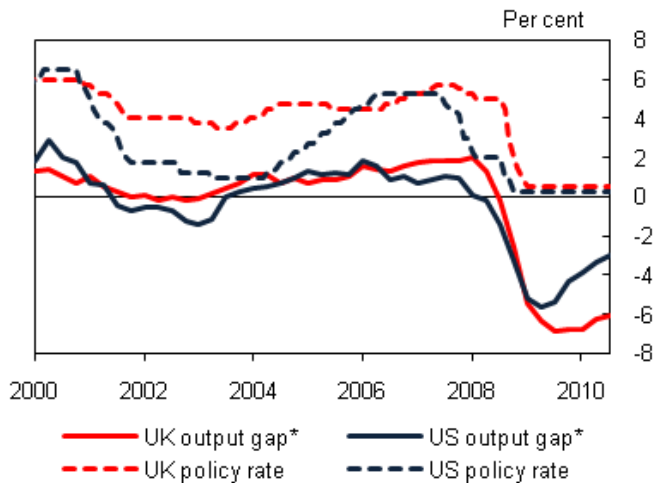
Policy Trade-Offs and International Spillovers at the Zero Bound

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Motivation



*OECD estimate.

Outline of the Paper

Question: Is monetary policy of a small open economy affected by the presence of the zero lower bound (ZLB) at home and abroad?

Answer: Yes!

ZLB in foreign economy affects:

- ▶ trade-off between stabilisation of home inflation and output gap for home central bank,
- ▶ the length of the stay of home economy at ZLB,
- ▶ subsequent policy of raising rates of home central bank.

Literature Review

Monetary Policy at the ZLB

- ▶ Foreign ZLB does not affect home policy at ZLB (Bodenstein et al, 2009).
- ▶ Commitment policy in closed economy is effective in stabilising economy at ZLB (eg Adam and Bili, 2006; Jung et al, 2005; Nakov, 2006).
- ▶ Commitment policy is less effective when shocks are large and persistent (Levin et al, 2010)
- ▶ Optimal policy at ZLB in a single open economy (Svensson, 2001; Coenen and Wieland, 2003; Nakajima, 2008).

Methodology

Dynamic Stochastic General Equilibrium Model

Model based on Gali and Monacelli 2005, De Paoli 2009 and Lipińska et al 2009:

- ▶ Two country structure: home (small open economy) and foreign (rest of the world),
- ▶ Agents in each economy: households and firms,
- ▶ Sticky prices,
- ▶ Producer currency pricing,
- ▶ Perfect risk sharing between countries,
- ▶ Optimal monetary policy given the loss function subject to constraints of the economy.

Foreign Economy

The Non-policy Block

- ▶ IS curve:

$$\Delta \hat{x}_{F,t+1} = \frac{1}{\rho} (i_{F,t} - \hat{\pi}_{F,t+1} - r_{F,t}^n).$$

- ▶ New Keynesian Phillips curve:

$$\hat{\pi}_{F,t} = k(\rho + \eta)\hat{x}_{F,t} + \beta\hat{\pi}_{F,t+1}.$$

- ▶ The natural real rate is a function of domestic productivity (A) and demand (B) shocks:

$$r_{F,t}^n = \frac{\rho\eta}{\rho + \eta} (\Delta \hat{A}_{F,t+1} - \Delta \hat{B}_{F,t+1}) + \frac{1 - \beta}{\beta}.$$

Home Economy

The Non-policy Block

- ▶ IS curve:

$$\Delta \hat{x}_{H,t+1} = \frac{1-\lambda}{\rho_\lambda} (i_{H,t} - \hat{\pi}_{H,t+1} - r_{H,t}^n) - \left(1 - \frac{\rho_\lambda}{\rho(1-\lambda)}\right) \Delta \hat{x}_{F,t+1}.$$

- ▶ New Keynesian Phillips curve:

$$\hat{\pi}_{H,t} = k \left((\eta + \frac{\rho_\lambda}{1-\lambda}) \hat{x}_{H,t} + (1 - \frac{\rho_\lambda}{1-\lambda}) \hat{x}_{F,t} \right) + \beta \hat{\pi}_{H,t+1}.$$

- ▶ The natural real rate is a function of home and foreign shocks:

$$r_{H,t}^n = r_{F,t}^n + \gamma (\Delta (\hat{A}_{H,t+1} - \hat{A}_{F,t+1}) - (1-\lambda) \Delta (\hat{B}_{H,t+1} - \hat{B}_{F,t+1})).$$

where ρ —intertemporal elast. of substitution, θ —intra-temporal elasticity of

substitution, λ —degree of openness, $\rho_\lambda = \frac{\rho(1-\lambda)}{(\rho\theta-1)\lambda(2-\lambda)+1}$

Spillovers from Foreign Economy

Spillover from foreign policy:

- ▶ Home output gap and inflation are affected by foreign output gap,
- ▶ Sign of the spillover depends on the substitutability of home and foreign good,
- ▶ Micro studies imply that goods are substitutes (Obstfeld and Rogoff, 2000),
- ▶ If goods are substitutes (ie $\rho\theta > 1$) then:
 - ▶ $\rho_\lambda < \rho(1 - \lambda)$, where $\rho_\lambda = \frac{\rho(1-\lambda)}{(\rho\theta-1)\lambda(2-\lambda)+1}$
 - ▶ $\mathbf{x}_F \downarrow \Rightarrow \mathbf{x}_H \uparrow, \pi_H \downarrow$.

Spillover from Foreign Policy

Effects of Foreign Contraction

Consider effects of foreign contraction

- ▶ Home inflation:
 - ▶ Fall in foreign output produces a negative wealth effect on home consumers,
 - ▶ Negative wealth effect results in increase of labour supply \Rightarrow decline in real wages and inflation.
- ▶ Home output:
 - ▶ Home real exchange rate depreciates \Rightarrow an increase in home output.

Monetary policy

The Loss Function

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\hat{\pi}_{j,t}^2 + \omega_j \hat{x}_{j,t}^2 \right)$$

subject to:

$$IS \text{ curve, } NKPC, \ i_t^j \geq 0$$

where $j = H, F$.

- ▶ Central banks are assumed to follow perfectly credible policies.
- ▶ They have a choice to whether commit or not.

Policy Experiment

Calibration

Calibration follows De Paoli (2009):

Intertemporal elasticity of substitution (ρ^{-1})	1
Intratemporal elasticity of substitution (θ)	3
Frisch elasticity of labour supply (η^{-1})	0.47^{-1}
Degree of openness (λ)	0.5
Subjective discount factor (β)	0.99
slope of the NKPC (k)	0.03
Probability of not being able to reset price (α)	0.66

Assumptions about the shock to the natural interest rate:

- ▶ Calibration to match Great Recession shock in Levin et al (2010), ie an 8% pa fall in natural rate with persistence parameter 0.85.

Policy experiment

Discretion vs Commitment

Home policy under discretion:

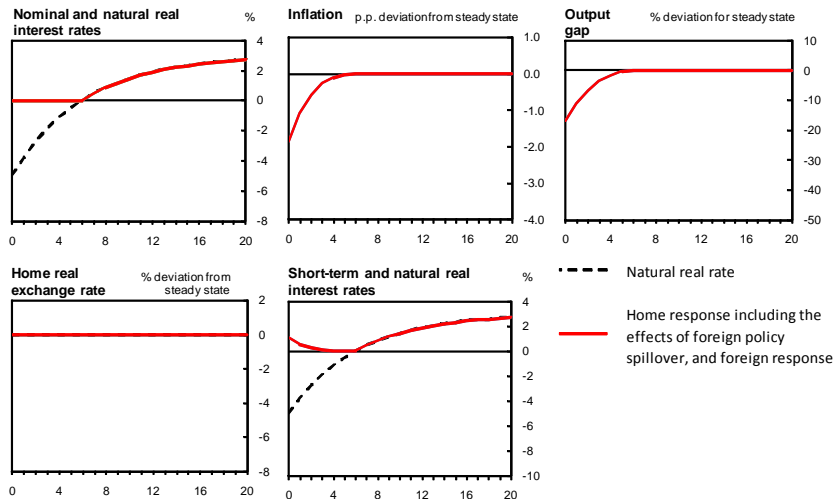
- ▶ Inflation and output gap at ZLB do not depend on home policy,
- ▶ Length of the stay at ZLB depends on the shock and foreign policy,
- ▶ Spillover from foreign policy is likely to imply that $i_t^H \neq r_{H,t}^n$ even when $r_{H,t}^n > 0$.

Home policy under commitment:

- ▶ Inflation and output gap at ZLB depend on home policy,
- ▶ Length of the stay at ZLB and exit policy depend on both home and foreign policy.

Simulation results

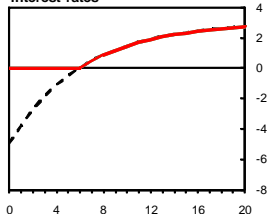
Discretion both at Home and Foreign



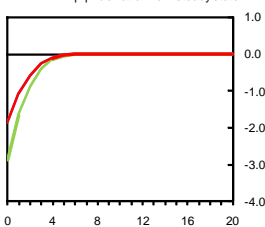
Simulation results

Discretion at Home and Foreign

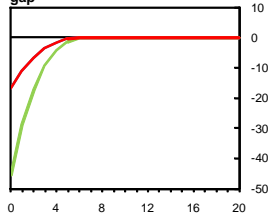
Nominal and natural real interest rates



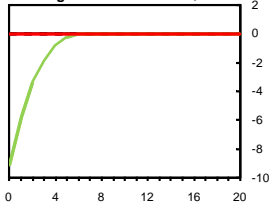
Inflation p.p. deviation from steady state



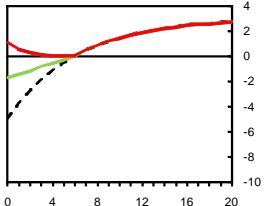
Output gap % deviation for steady state



Home real exchange rate % deviation from steady state



Short-term and natural real interest rates

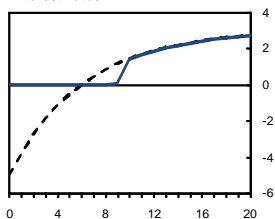


- Natural real rate
- Home response including the effects of foreign policy spillover, and foreign response
- Home response excluding the effects of foreign policy spillover

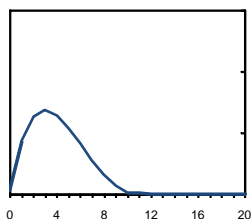
Simulation results

Commitment at Home and Foreign

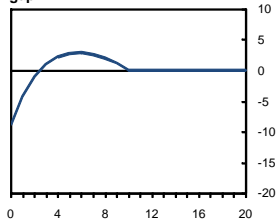
Nominal and natural real interest rates



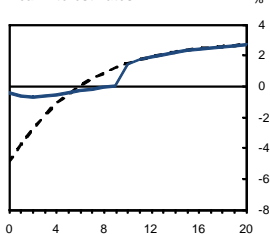
Inflation p.p. deviation from steady state



Output gap % deviation for steady state



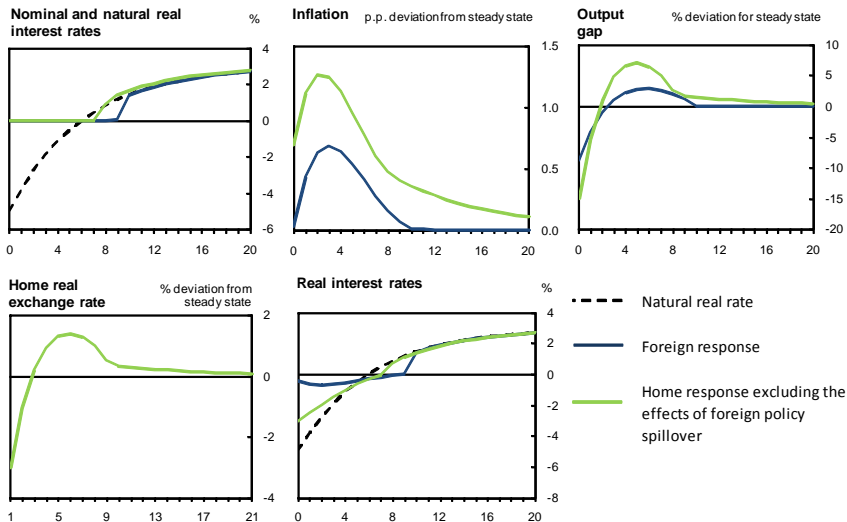
Real interest rates



- Natural real rate
- Foreign response

Simulation results

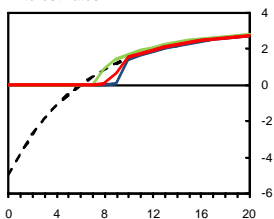
Commitment at Home and Foreign



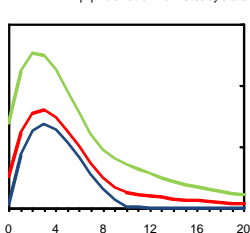
Simulation results

Commitment at Home and Foreign

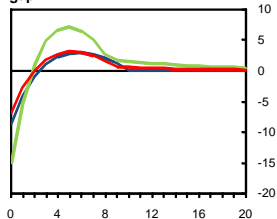
Nominal and natural real interest rates



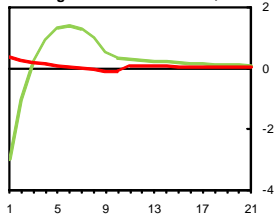
Inflation p.p. deviation from steady state



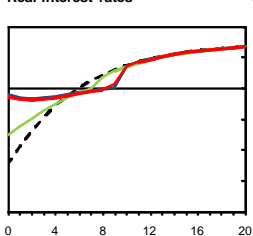
Output gap % deviation for steady state



Home real exchange rate % deviation from steady state



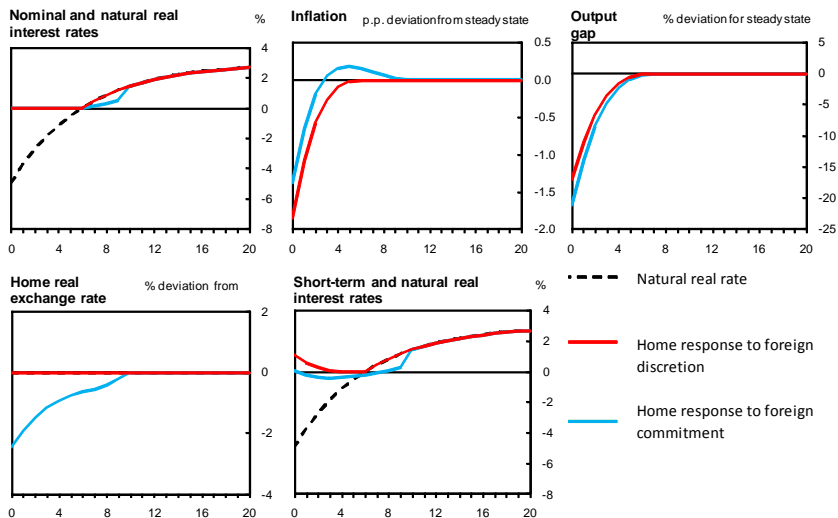
Real interest rates



- Natural real rate
- Foreign response
- Home response excluding the effects of foreign policy spillover
- Home response including the effects of foreign policy spillover.

Foreign policy design

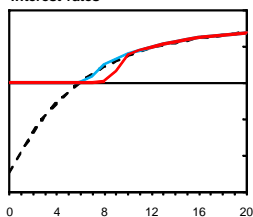
Discretionary policy at Home



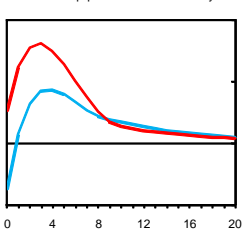
Foreign policy design

Commitment policy at Home

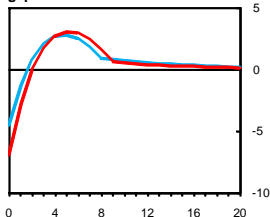
Nominal and natural real interest rates



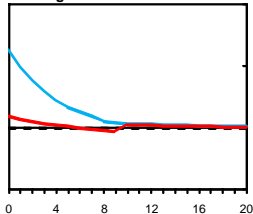
Inflation p.p. deviation from steady state



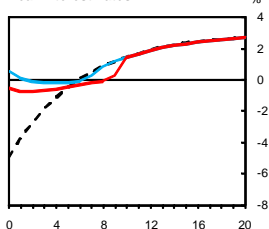
Output gap % deviation for steady state



Home real exchange rate % deviation from steady state



Real interest rates



- Natural real rate
- Home response to foreign discretion
- Home response to foreign commitment

Conclusions

We study how the presence of the ZLB both at home and abroad affects the optimal policy response to a global shock in a standard new Keynesian model of a small open economy:

1. Inability of foreign central bank to stabilise foreign output gap produces a spillover for the small open economy.
2. This spillover is independent from the type of the shock that hit both economies.
3. Size and sign of the spillover is determined by the degree of substitutability of home and foreign goods and also the choice of foreign policy on whether to commit.
4. This spillover may change the length of the stay at ZLB and subsequent exit policy.