Exchange Rate Flexibility under the Zero Bound: The Need for Forward Guidance

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ECB April 2014

Major cost of a SC is dealing with asymmetric shocks

- Lessons of the European crisis:
  - Unambiguous affirmation of traditional OCA theory?
  - Huge asymmetry in shocks South versus North Europe
  - Hard to adjust relative prices: need for internal devaluation
  - Absence of fiscal equalization mechanisms

But what is the counterfactual?

- Exchange rate adjustment depends on stance of monetary policy
- Crisis/aftermath limited effectiveness of monetary policy
  - Many countries at or close to zero lower bound (ZLB)
- Comparison should be between SCA and flexible exchange rate system constrained by ZLB
- Seems like it would enhance need for multiple currencies?

Answer given in this paper

- No. Benefits of exchange rate adjustment may be absent under ZLB
- Without activist monetary policy;
  - Asymmetric shocks lead exchange rate to move in perverse direction
  - Welfare may be higher *without* exchange rate flexibility
  - True even if only subset of countries constrained by ZLB,
- Key distortion is absence of commitment
  - Lack of commitment - no instrument to guide the exchange rate at ZLB
  - SCA acts as a quasi-commitment device - assures that there will be inflation in post-shock hit country
  - With functioning forward guidance, flexible exchange rates dominate

Caveats

- Not an unconditional argument for SCA
- With large shocks and constrained monetary policy, efficient relative price adjustment not guaranteed
- Key assumption, abstract from smoothly functioning forward guidance, or efficacy of QE
- Other aspects of SC (moral hazard, financial fragility) ignored here

Related literature

- Standard model of SCA (Benigno 2004 JIE)
- Compare with standard model of flexible ER (Clarida et al. 2002 JME)
- Assume large shocks and temporary ZLB (Eggertson 2010 NBER M.)
- Related to recent literature on ZLB (Fujiwara et al. 2011, Erceg et al. 2011)
- Properties of ZLB Bodenstein, et al. 2009; Christiano et al, JPE 2011; Eggertson AER 2012
- Perverse effects of openness in ZLB (Cook and Devereux, EER, 2011, AEJM, 2013)

Model Description

Standard Two Country New Keynesian Model:

- Complete Assets Markets
- Calvo Price Adjustment
- Home bias in preferences
- 'Demand' (time preference) Shocks

Model

Home Preferences

$$U_t = E_0 \sum_{t=0}^{\infty} (U(C_t, \xi_t) - V(N_t))$$

ξ_t preference shock, and $U_{12} > 0$

Composite consumption

$$C_t = \Phi C_{Ht}^{v/2} C_{Ft}^{1-v/2}, \quad v \geq 1$$

Home bias in preferences

Do three things

1. Simple case where monetary policy is arbitrary and/or ZLB constraint binds in both countries (no commitment)

2. Case where one country may be outside ZLB and monetary policy chosen optimally (no commitment)

3. Case where there exists commitment, and monetary policy is chosen optimally

System

The world average equations are:

$$\pi_t^W = k((\phi + \sigma)\widetilde{y}_t^W) + \beta E_t \pi_{t+1}^W$$

$$\sigma E_t(\widetilde{y}_{t+1}^W - \widetilde{y}_t^W) = r_t^W - E_t \pi_{t+1}^W - \bar{r}_t^W$$

- Aggregate economy completely separable from relative distribution
- Each system isomorphic to canonical New Keynesian economy
- Degree of home bias affects only relative economy

Most simple case: ZLB in both countries

2 Equation equilibrium in World 'Relative' $\tilde{y}^R$ and π^R

$$\pi_t^R = k((\phi + \sigma_D)\widetilde{y}_t^R + \beta E_t \pi_{t+1}^R$$

$$\sigma_D E_t(\widetilde{y}_{t+1}^R - \widetilde{y}_t^R) = r_t^R - E_t\pi_{t+1}^R - \bar{r}_t^R$$

- $\bar{r}_t^R = (1-\mu)\frac{\phi}{\sigma_D+\phi}\zeta\varepsilon_t^R$ relative 'natural' interest rate
- $0 < \zeta \equiv \frac{(v-1)}{D} < 1$. Normalized Home Bias
- Demand shock continues (ends) with probability μ, $(1-\mu)$

Terms of Trade and Exchange Rate

Terms of trade

$$\hat{\tau}_t = 2\left(\sigma_D \widetilde{y}_t^R - \frac{\bar{r}_t^R}{(1-\mu)}\right)$$

Nominal Exchange Rate

$$s_t - s_{t-1} = \pi_t^R + \tau_t - \tau_{t-1}$$

For now assume arbitrary Policy Rules $\gamma > 1$

Multiple Currencies

$$r_t = \max(0, \rho + \gamma\pi_t)$$

$$r_t^* = \max(0, \rho + \gamma\pi_t^*)$$

Single currency

$$r_t \equiv r_t^* = \max(0, \rho + \gamma\pi_t^W)$$

Since r_t^W same in each case:

World averages y^W and π^W are the same in each case

Given shock process, solution stationary under multiple currencies

Impose stationarity to get 'relative AS'

$$\pi_t^R = \frac{k(\phi + \sigma_D)}{(1 - \beta\mu)} \widetilde{y_t}^R$$

Positive relationship between relative inflation and relative output gap

First, case when ZLB was not binding

With multiple currencies

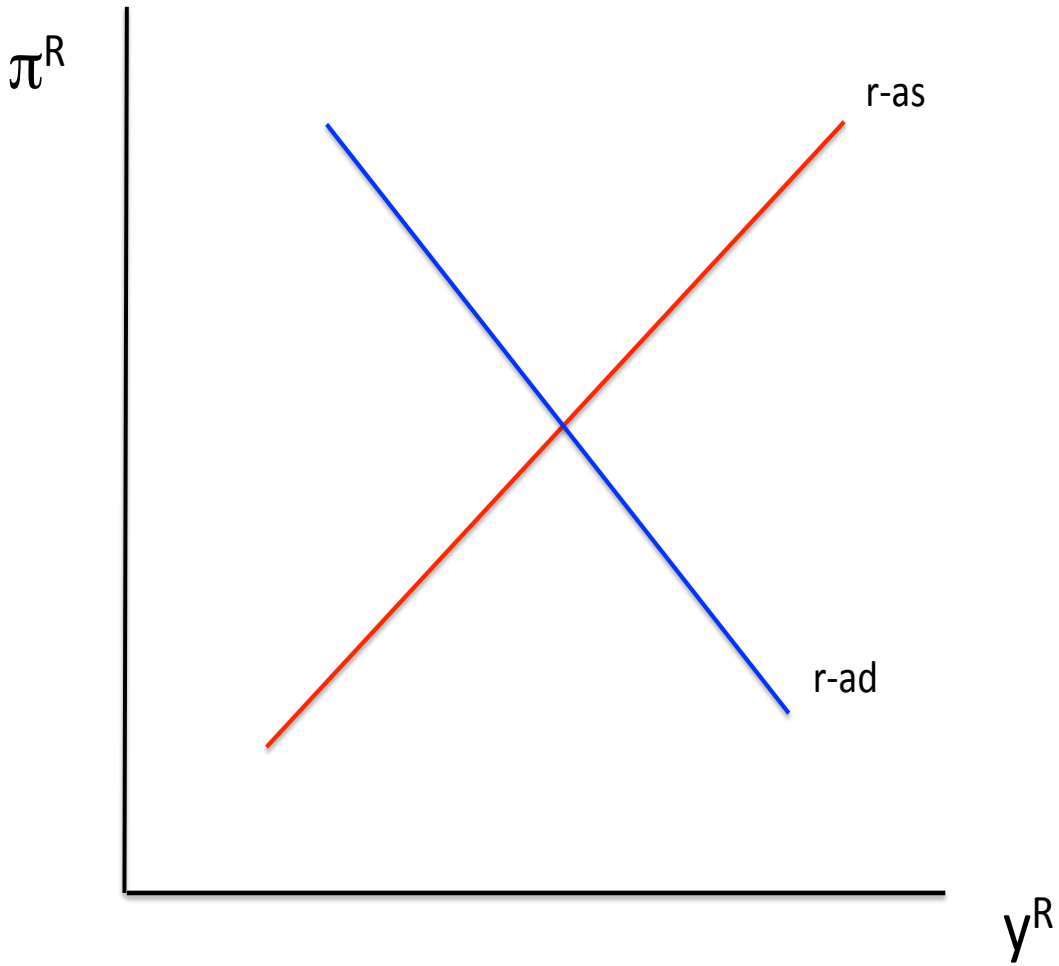
$$r_t^R = \gamma \pi_t^R$$

Imposing stationarity get 'relative AD'

$$\pi_t^R = -\frac{(1-\mu)}{(\gamma-\mu)}\left(\sigma_D \widetilde{y_t}^R - \frac{\bar{r}_t^R}{(1-\mu)}\right)$$

Negative Relationship between π^R and $\tilde{y}^R$

Rel-AS and Rel-AD - Multiple Currencies



Under single currency, relative economy independent of monetary rule

$$r_t^R = 0$$

Relative inflation driven by terms of trade

$$\pi_t^R = -(\hat{\tau}_t - \hat{\tau}_{t-1}).$$

Substitute to get:

$$\pi_t^R = -2\left(\sigma_D \widetilde{y}_t^R - \frac{\bar{r}_t^R}{1-\mu}\right) + 2\left(\sigma_D \widetilde{y}_{t-1}^R - \frac{\bar{r}_{t-1}^R}{(1-\mu)}\right)$$

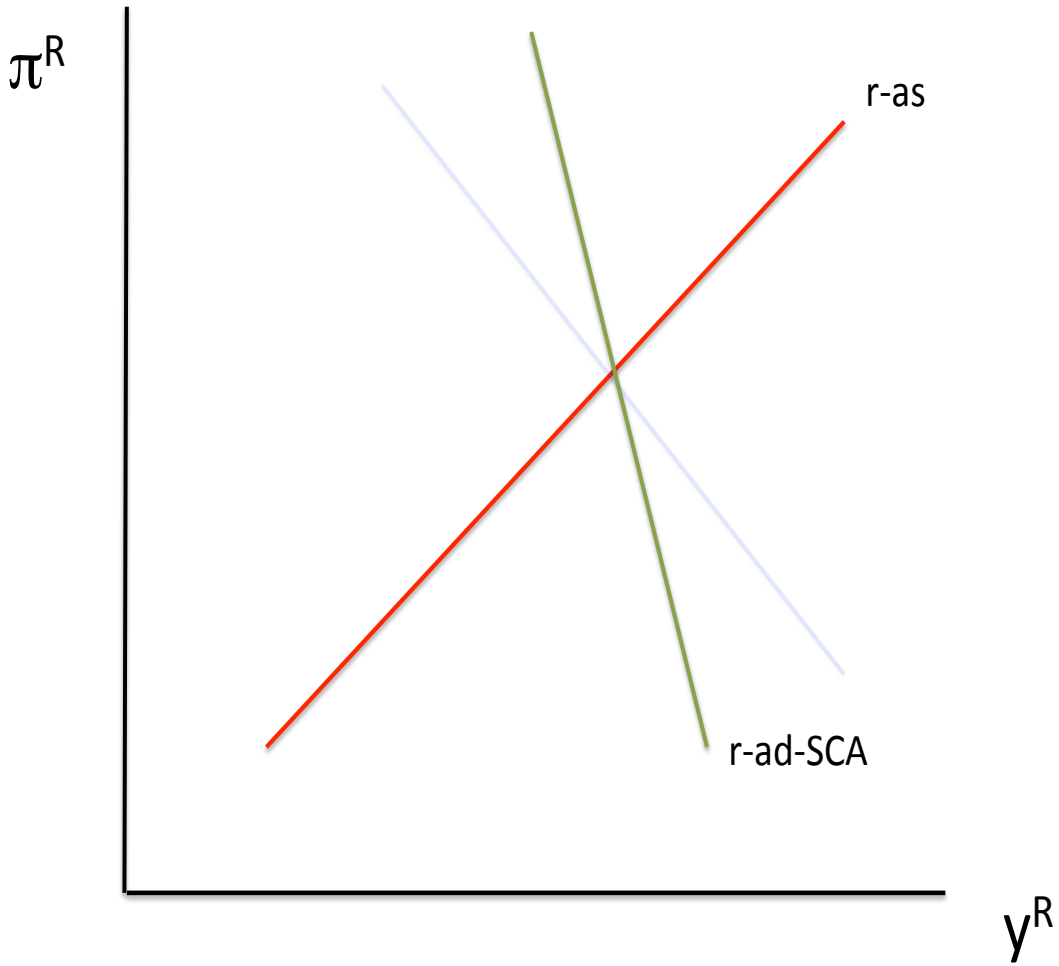
Rel-AD is now dynamic (solution is not stationary) But we can compare first round impact of shock

Rel-AS under SC

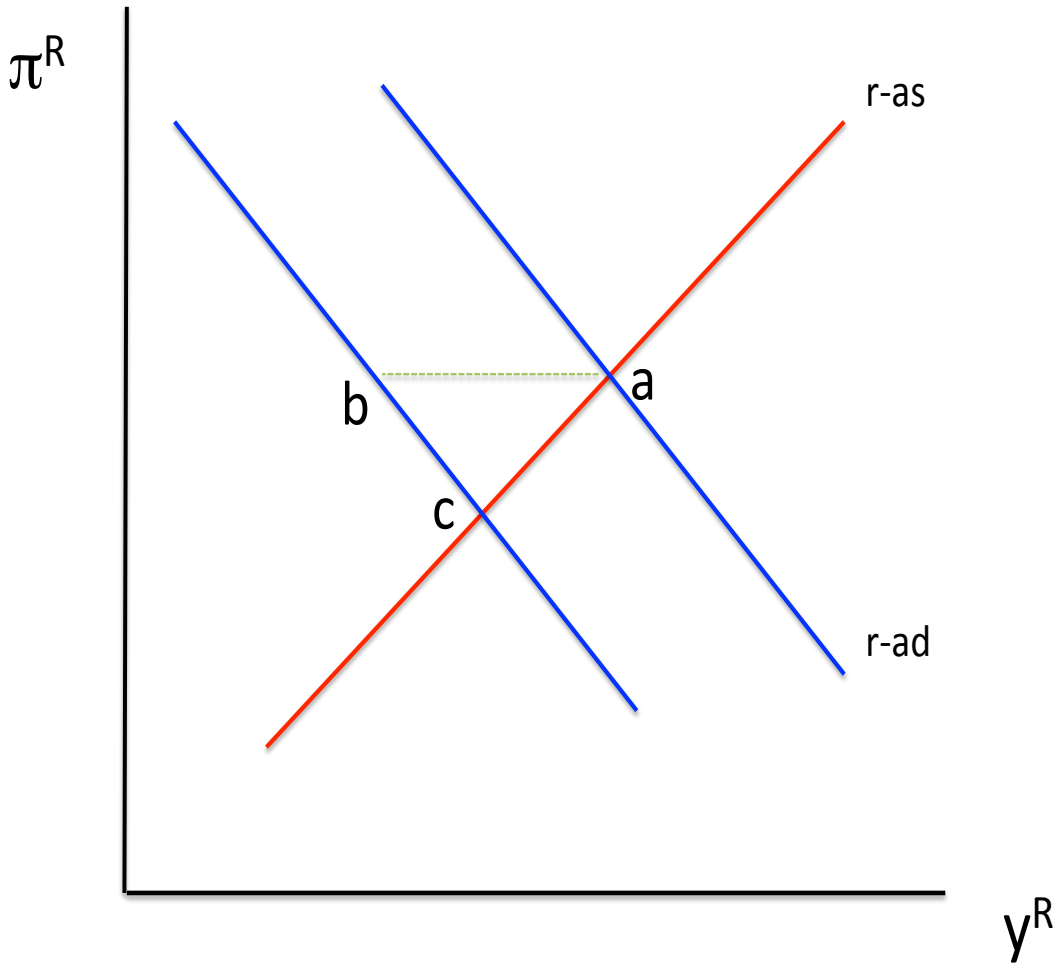
Rel-AS is 'approximately' the same (differs only due to inflation root λ):

$$\pi_t^R = \frac{k(\phi + \sigma_D)}{(1 - \beta\lambda)} \widetilde{y_t}^R$$

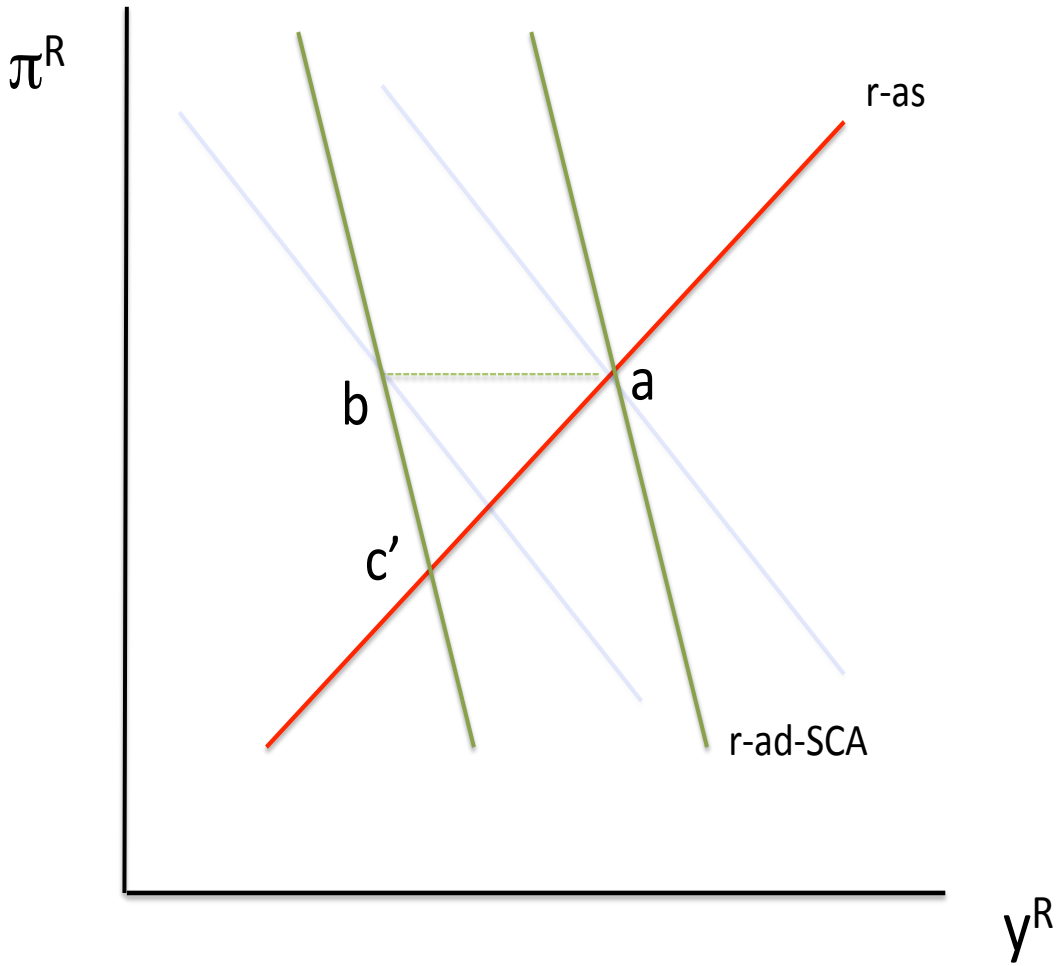
Rel-AS and Rel-AD - Single Currency Area - first period effect



Demand Shock - Multiple currencies



Demand Shock - Single Currency - first period effect



Summary, absent ZLB

- Fall in relative inflation and relative output gap greater under SC
- Terms of Trade response from UIRP:

$$\gamma \pi_t^R = E_t(\pi_{t+1}^R + \tau_{t+1} - \tau_t)$$

- Solves for:

$$\tau_t = -\frac{\gamma - \mu}{1 - \mu} \pi_t^R$$

  - Terms of trade depreciation
- Under SC terms of trade depreciation through deflation

$$\tau_t = \tau_{t-1} - \pi_t^R$$

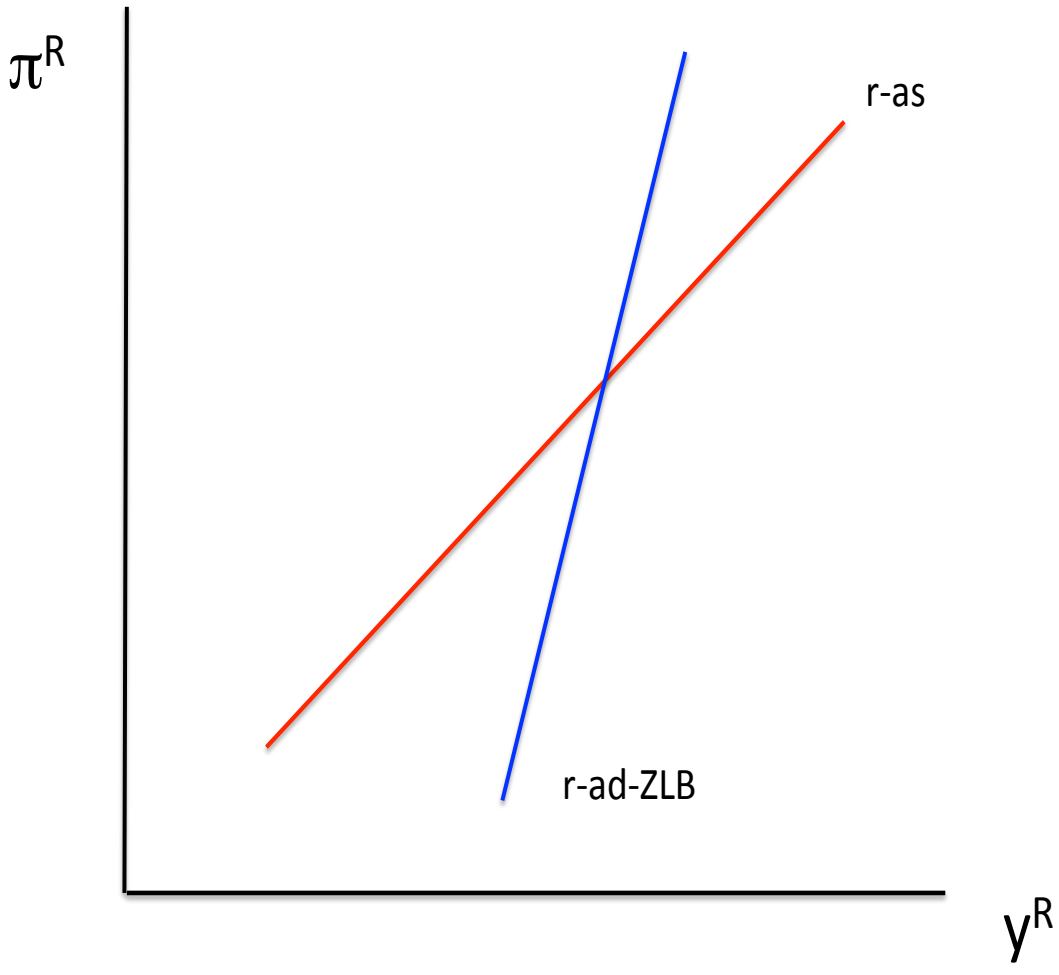
Now assume ZLB binding

- rel-AS unchanged
- rel-AD, flexible exchange rates:

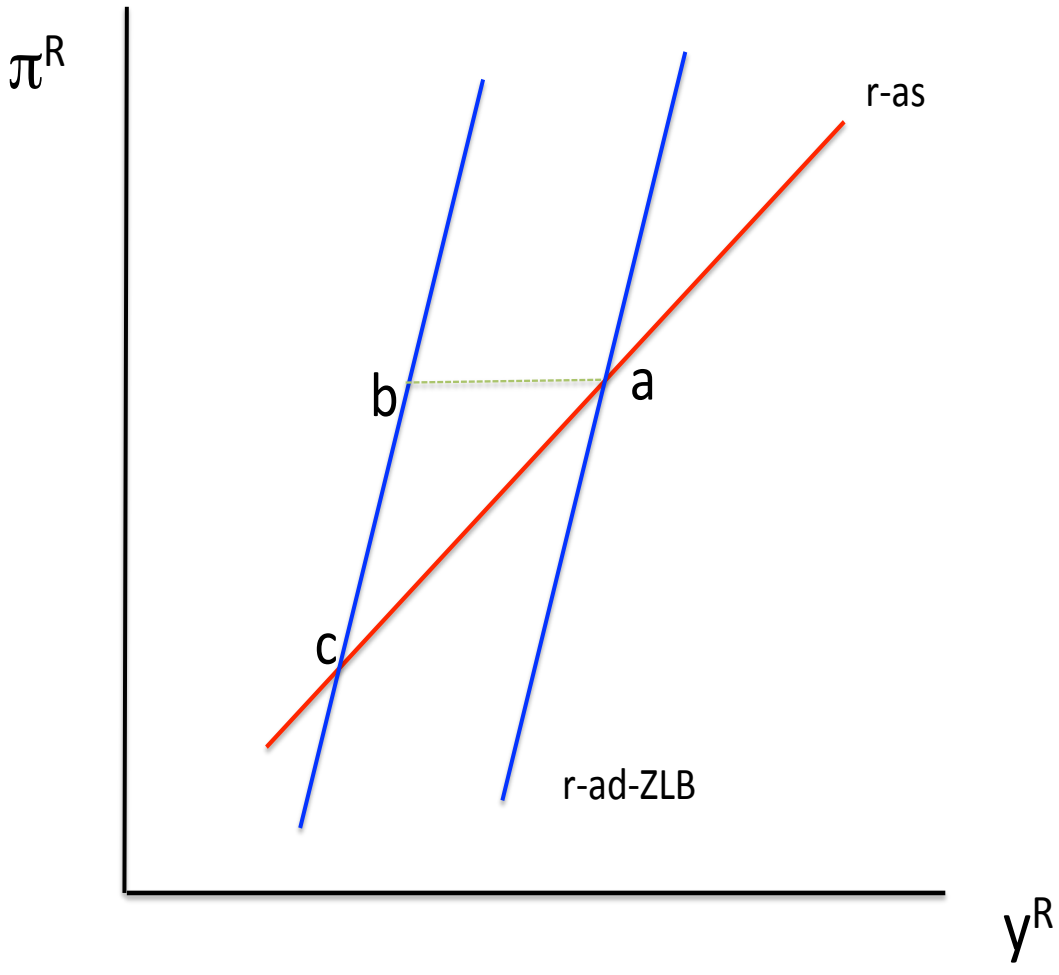
$$\pi_t^R = -\frac{1-\mu}{\mu}\left(\sigma_D \widetilde{y_t}^R - \frac{\zeta\phi}{\sigma_D+\phi}\varepsilon_t^R\right)$$

- Upward sloping in π_t^R, y_t^R space
- rel-AD SCA - unchanged

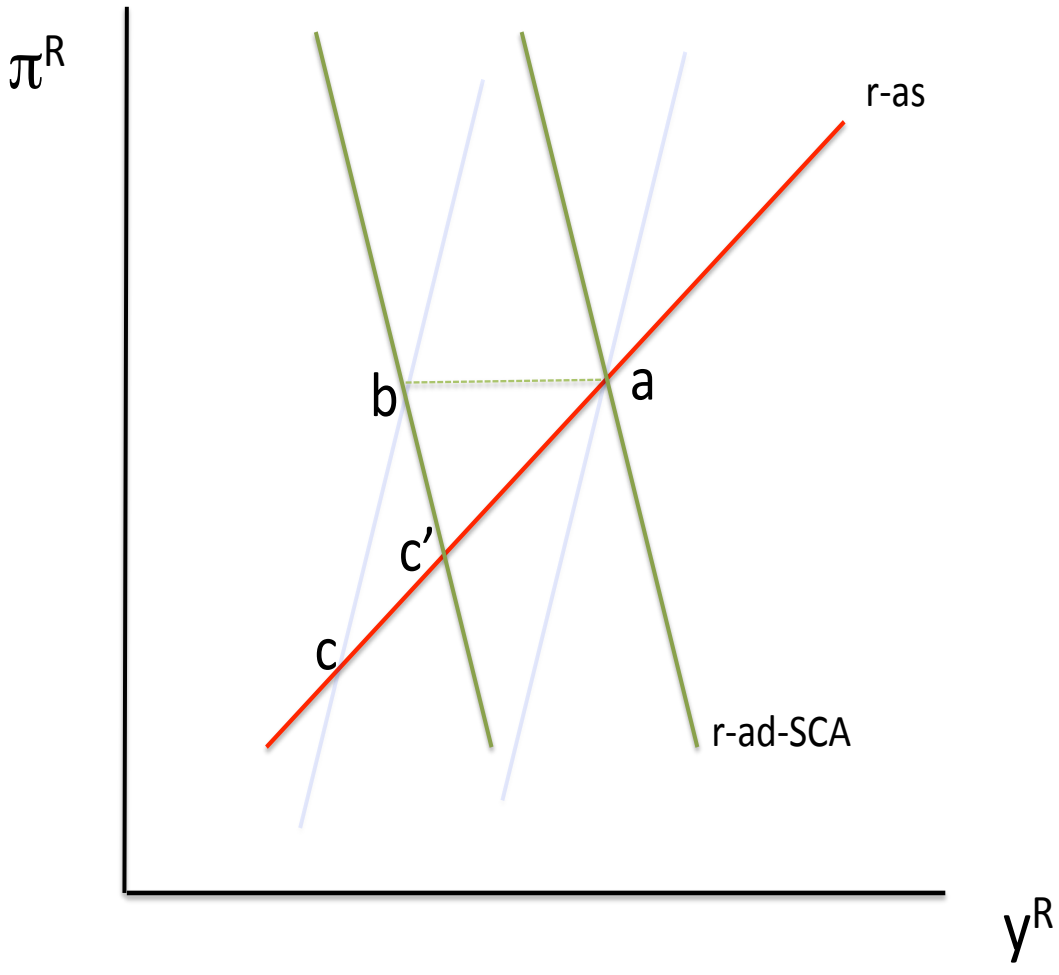
Rel-AD, Rel-AS, ZLB



Demand Shock - Multiple Currencies - ZLB



Demand Shock - Single Currency Area



Effect of demand shock under ZLB

- Large fall in inflation and output gap
- Terms of trade **appreciation**

$$0 = E_t(\pi^R_{t+1} + \tau_{t+1} - \tau_t)$$

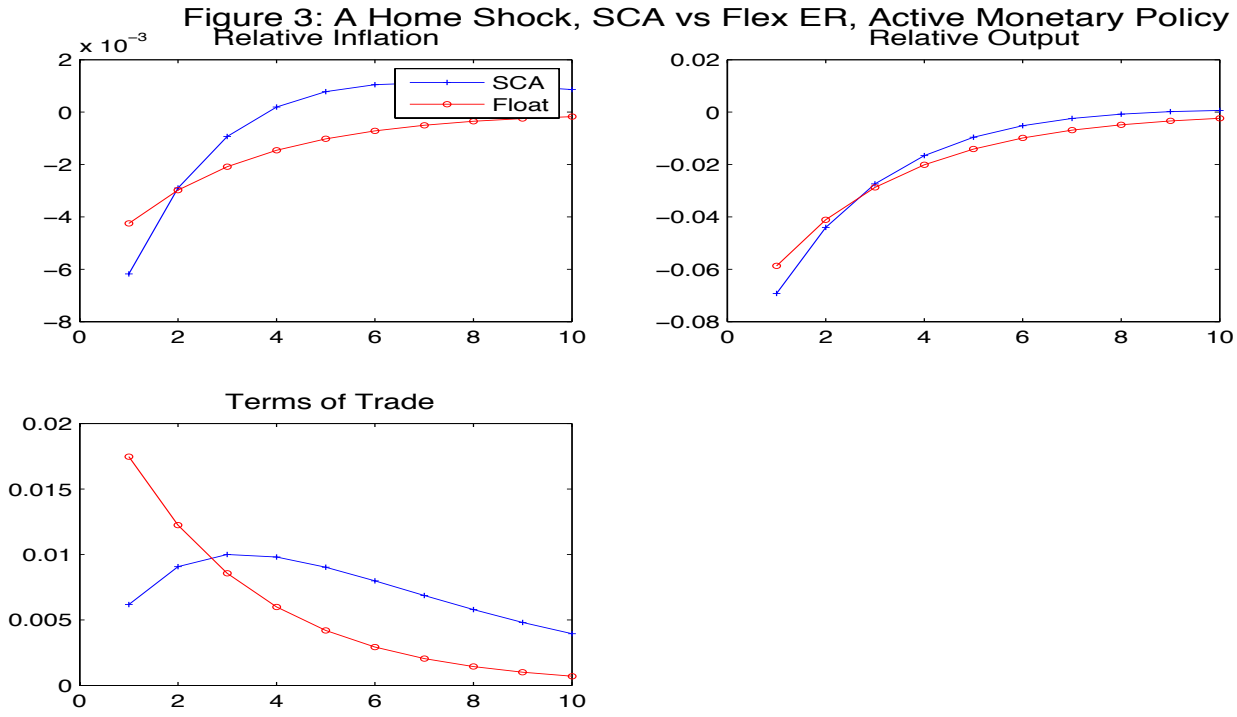
$$\tau_t = \frac{-\mu}{1-\mu}\pi^R_t$$

- Also nominal exchange rate *appreciation*

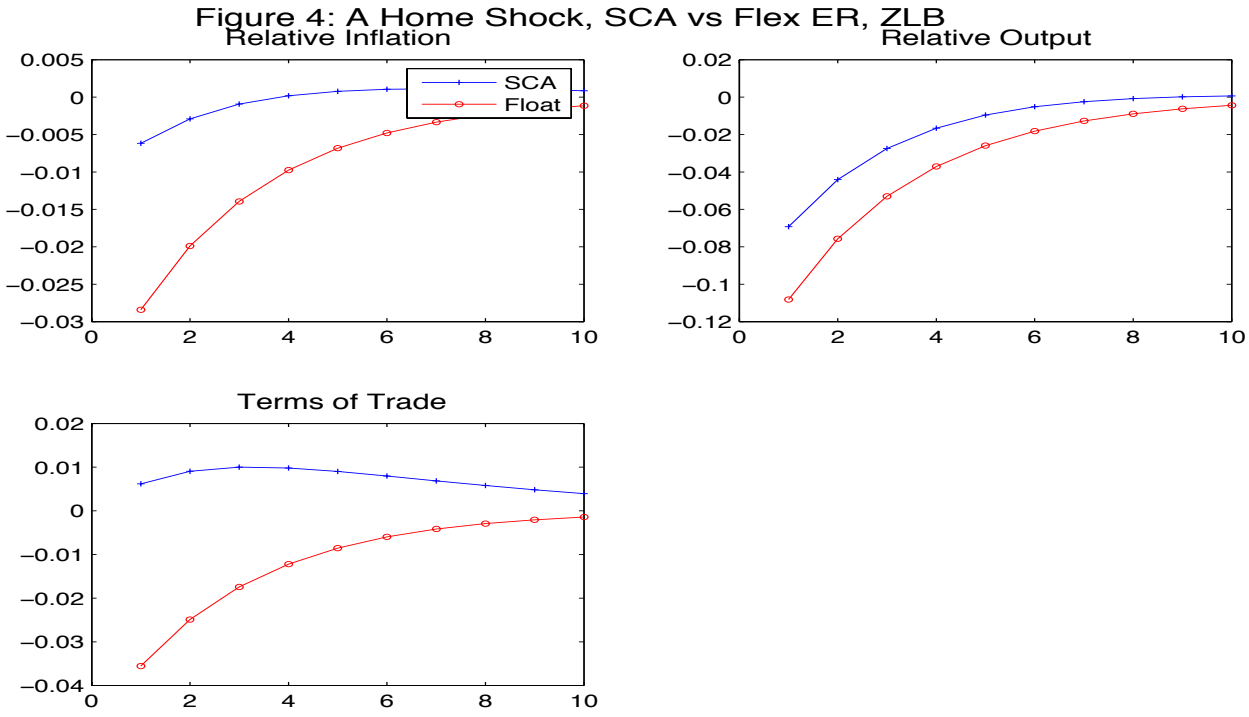
$$s_t - s_{t-1} = \pi^R_t + \tau_t - \tau_{t-1}$$

- Under SCA, response is same as before

Compare responses: Normal monetary policy



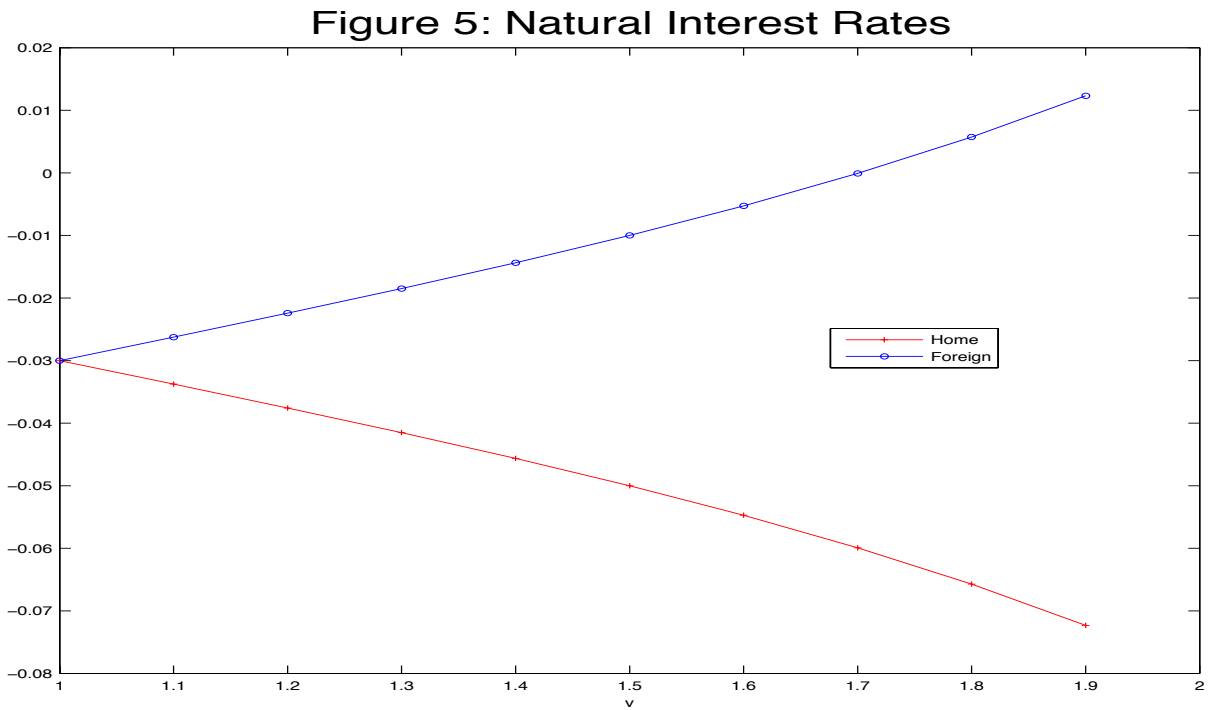
Compare responses: ZLB



Now look at optimal policy, but without commitment

- Possibly ZLB will not apply in both countries
- Depends on response of $\bar{r}_t$, $\bar{r}_t^*$
- $\varepsilon_t < 0$ and $\varepsilon_t^* = 0$
- $\bar{r}_t^W < 0$
- $\bar{r}_t < 0$, but $\bar{r}_t^* < 0$, or > 0, depending on v.

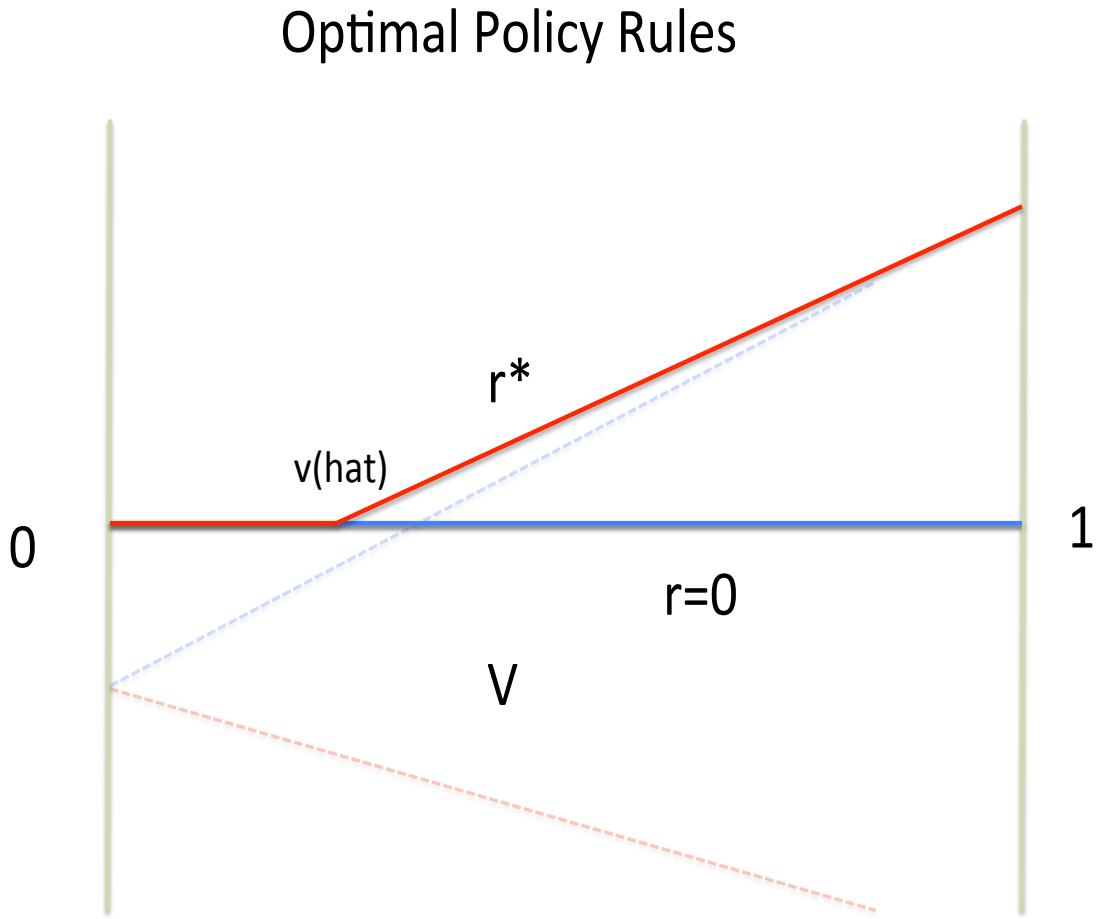
Natural interest rates



Optimal Policy with flexible exchange rates

- $r_t = 0$,
- $\exists\ \hat{v}$
  - for $1 \leq v \leq \hat{v}$, $r_t^* = 0$
  - for $\hat{v} < v < 1$, $\quad r_t^* = \bar{r}_t^* + \frac{\Omega_D - \Omega}{\Omega_D + \Omega} \bar{r}_t$
- $\Omega_D - \Omega < 0$
- Home policy rate always zero
- Foreign policy rate may be positive if enough home bias

Optimal policy with multiple currencies



World interest rates differ under flexible exchange rates and SCA

Flexible rate interest rate may be above the 'world natural rate'

$$r_t^{W,mc} = \max(0, \bar{r}_t^W - \frac{\Omega}{\Omega_D + \Omega}\bar{r}_t)$$

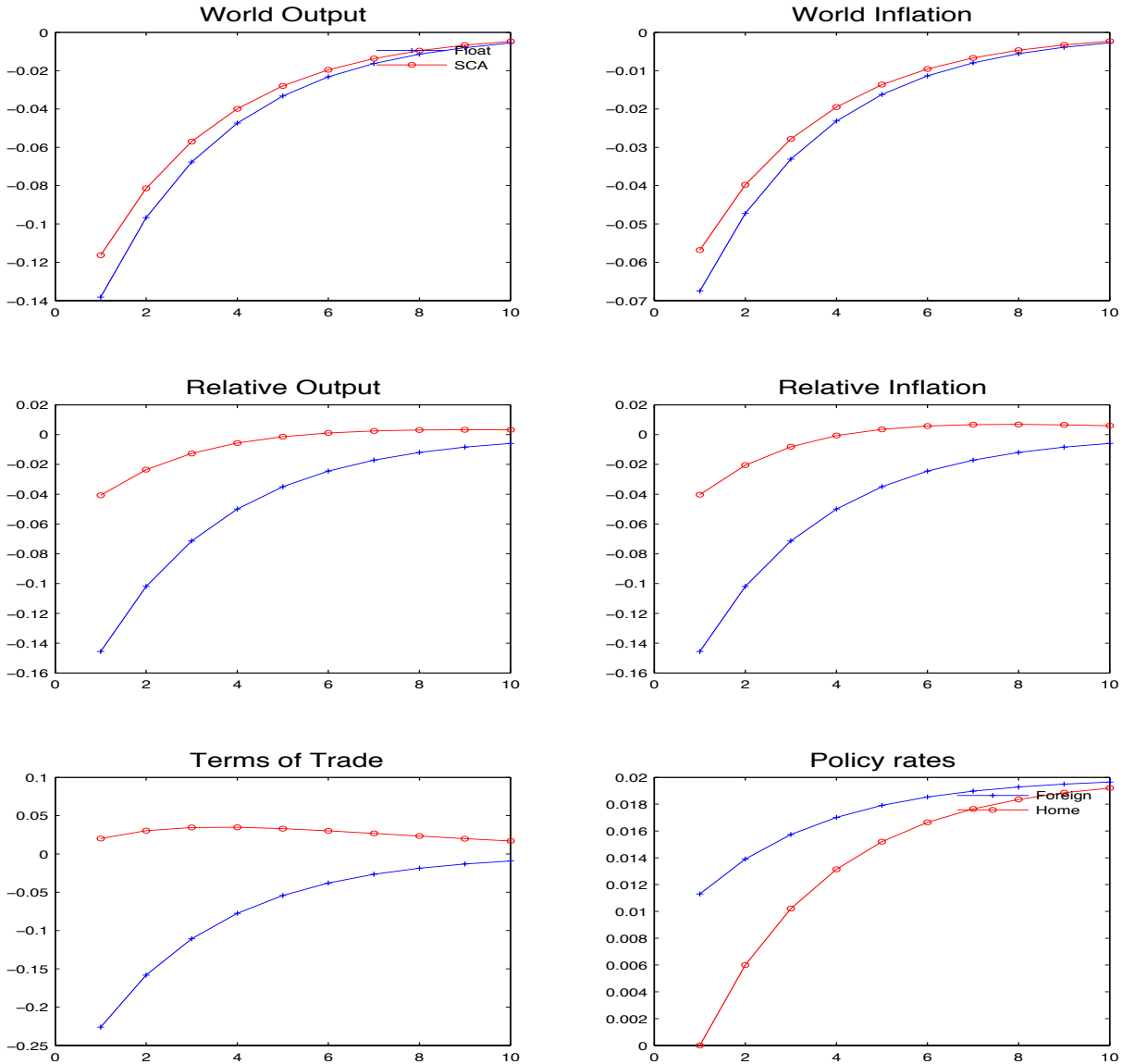
May be optimal to raise foreign policy rates, to reduce appreciation of home terms of trade.

For SCA, optimal policy is

$$r_t^{W,sca} = \max(0, \bar{r}_t^W)$$

Responses under Optimal Policy

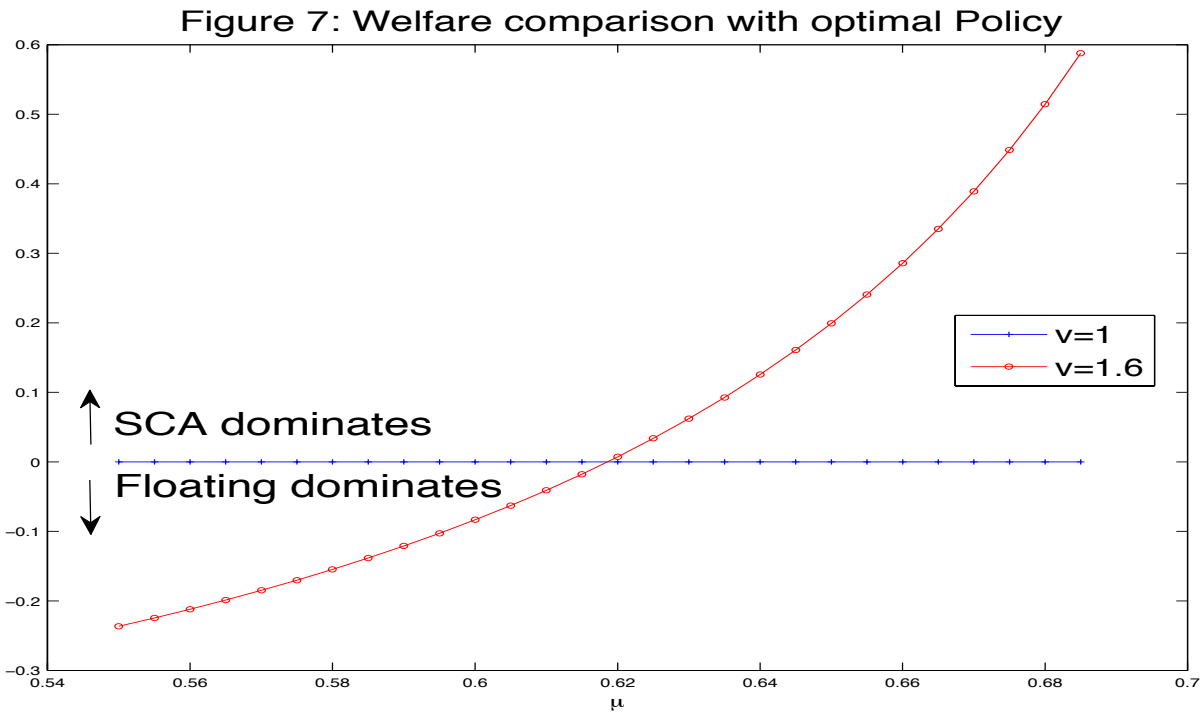
Figure 6: Optimal Policy



Summary under optimal policy

- Average world output falls by more under flexible exchange rates
- Relative world output falls by more under flexible exchange rates
- Even when
  - Foreign country not constrained by ZLB
  - Monetary policy set optimally
- Problem stems from perverse response of exchange rate under ZLB
- Foreign interest rate rises to offset home exchange rate appreciation

Welfare Comparison: depends on persistence of shock



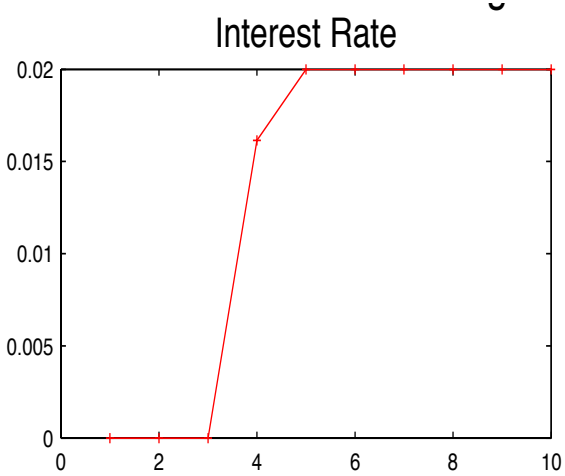
Now look at model with commitment (forward guidance)

- Assume shock lasts for T periods (known)
- Under either currency arrangement, policymakers commit to path of interest rates for $T' > T$
- Guides current expectations

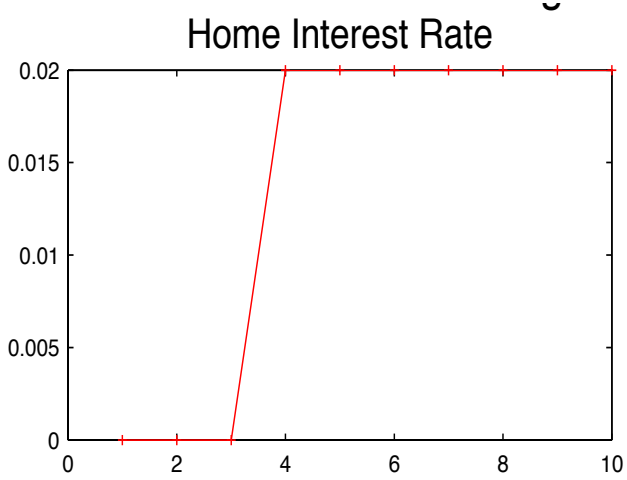
Discretion

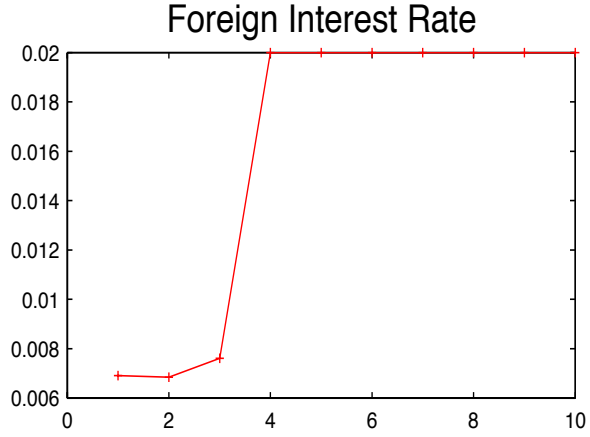
Discretionary Policy

Single Currency



Multiple Currency



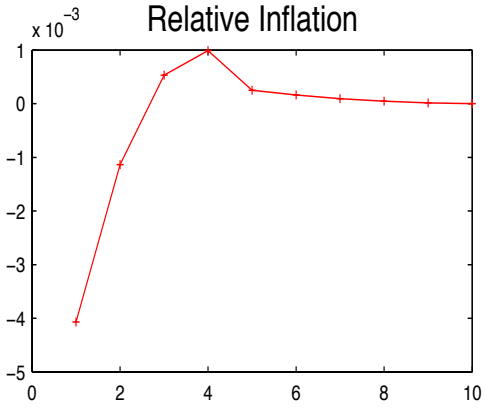


r goes back to steady state after shock ends, under multiple currency
But not under single currency

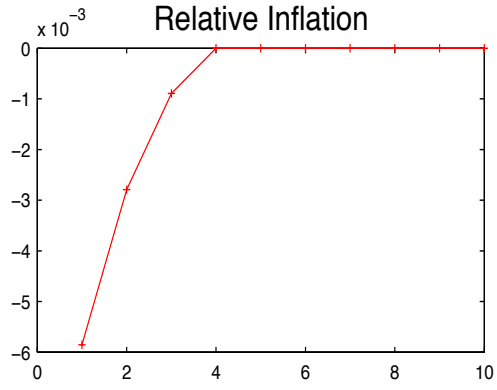
Discretion

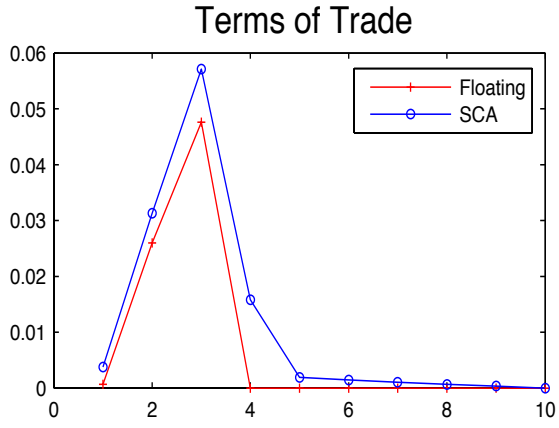
Discretionary Policy

Single Currency



Multiple Currency

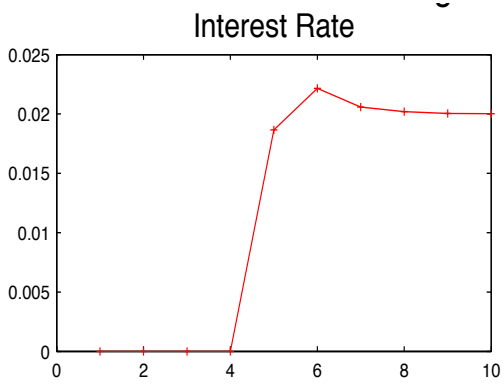




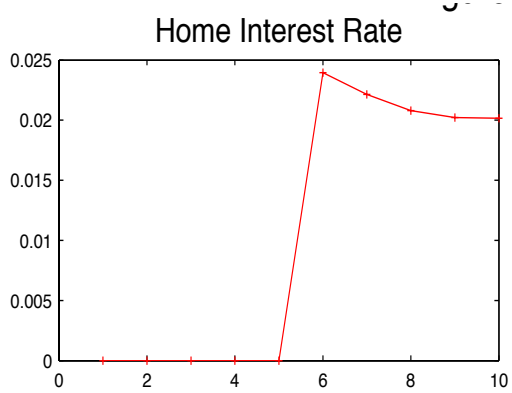
Commitment

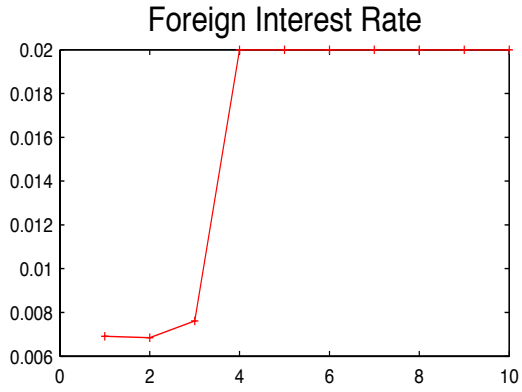
Commitment (forward guidance)

Single Currency



Multiple Currency



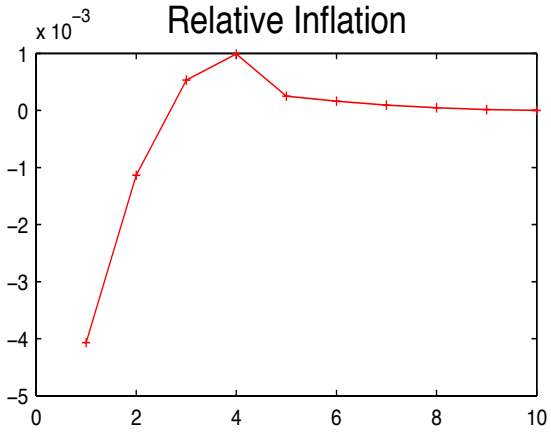


Keep home r=zero
for 5 periods

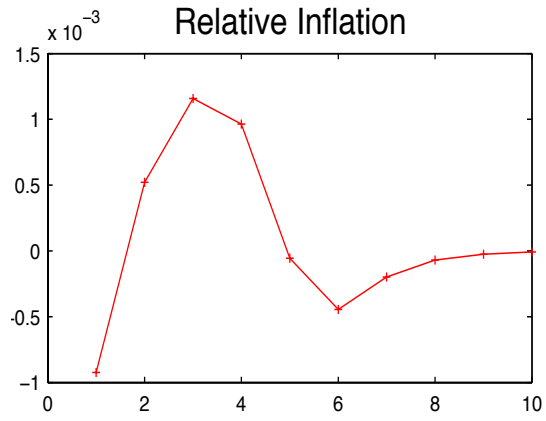
Commitment

Commitment (forward guidance)

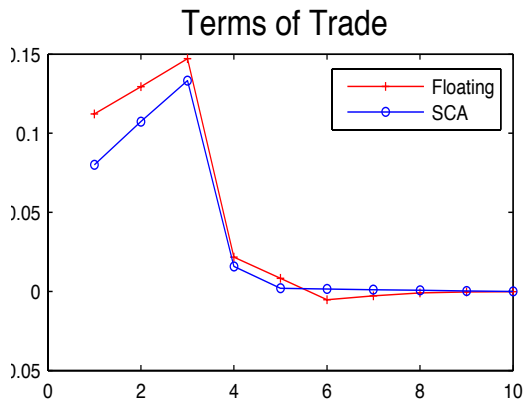
Single Currency



Multiple Currency



Forward guidance allows for efficient relative price adjustment under multiple currencies



Welfare Comparison

Table 1: Welfare Comparison

	SCA	Float
Discretion	-0.007	-0.017
Commitment	-0.0039	-0.002

Notes: Compares present value of welfare under optimal policy under discretionary and commitment policies under each regime

.

Conclusions

- Empirical support? Do zero interest rate currencies appreciate?
- Other tools of adjustment (taxes) - need in both cases
- Efficient exchange rate response needs clear direction of monetary policy
- SCA can prevent inefficient adjustment
- Other aspects of SCA may be more damaging (moral hazard, financial fragility, decentralized regulation)