

Demand Imbalances, Exchange-Rate Misalignments, and Monetary Policy

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Exchange Rate misalignments and demand/trade imbalances

- ▶ Concerns about ER misalignments and associated imbalances are recurrent in the policy debate — e.g. recent G-20 meeting
 - ▶ Motivation for cooperative (monetary) policy to mitigate them
- ▶ Can misalignments in asset prices like the ER and ensuing imbalances cause trade-offs with traditional stabilization objectives?
- ▶ NOEM literature has focused on the impact of nominal price rigidities in goods markets:
 - ▶ Emphasize effects of ER misalignments on relative price of goods
- ▶ What about misalignments arising from the ER dual role as good and asset price in incomplete markets economies?

What does this paper do?

- ▶ Understand trade-offs when asset markets support allocation far from efficient one
- ▶ Standard incomplete markets model yielding misalignments and demand imbalances even with flexible price
 - ▶ Misalignments reflect suboptimal wealth movements across countries
 - ▶ Inefficient adjustment, although ER is driven by fundamentals only
- ▶ Allowing for alternative pricing mechanisms (PCP vs LCP), characterize optimal policy trade-offs

Monetary policy trade-offs with incomplete markets

- ▶ Analytic quadratic loss functions under incomplete markets
- ▶ Numerical analysis of Ramsey policy implications for inflation, output gap, real exchange rates, net exports,...
- ▶ Focus on "news" about future productivity to stress ER dual role in goods and asset markets — But also look at standard AR shocks

Main results

- ▶ Welfare trade-offs between domestic as well as external distortions:
 - ▶ Output gaps and inflation, but also misalignment and cross-country demand (consumption) gaps
 - ▶ External distortions depend on openness, trade elasticities
- ▶ Low trade elasticity:
 - ▶ Sizable inefficiencies as currency misalignments and large demand imbalances
 - ▶ Optimal policy delivers close to first-best allocation under LCP
- ▶ Policy leans against misalignment, reducing domestic and trade imbalances

Workhorse NOEM model

- ▶ 2-country, cashless economy with sticky prices
- ▶ All goods are traded
- ▶ Both producer currency pricing (PCP) and local currency pricing (LCP)
- ▶ No capital, technology linear in labor
- ▶ Complete markets domestically, incomplete markets internationally: only one short-term, risk-free, nominal bond
- ▶ Encompass Clarida-Gali-Gertler, Obstfeld-Rogoff, Devereux-Engel, Benigno-Benigno, and other NOEM contributions

Preferences

▶ Per-period utility: $\zeta_{C,t} \frac{C_t^{1-\sigma}}{1-\sigma} + \kappa \frac{(1-L_t)^{1+\eta}}{1+\eta}$

▶ Consumption consists of Home and Foreign tradables:

$$C = \left[a_H^{1/\phi} C_H^{\frac{\phi-1}{\phi}} + a_F^{1/\phi} C_F^{\frac{\phi-1}{\phi}} \right]^{\frac{\phi}{\phi-1}}, \quad \phi > 0$$

$$C_{H,t} \equiv \left[\int_0^1 C_t(h)^{\frac{\theta-1}{\theta}} dh \right]^{\frac{\theta}{\theta-1}} \quad C_{F,t} \equiv \left[\int_0^1 C_t(f)^{\frac{\theta-1}{\theta}} df \right]^{\frac{\theta}{\theta-1}}$$

▶ Trade elasticity: ϕ

Welfare-relevant gaps in open economy: ER misalignments

- ▶ As in closed economies, output gap relative to first-best allocation

$$Y^{gap} = \hat{Y}_{H,t} - \tilde{Y}_{H,t}^{fb}$$

- ▶ International-price gaps provide welfare-based concept of *misalignments*:

$$RER^{gap} = \hat{Q}_t - \tilde{Q}_t^{fb}$$

$$TOT^{gap} = \hat{T}_t - \tilde{T}_t^{fb}$$

$$\hat{\Delta}_{H,t} = \hat{\mathcal{E}}_t + \hat{P}_{H,t}^* - \hat{P}_{H,t}$$

- ▶ A “misaligned” real exchange rate is one that is not equal to its efficient level:
 - ▶ No guarantee that e.g. flexible exchange rates will deliver an efficient real exchange rate

Welfare-relevant gaps in open economy: Demand imbalances

- ▶ Deviations from efficiency condition under complete markets:

$$\hat{Q}_t = \sigma \left(\hat{C}_t - \hat{C}_t^* \right) - \left(\hat{\zeta}_{C,t} - \hat{\zeta}_{C,t}^* \right)$$

result in *cross-country demand imbalances*:

$$\hat{D}_t^{gap} = \sigma(\hat{C}_t - \hat{C}_t^*) - \hat{Q}_t - \left(\hat{\zeta}_{C,t} - \hat{\zeta}_{C,t}^* \right) \geq 0$$

- ▶ General feature of multi-agent economies, sounder foundations than using current account or trade balance measures

Gaps enter the Open-Economy Phillips curves...

- ▶ NKPC is a function of output gaps, markups, misalignment, and imbalances ...:

$$\pi_{H,t} = \beta E_t \pi_{H,t+1} + \kappa \left\{ \begin{array}{l} (\eta + \sigma) \left(\widehat{Y}_{H,t}^{gap} \right) \\ - (1 - a_H) \left[(\sigma\phi - 1) \left(\widehat{T}_t^{gap} + \widehat{Q}_t^{gap} \right) \right] \\ - (1 - a_H) \left[-\widehat{\Delta}_{H,t} - \widehat{D}_t^{gap} \right] \end{array} \right\}$$

- ▶ $\widehat{\Delta}_{H,t} = 0$ under PCP, but not under LPC
- ▶ $\widehat{D}_t^{gap} = 0$ under complete markets, but not under IM

... and characterize the loss function

under cooperation and LCP

$$\begin{aligned} &\propto -\frac{1}{2} \{ (\sigma + \eta) \left(\widehat{Y}_{H,t}^{gap} \right)^2 + (\sigma + \eta) \left(\widehat{Y}_{F,t}^{gap} \right)^2 \\ &+ \frac{\theta\alpha}{(1 - \alpha\beta)(1 - \alpha)} \left[a_H \pi_{H,t}^2 + (1 - a_H) \pi_{F,t}^2 + a_H \pi_{F,t}^{*2} + (1 - a_H) \pi_{H,t}^{*2} \right] \\ &+ \Psi \left[(\sigma\phi - 1) \sigma \left(\left(\widehat{Y}_{H,t} - \widetilde{Y}_{H,t}^{fb} \right) - \left(\widehat{Y}_{F,t} - \widetilde{Y}_{F,t}^{fb} \right) \right)^2 + \right. \\ &\quad \left. - \phi \left(\widehat{\Delta}_t + \widehat{D}_t \right)^2 \right] \} \end{aligned}$$

$$\text{where } \Psi = \frac{2a_H(1 - a_H)}{4a_H(1 - a_H)(\sigma\phi - 1) + 1}$$

CM and PCP: Divine coincidence in open economy

Optimal policy in two targeting rules: global (sum)

$$0 = \left[\left(\hat{Y}_{H,t}^{gap} - \hat{Y}_{H,t-1}^{gap} \right) + \left(\hat{Y}_{F,t}^{gap} - \hat{Y}_{F,t-1}^{gap} \right) \right] + \theta \left(\pi_{H,t} + \pi_{F,t}^* \right)$$

and relative (difference)

$$0 = \left[\left(\hat{Y}_{H,t}^{gap} - \hat{Y}_{H,t-1}^{gap} \right) - \left(\hat{Y}_{F,t}^{gap} - \hat{Y}_{F,t-1}^{gap} \right) \right] + \theta \left(\pi_{H,t} - \pi_{F,t}^* \right)$$

- ▶ International variables matter only if they influence output gap and inflation
- ▶ Same as in closed economy: strict inflation targeting is optimal against all – *current and anticipated future – efficient shocks* (preferences technology)
 - ▶ correcting output gaps coincides with closing misalignments (as in DE)

But divine coincidence breaks with incomplete market

With financial autarky and PCP, global targeting rule is the same as with CM, but relative rule is

$$\begin{aligned} 0 = & (\sigma + \eta) \left[\left(\widehat{Y}_{H,t}^{gap} - \widehat{Y}_{H,t-1}^{gap} \right) - \left(\widehat{Y}_{F,t}^{gap} - \widehat{Y}_{F,t-1}^{gap} \right) \right] \\ & + \theta \left[(\sigma + \eta) + 2 \frac{(1 - a_H)(1 - \sigma)}{1 - 2a_H(1 - \phi)} \right] (\pi_{H,t} - \pi_{F,t}^*) \\ & + 4a_H(1 - a_H)(\sigma\phi - 1) \left(\widehat{TOT}_t^{gap} - \widehat{TOT}_{t-1}^{gap} \right) \\ & + \frac{4a_H(1 - a_H)(\phi - 1)}{1 - 2a_H(1 - \phi)} \left(\widehat{D}_t^{gap} - \widehat{D}_{t-1}^{gap} \right) \end{aligned}$$

- ▶ Trade-off between stabilizing relative Y^{gap} and π , and correcting \widehat{TOT}_t^{gap} and \widehat{D}_t^{gap} .

Trade-offs and effectiveness of optimal policy

- ▶ By making the flexible price allocation inefficient, incomplete markets may induce relevant policy trade-offs
- ▶ *Relevance* of misalignment/imbances in trade-offs depends on size of incomplete market distortions:
 - ▶ Structure of financial markets, nature and number of the shocks, economic features like trade elasticity
- ▶ *Effectiveness* of optimal policy also depends on type of nominal distortions:
 - ▶ With PCP terms of trade (RER), \widehat{D}_t^{gap} and relative output all proportional
 - ▶ With LCP no longer true because of $\widehat{\Delta}_t$, but LOOP deviations costly

Trade-offs and effectiveness of optimal policy: PCP

- ▶ With PCP, terms of trade (RER) and relative output are proportional to each other:

$$\hat{\mathcal{T}}_t = \left(\hat{Y}_{H,t} - \hat{Y}_{F,t} \right) \frac{1}{1 - 2a_H(1 - \phi)}$$

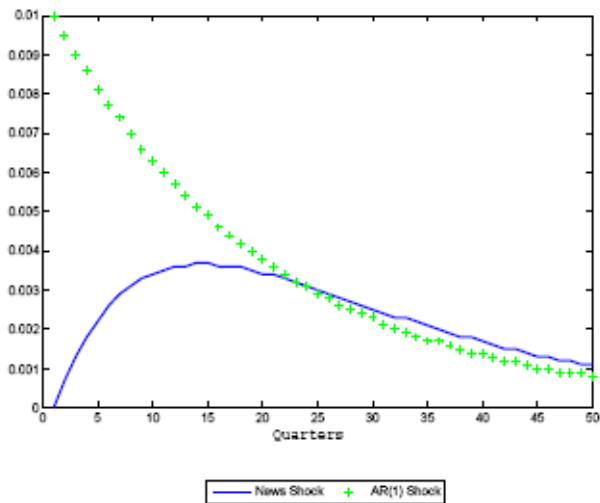
$$\hat{\mathcal{D}}_t = \left(\hat{Y}_{H,t} - \hat{Y}_{F,t} \right) \frac{\sigma(2a_H\phi - 1) - (2a_H - 1)}{1 - 2a_H(1 - \phi)}$$

Trade-offs and effectiveness of optimal policy: LCP

$$\hat{T}_t = \left(\hat{Y}_{H,t} - \hat{Y}_{F,t} \right) \frac{1}{1 - 2a_H(1 - \phi)} - \hat{\Delta}_t \frac{2a_H\phi}{1 - 2a_H(1 - \phi)}$$

$$\hat{D}_t = \left(\hat{Y}_{H,t} - \hat{Y}_{F,t} \right) \frac{\sigma(2a_H\phi - 1) - (2a_H - 1)}{1 - 2a_H(1 - \phi)} + \hat{\Delta}_t a_H \left[\frac{2a_H - 1 + \phi(2\sigma(1 - a_H) - 1)}{1 - 2a_H(1 - \phi)} \right]$$

Technology: News shocks vs Autoregressive AR

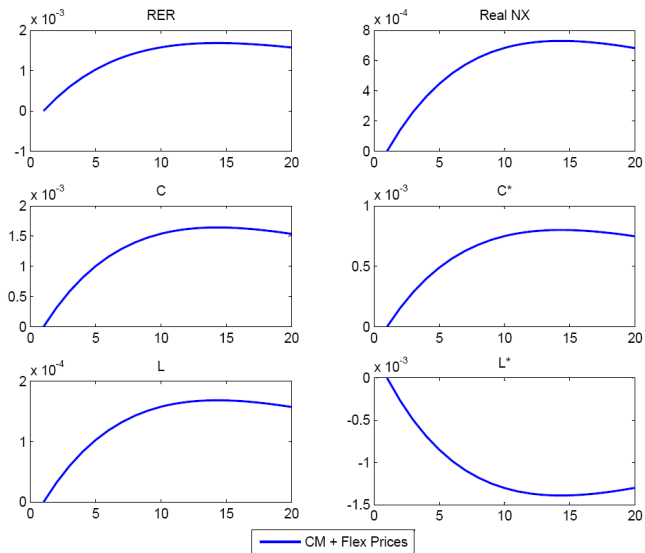


Values of key parameters

- ▶ $\theta = 0.75$
- ▶ $\theta = 6$: implying a 20% markup
- ▶ a_H set to generate a 10% import share
- ▶ κ set so that households spend 1/3 of their time working
- ▶ $\phi = \{0.45, 6\}$

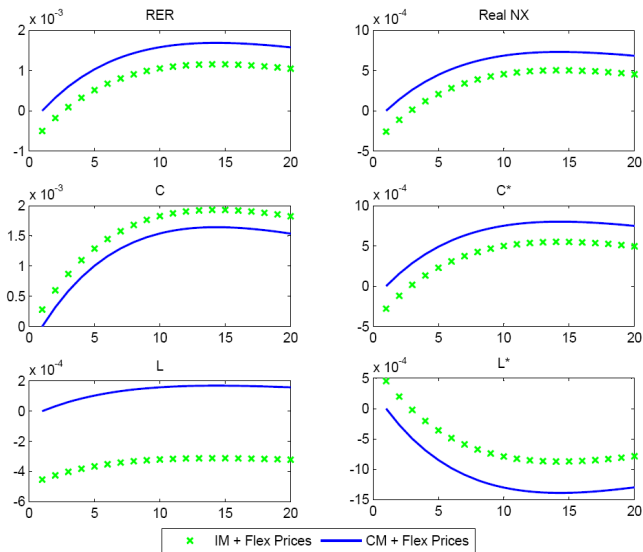
Understanding misalignment and demand imbalances: flex-price allocation and CM

Anticipated Home productivity increase with High trade elasticity / good substitutability



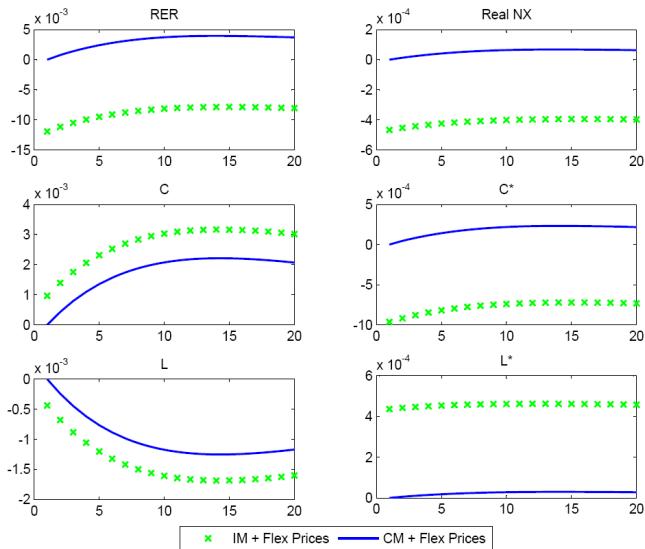
Understanding misalignment and demand imbalances: flex-price allocation, gaps between CM and IM

Anticipated Home productivity increase with High trade elasticity / good substitutability



Understanding misalignment and demand imbalances: larger gaps with low elasticity

Anticipated Home productivity increase with low trade elasticity / good complementarity



Large imbalances: role of low trade elasticity

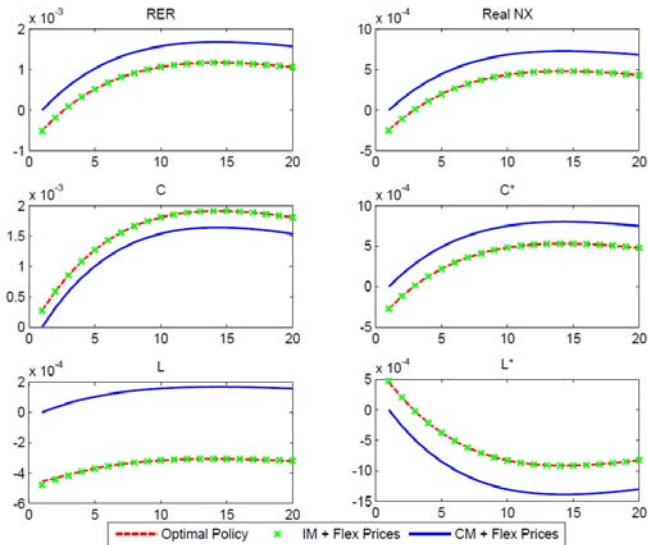
- ▶ Following an increase in Home tradable output, with a low trade elasticity, income effects are large
- ▶ If TOT worsen (as in the efficient case):
 - ▶ Home demand falls (large negative income effect)
 - ▶ With enough home bias: world demand for Home goods falls
- ▶ TOT must improve to bring the goods market in equilibrium (and RER appreciates)
- ▶ These movements amplify cross-country (relative) demand imbalances

Optimal cooperative policy

- ▶ Jointly maximize welfare under commitment and *timeless* perspective
- ▶ High elasticity: near divine coincidence, PCP versus LCP
- ▶ Low elasticity: optimal policy corrects misalignment and imbalances
 - ▶ moderate success (short run) with PCP
 - ▶ higher degree of success with LCP

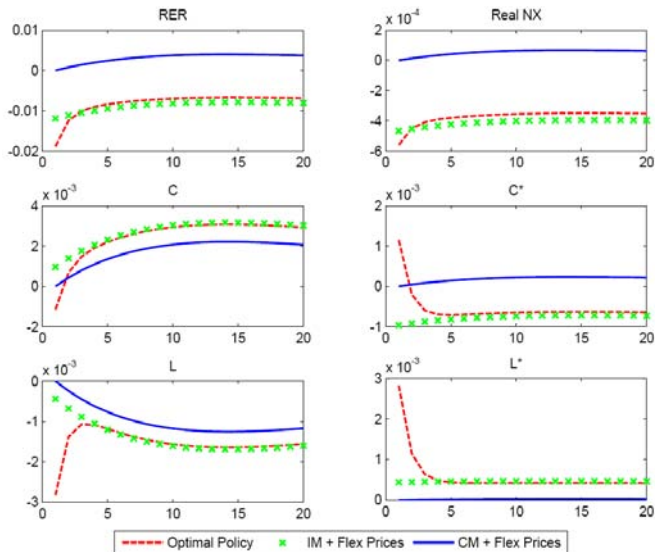
'Near divine coincidence' with high elasticity and PCP

Optimal policy arbitrarily close to strict inflation targeting (flex-price)



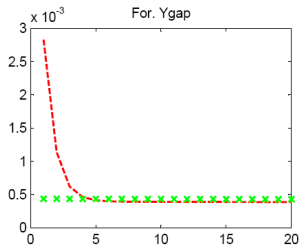
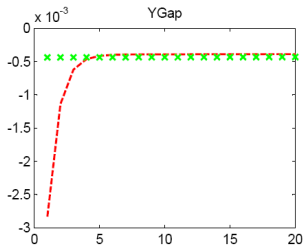
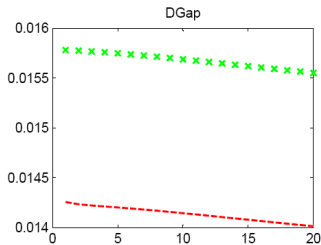
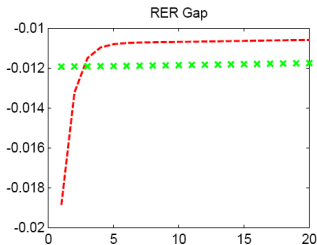
Low trade elasticity and PCP

Correcting D^{gap} via consumption: effective in the short-run



Low trade elasticity and PCP

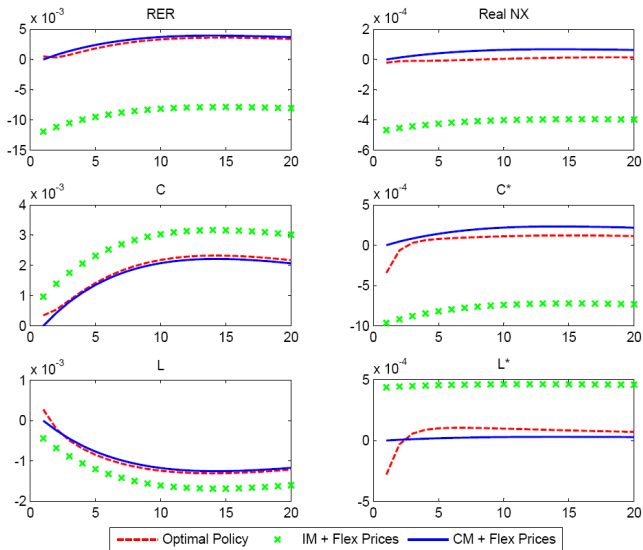
Correcting D^{gap} via consumption: effective in the short-run



--- Optimal Policy x IM + Flex Prices

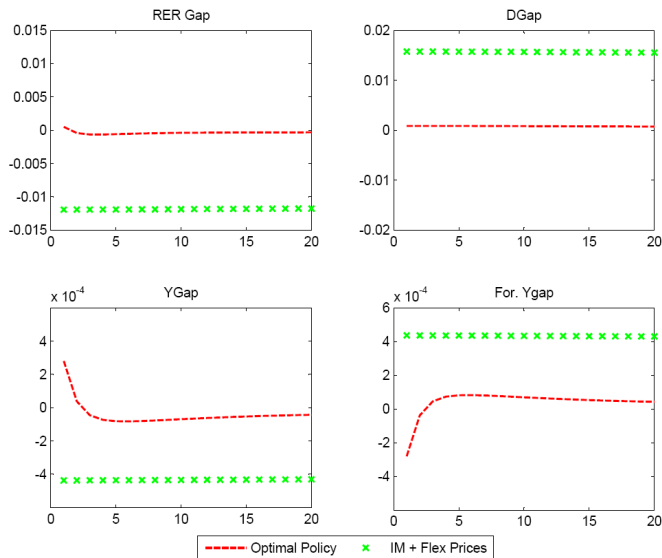
Low trade elasticity and LCP

Leaning against misalignment has persistent effects on imbalances

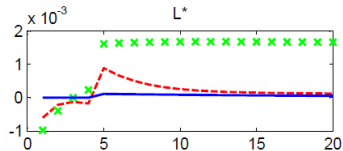
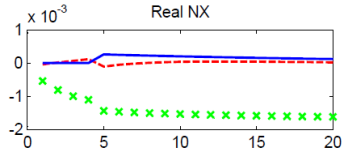
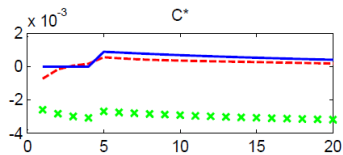
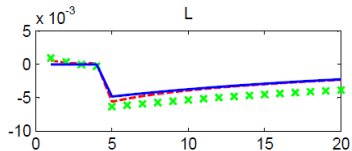
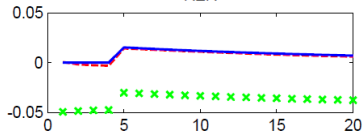
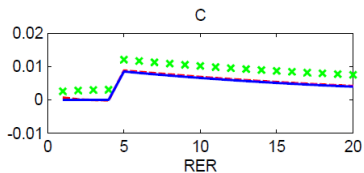


Optimal policy with low trade elasticity and LCP

Considerable improvement over flex-price allocation: 0.36% of steady state consumption



Anticipated AR shocks: low trade elasticity and LCP



Conclusion

- ▶ Asset-price misalignments pose relevant trade-offs for monetary policy when they lead to wealth and demand imbalances even for reasons independent of nominal frictions
- ▶ Optimal policy should generally use monetary stance to redress misalignments in these cases
- ▶ The success of optimal monetary policy in doing so depends on the structure of the economy, including the form of nominal rigidities – PCP vs. LCP in our case

Conclusions

Further exercises/directions:

- ▶ Implementation
- ▶ Domestically and international incomplete markets
- ▶ Cooperative vs Nash

Conclusions

- ▶ Misalignments and wealth/demand imbalances — inefficiencies that generally arise independently of monetary and nominal distortions — raise relevant policy trade-offs
- ▶ Examples of economies where inward-looking strict inflation targeting, rather than correcting, results in significant misalignments
 - ▶ Even when the latter only reflects fundamental-based valuations
 - ▶ Generate suboptimal demand and current account imbalances
- ▶ Monetary policy should address misalignments in the foreign exchange market
- ▶ Degree of success of optimal monetary policy depends on the structure of the economy, including the form of nominal rigidities – PCP vs. LCP in our case

Conclusions

Further exercises/directions:

- ▶ Implementation
- ▶ Domestically and international incomplete markets
- ▶ Cooperative vs Nash

Welfare and optimal (cooperative) policy

- ▶ Planner chooses world allocation that maximizes:

$$Welfare = \frac{W_0 + W_0^*}{2}$$

subject to households and firms FOCs and resource constraints

- ▶ Commitment and timeless perspective

Experiments: focus on news shocks

Linear technology with standard (ζ) shocks and news (ζ^v) shocks:

$$Y_t(h) = Z_t L_t(h), \quad Z_t = U_t - V_t$$

$$U_t = 0.95U_{t-1} + \zeta_t + \zeta_t^v$$

$$V_t = 0.9V_{t-1} + \zeta_t^v$$

- ▶ Focus on a positive shock in the Home country

Households

$$V(s_t) = \max_{\substack{C_H, C_F, \\ L, B_{H,t+1}}} \left\{ \zeta_{C,t} \frac{C_t^{1-\sigma}}{1-\sigma} + \kappa \frac{(1-L_t)^{1-\eta}}{1-\eta} + \beta [\bar{C}_t, \bar{L}_t] EV(s_{t+1}) \right\}$$

subject to:

$$P_{H,t} C_{H,t} + P_{F,t} C_{F,t} + B_{H,t+1} \leq W_t L_t + (1+i_t) B_{H,t} + \int_0^1 \Pi(h) dh$$

$B_{H,t}$: risk-free nominal bond that pays in unit of domestic currency

'Near divine coincidence' with high elasticity and LCP

Some correction, but inefficient gaps remain open

