The Optimal Currency Area in a Liquidity Trap

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Very preliminary draft

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Determinants of the optimal currency area

- Long debate about the conditions necessary for successful single currency area
- Traditional factors
  - A) Labor mobility (+)
  - B) Country Specific shocks (-)
  - C) Fiscal integration (+)
- Discussion of eurozone suggests that factors B) and C) were achilles heel
- Most commentary on European crisis:
  - Overwhelming affirmation of traditional OCA theory?
  - Huge asymmetry in shocks to Southern versus Northern Europe
  - Inability to adjust relative prices: need for internal devaluation

But what is the counterfactual?

- OCA theory presumes activist monetary policy
- Global Financial Crisis severely hindered use of monetary policy in many jurisdictions
  - Many countries at or close to zero lower bound
- Large debt shocks pushing natural real interests negative
- Comparison should be between SCA and flexible exchange rate system at ZLB
- Makes flexible exchange rates look even better?
  - Krugman: Europe in LT - needs exchange rate adjustment
  - Svensson 'foolproof' plan for Japan requires exchange rate flexibility

This paper

- OCA in a liquidity trap
- Plain vanilla NK 2 country model
- Assemble model so that OCA theory holds exactly with activist monetary policy
  - Country specific demand shocks
  - Always better to have flexible exchange rates
  - A. Exchange rate adjusts to stabilize country specific shocks
  - B. Monetary policy can be used actively to offset shocks
- But now assume that we have large (country-specific) shocks
- Pushing region into ZLB
  - Then it turns out the SCA dominates flexible exchange rates
  - Macro shocks more stabilized in absence of ER adjustment
  - Ex ante, when large shocks dominate, EU higher under a SCA

Understanding this result

- Combination of zero lower bound and integrated international capital markets
  - With activist monetary policy, country experiencing shock has fall in its relative real interest rate
  - Depreciation of exchange rate - helps to absorb shock
- But when large shocks and no interest rate adjustment
  - Relative real interest rates rise in country of shock
  - Exchange rate appreciates - exacerbates the response to the shock
- Absence of monetary instrument (plus open capital markets) removes ability to direct the exchange rate
- By contrast, in SCA, no nominal exchange rate at all
  - Shock causes a real exchange rate depreciation
  - RER response same in and out of LT
- SCA acts as kind of precommitment - removing possibility for perverse ER response

Caveats

- Not an argument for SCA
- But key defects in eurozone related to sovereign risk, moral hazard and regulatory negligence
- Can make case that relative price (RER) adjustment not at centre of eurozone defects (Berka Devereux Engel 2012)
- Here, just saying that in case of large shocks, efficient relative price adjustment not guaranteed.

Related literature

- Standard model of SCA (Benigno 2004)
- Compare with standard model of flexible ER (Clarida et al. 2002)
- Assume large shocks and temporary ZLB (Eggertson 2010)
- Related to recent literature on ZLB (Fujiwara et al. 2011, Erceg et al. 2011)

Model Description

Standard Two Country New Keynesian Model:

- Complete Assets Markets
- Calvo Price Adjustment
- Home bias in preferences
- Time Preference Shocks
- Simplicity allows full closed form objects
- But logic is very general

Model

Home Preferences

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

ξ_t is a preference shock, and $U_{12} > 0$ (proxy for deleveraging shock)

Composite consumption defined as

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

Simplifying assumptions for analytical solution

Standard Euler equations, labor supply, price setting

Natural Real Interest Rates

World average and relative, $x_t^W = \frac{x_t + x_t^*}{2}$ and $x_t^R = \frac{x_t - x_t^*}{2}$.

Shock continues (ends) with probability μ, $(1-\mu)$
Take example of home country shock
Home natural rate

$$\widetilde{r}_t = \overline{r} + \left(\frac{\Delta + (\phi + \sigma)(v-1)}{(\phi + \sigma)\Delta} \right) (1-\mu)\phi c_y \frac{\varepsilon_t}{2}$$

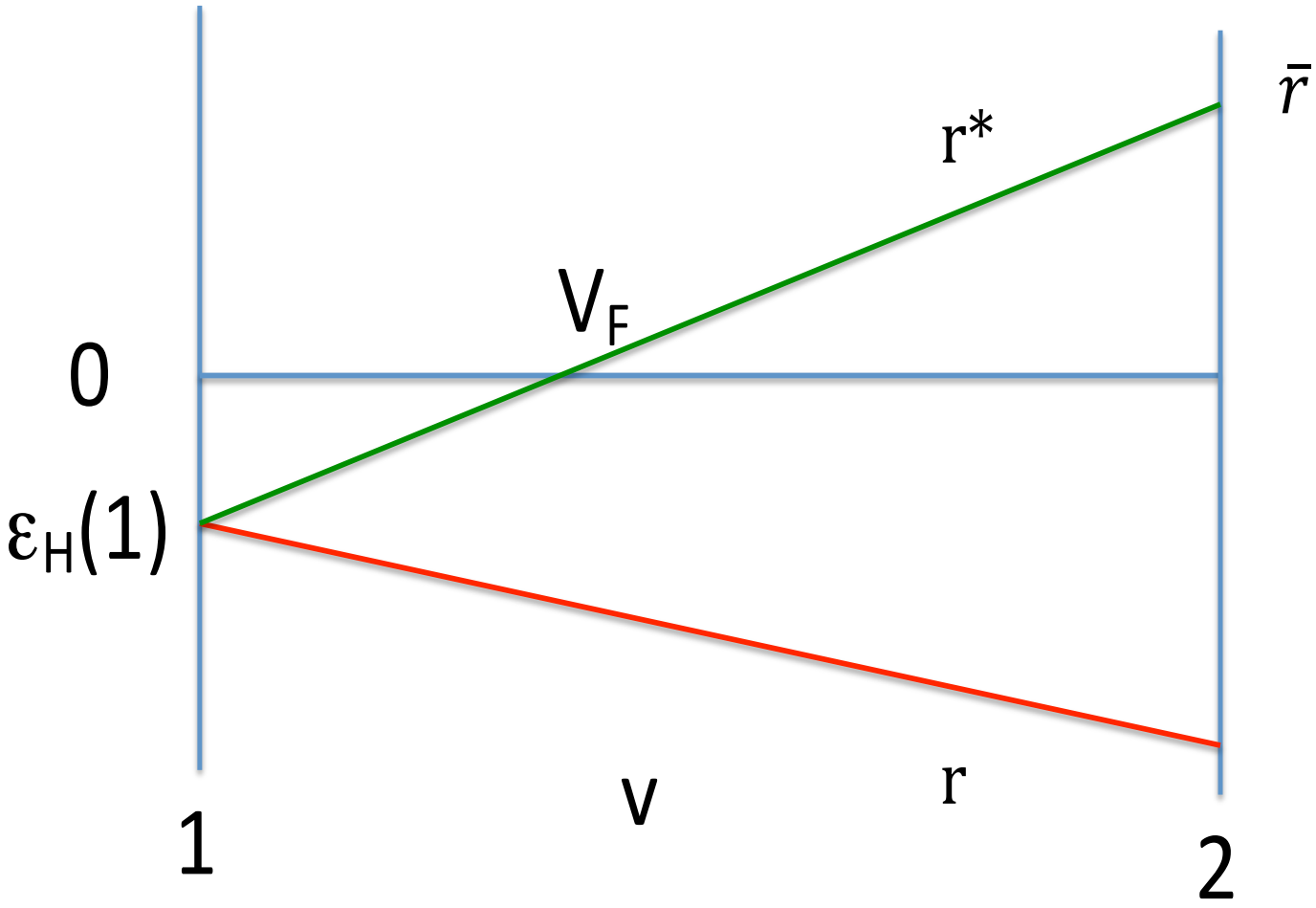
Foreign natural rate is:

$$\widetilde{r}_t^* = \overline{r} + \left(\frac{\Delta - (\phi + \sigma)(v-1)}{(\phi + \sigma)\Delta} \right) (1-\mu)\phi c_y \frac{\varepsilon_t}{2}$$

For $v = 1$, natural real interest rates are identical

Connected through capital mobility

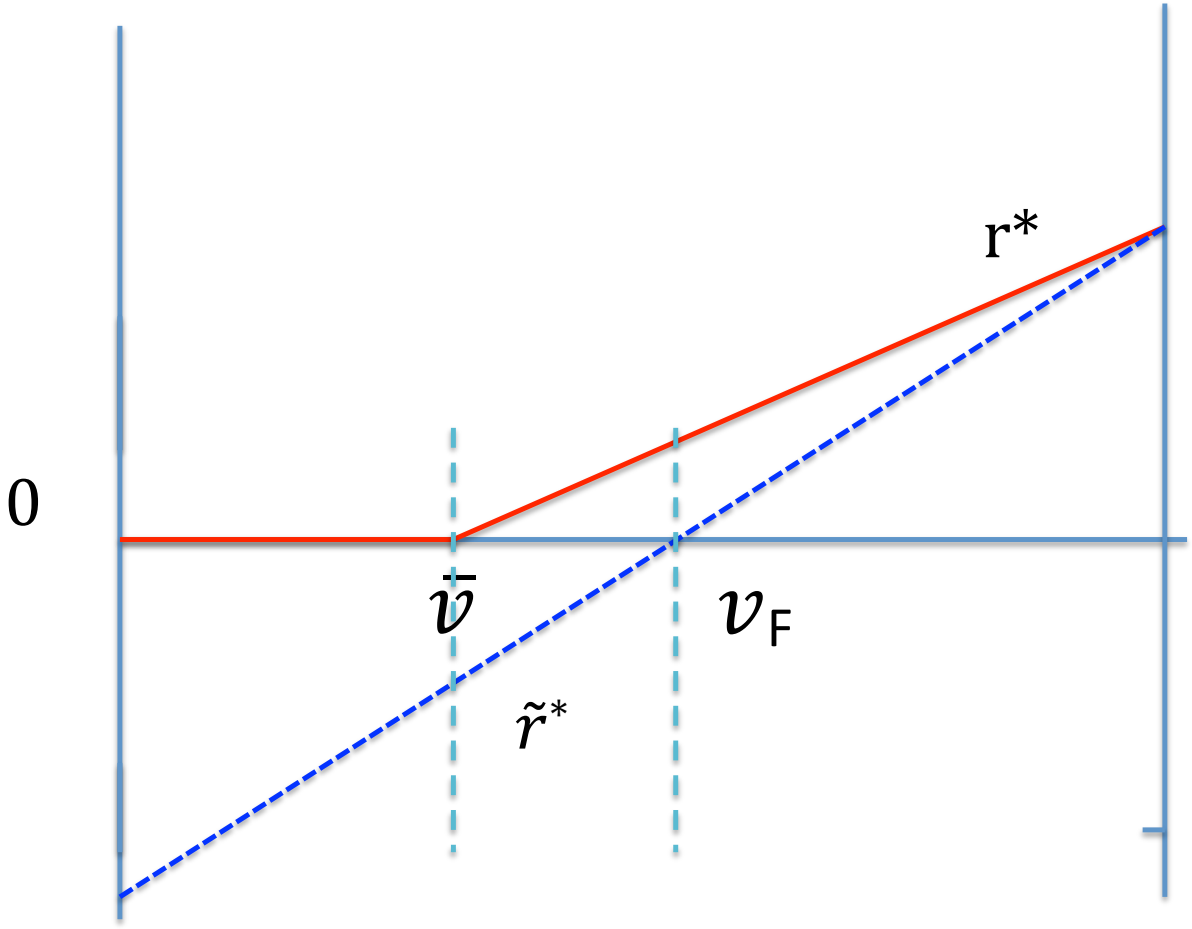
Degree of openness determines strength of connection



Cook-Devereux 2012

Multiple Currencies: Optimal monetary policy

Then in what follows assume that $v < \bar{v}$, so $r = r^* = 0$



World Averages and Relatives:

Averages:

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

$$\sigma E_t(\widehat{y}_{t+1}^W - \widehat{y}_t^W) = E_t(\varepsilon_{t+1}^W - \varepsilon_t^W) + E_t\left(r_t^W - E_t\pi_{t+1}^W - \rho\right)$$

Relatives:

$$\pi_t^R = k((\phi + \sigma_D)\widehat{y}_t^R - \frac{(v-1)}{D}\varepsilon_t^R) + \beta E_t \pi_{t+1}^R$$

$$\sigma_D E_t(\widehat{y}_{t+1}^R - \widehat{y}_t^R) = \frac{(v-1)}{D} E_t(\varepsilon_{t+1}^R - \varepsilon_t^R) + E_t\left(r_t^R - \pi_{t+1}^R\right)$$

Monetary policy with positive interest rates

With multiple currencies, each country follows interest rate rule

$$r_t = \rho + \gamma \pi_t$$

Therefore:

$$r_t^W = \rho + \gamma \pi_t^W$$

,

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

.

Under a single currency:

$$r_t^{SCA} = \rho + \gamma \pi_t^W, \quad r_t^{R,SCA} = 0$$

Some convenient properties

- Behaviour of world economy is identical under a SCA and multiple currencies
- True both with positive interest rates and when when constrained by ZLB
- Under multiple currencies, nominal interest rate defined by

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

Solution of Relative Economy

- Under multiple currencies, analogous solution.
- But with SCA, $r_t^{R,SCA} = 0$, so relative equations are indeterminate

$$\pi_t^{R,SCA} = k((\phi + \sigma_D)\widehat{y}_t^{R,SCA} - \frac{(v-1)}{D}\varepsilon_t^R) + \beta E_t \pi_{t+1}^{R,SCA}$$

$$\sigma_D E_t(\widehat{y}_{t+1}^{R,SCA} - \widehat{y}_t^{R,SCA}) = \frac{(v-1)}{D} E_t(\varepsilon_{t+1}^R - \varepsilon_t^R) + E_t\left(0 - \pi_{t+1}^{R,SCA}\right)$$

- Need backward condition given by:

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

Note: property of a SCA

- Produces responses of *relative* variables akin to response of level variables under ZLB
- Nakamura and Steinsonn 2012 - state level GS multipliers in the US

- So SCA leads to less stable relative variables (OCA theory)
- But, as we see, this is *not true* when, under multiple currencies, *relative* interest rates constrained by ZLB

Savings shocks: multiple currencies, activist monetary policy

Assume that $\varepsilon^W < 0$, and $\varepsilon^R < 0$

- Shock to world saving and relative saving
- Solutions for world averages:

$$\widehat{y}^W = \frac{[(1-\beta\mu)(1-\mu)+k(\gamma-\mu)]}{\Delta}\varepsilon^W$$

$$\pi^W = \frac{(1-\mu)\phi k}{\Delta}\varepsilon^W$$

where $\Delta \equiv \sigma(1-\beta\mu)(1-\mu)+(\gamma-\mu)k(\phi+\sigma) > 0$

Multiple currencies, activist policy

Solutions for world relatives

$$\widehat{y}^R = \frac{[(1-\beta\mu)(1-\mu)+k(\gamma-\mu)]}{\Delta_D}\frac{(v-1)\varepsilon^R}{D}$$

$$\pi^R = \frac{(1-\mu)\phi k}{\Delta_D}\frac{(v-1)\varepsilon^R}{D}$$

where $\Delta_D \equiv \sigma_D(1-\beta\mu)(1-\mu)+(\gamma-\mu)k(\phi+\sigma_D) > 0$

Multiple currencies, activist policy

- Solution for terms of trade

$$\widehat{\tau} = \frac{-k\phi(\gamma - \mu)}{\Delta_D} \frac{2(v-1)\varepsilon^R}{D} \tag{1}$$

- For $\varepsilon^R < 0$, the terms of trade depreciates
- Also nominal exchange rate depreciates
- Both world averages and world relatives are determined by parameters of monetary rule γ

Multiple currencies, activist policy

- Deviations from efficient levels

$$\widetilde{y}^W = \frac{\phi}{\phi + \sigma}\Omega\varepsilon^W$$

$$\widetilde{y}^R = \frac{\phi}{\phi D + \sigma}\Omega_D(v-1)\varepsilon^R$$

$$\widetilde{\tau} = \frac{\phi(v-1)}{\phi D + \sigma}\sigma_D\Omega_D 2\varepsilon^R$$

- $\Omega < 1$, and $\Omega_D < 1$.

- Relative to efficient response:
- y^W and y^R fall too much
- τ rises too little
- Note that γ affects deviations

Single Currency Area, activist policy

- Response of world averages exactly the same
- World relatives solved by

$$\widehat{\tau}_{t-1} - \widehat{\tau}_t = k\frac{(\phi D + \sigma)}{2\sigma}[\widehat{\tau}_t + \frac{(v-1)\phi}{(\phi D + \sigma)}2\varepsilon^R] + \beta E_t(\widehat{\tau}_t - \widehat{\tau}_{t+1})$$

- Has simple solution given by

$$\widehat{\tau}_t = \lambda\widehat{\tau}_{t-1} + \chi 2\varepsilon^R$$

$0 < \lambda < 1$, $\chi = -\frac{k}{2}\frac{(v-1)\phi}{D\Delta_{D1}} < 0$

- Response does not depend on γ

Single Currency Area, activist policy

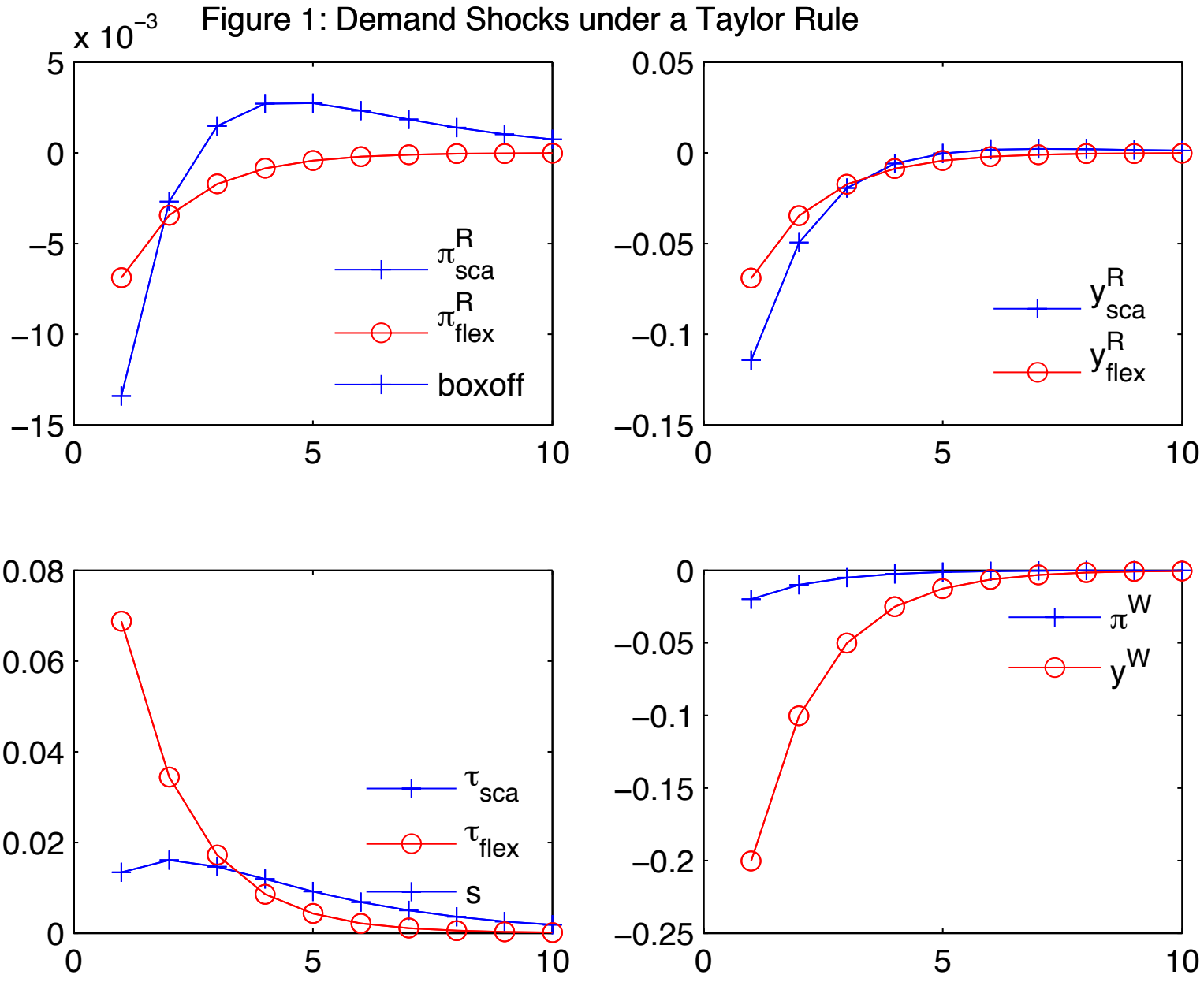
- Deviations from efficient levels

$$\widetilde{\tau}_t = \lambda \widehat{\tau}_{t-1} + (v-1) 2\varepsilon^R \frac{\phi}{\phi + \sigma_D} \frac{\sigma(1 - \beta\lambda + \beta(1-\mu))}{D\Delta_{D1}}$$

$$\widetilde{y}_t^R = \lambda \frac{D\widehat{\tau}_{t-1}}{2\sigma} + (v-1)\varepsilon^R \frac{\phi}{\phi + \sigma_D} \frac{(1 - \beta\lambda + \beta(1-\mu))}{D\Delta_{D1}}$$

- Deviations are again negative
- Greater in absolute terms than under multiple currencies and flexible exchange rates

Comparison under activist policies



Solutions in a liquidity trap

- Assume shocks push down both rates to zero bound
- Solution for world averages - obtained by link to future exit from liquidity trap

$$\widehat{y}^W = \frac{[(1-\beta\mu)(1-\mu)-k\mu]}{\Delta_1}\frac{\varepsilon}{2}$$

$$\pi^W = \frac{(1-\mu)\phi k}{\Delta_1}\frac{\varepsilon}{2}$$

  where $\Delta_1 > 0$.
- Response exceeds that under activist policy

World relatives in a LT: multiple currencies

- Multiple currencies

$$\widehat{y}^R = \frac{[(1-\beta\mu)(1-\mu)-k\mu]}{\Delta_{D1}} \frac{(v-1)\varepsilon}{2D}$$

$$\pi^R = \frac{(1-\mu)\phi k}{\Delta_{D1}} \frac{(v-1)\varepsilon}{2D}$$

  where $\Delta_{D1} > 0$

- Again, exceeds that under activist policy

Response of terms of trade

- Multiple currencies

$$\widehat{\tau} = \frac{k\sigma(\mu)}{\Delta_D}\frac{(v-1)\varepsilon}{2D}$$

- The terms of trade appreciates
- Likewise, nominal exchange rate appreciates

$$\widehat{s}_t - \widehat{s}_{t-1} = \pi_t^R + (\widehat{\tau}_t - \widehat{\tau}_{t-1})$$

- Even though home inflation falls, nominal exchange rate falls by more, so get a terms of trade appreciation

Basic intuition

- Although interest rates cannot move, capital markets still integrated
- So up to 1st order, interest rate parity holds

$$-E_t\pi_{t+1} = -E_t\pi^*_{t+1} + E_t(\widehat{\tau}_{t+1} - \widehat{\tau}_t)$$

- Fall in relative home PPI inflation leads to a *rise* in home relative real interest rates
- requiring an anticipated terms of trade deterioration.
- Implies an immediate *appreciation*.

- In terms of deviations

$$\widetilde{y}^W = \frac{\phi}{\phi + \sigma}\Omega_1 \varepsilon^W$$

$$\widetilde{y}^R = \frac{\phi}{\phi D + \sigma}\Omega_{D1}(v-1)\varepsilon^R$$

$$\widetilde{\tau} = \frac{\phi(v-1)}{\phi D + \sigma}\sigma_D \Omega_{D1} 2\varepsilon^R$$

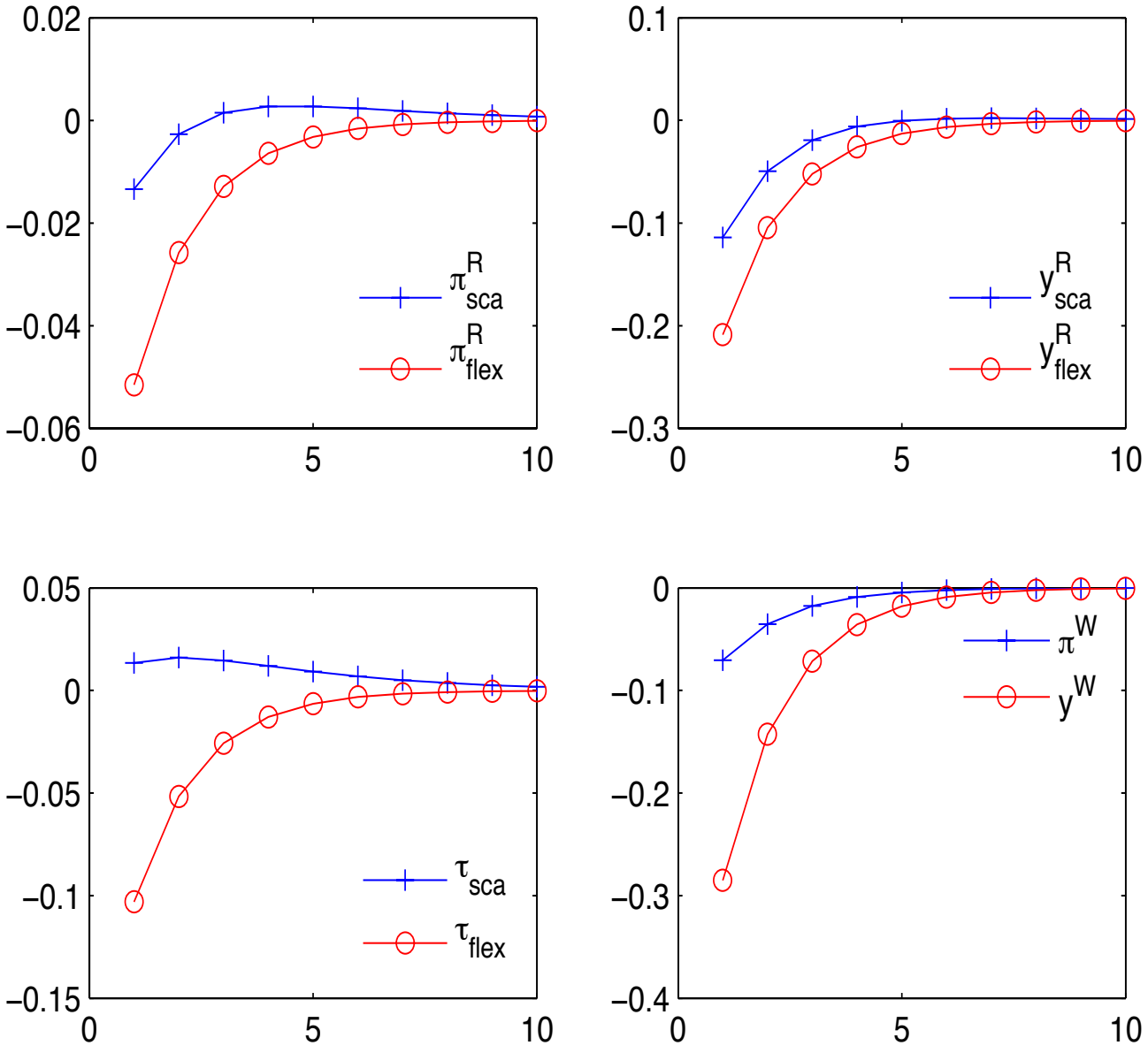
  $\Omega_1 < 1$, and $\Omega_{D1} < 1$.
- Exceeds gaps under activism

Now comparison with SCA

- Solutions for world averages exactly as in multiple currencies case
- Solutions for world relatives exactly as in policy activist case
- Now can show that gaps more negative under flexible exchange rates than in SCA

Comparison of MC and SCA under LT

Figure 4: Demand Shocks under a Liquidity Trap



Result

- Flexible exchange rates impart greater instability
- Response of exchange rate compounds original shock
- But since interest rates zero, countries have no lever to affect exchange rate (with open capital markets)
- Hence, SCA acts as an efficient limitation on perverse ER movement

Welfare evaluation

Table 1 Welfare Loss		
Policy	Taylor Rule	Zero Bound Limit
Multiple Currency	0.0495	0.774
Single Currency Area	0.0629	0.592

Extensions

- Limiting capital mobility
  - Without capital mobility, interest rates move in different directions
  - Foreign interest rate may adjust
  - Efficient response my a) dominate outcome with capital mobility, b) dominate SCA
- Fiscal adjustments
  - Can introduce capital taxes subsidies to induce efficient response
  - Note that need these even with multiple currencies
  - Quite different than taxes for 'internal devaluation'
- Empirical evidence
  - Some suggestion that low interest rate currencies appreciated: US, Japan

Caveats

- Not an argument for SCA unconditionally
- Message is that exchange rate adjustment not always efficient
- SCA can prevent inefficient adjustment
- Other aspects of SCA may be more damaging (moral hazard, decentralized regulation)