

# International Dimensions of Optimal Monetary Policy: A Re-appraisal and New Directions.<sup>1</sup>

Giancarlo Corsetti

*EUI, Roma III & CEPR*

Luca Dedola

*ECB & CEPR*

Sylvain Leduc

*Federal Reserve Bank of San Francisco*

October 29 2009

---

<sup>1</sup>The views expressed in this paper do not necessarily reflect those of the ECB or the Federal Reserve System.

# Openness and monetary policy

## Classical questions

- ▶ Should optimal policy react to global activity and international prices on top and beyond their influence on domestic output gap and inflation?
- ▶ Do exchange rate movements have desirable stabilization properties, or should policymakers be concerned with misalignments and excess volatility?
- ▶ Should policies be coordinated internationally?

This paper revisits these issues in the framework of the New Open Economy Macroeconomics/New Keynesian large literature.

- ▶ Stepping stones include Benigno's (BB), Clarida Galí Gertler (CGG), Devereux Engel (DE), Kollmann, Obstfeld-Rogoff (OR), Pesenti (CP), Sutherland.

# What does the chapter do?

## **Re-appraisal**

1. Divine coincidence in open economy: the 'Classical View' of exchange rate adjustment (e.g. Friedman 1953).
2. Pessimism on the 'Classical View': low pass through and nominal misalignment.
3. Competitive Devaluations and strategic interactions.

## **New Directions**

4. Interactions between nominal rigidities and financial market imperfections:  
real exchange rate misalignments, domestic and global inefficiencies independent of nominal rigidities.

## A workhorse model

- ▶ Two country, national representative household
- ▶ Standard separable preferences (CES)
- ▶ Armington aggregator in consumption (product specialization)

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

- ▶ Calvo-Yun price rigidities
- ▶ Labor only factor of production
- ▶ Plain vanilla: No habit, no indexation, no adjustment cost...
- ▶ ...but 'envelope' of OR, CGG, CP, BB, DE

## Open Economy Phillips Curve

$$\pi_{H,t} = \beta E_t \pi_{H,t+1} + \frac{(1 - \alpha\beta)(1 - \alpha)}{\alpha(1 + \theta\eta)} \cdot \left\{ \begin{array}{l} (\eta + \sigma) (\hat{Y}_{H,t} - \tilde{Y}_{H,t}) + \hat{\mu}_t + \\ (1 - a_H) \cdot \left[ \begin{array}{l} 2a_H(1 - \sigma\phi) (\Psi_1 \hat{\mathcal{T}}_t - \tilde{\mathcal{T}}_t) \\ + \Psi_2 \hat{\Delta}_{H,t} + \Omega_t \end{array} \right] \end{array} \right\}$$

where  $\tilde{\cdot}$  : first best allocation,  $\hat{\cdot}$  : market allocation, both in steady state deviations.

- ▶ Interdependence through openness  $1 - a_H$
- ▶ Terms of trade ( $\mathcal{T}_t \equiv P_{F,t} / \mathcal{E}_t P_{H,t}^*$ ) and goods complementarity  $\sigma\phi \leq 1$ 
  - ▶ in closed-economy two-sector model:  $\eta\phi + 1$
- ▶ Pass-through/deviations from the law of one price  $\hat{\Delta}_{H,t}$
- ▶ International asset markets  $\Psi_1, \Psi_2, \Omega_t$

# 1: Open-economy divine coincidence

- ▶ Required: complete markets (CM) and high pass through ('producer currency pricing' or PCP)
  - ▶ Exchange rate movements are efficient (CM)

$$\frac{U_C(C_t, \zeta_{C,t})}{P_t} = \frac{U_C(C_t^*, \zeta_{C,t})}{\mathcal{E}_t P_t^*}$$

$\Rightarrow$

$$\widehat{\mathcal{E}_t P_t^* / P_t} = (2a_H - 1) \widehat{T}_t = (\widehat{\zeta_{C,t}^*} - \widehat{\zeta_{C,t}}) + \sigma (\widehat{C}_t - \widehat{C}_t^*)$$

- ▶ Expenditure switching effects — a depreciation worsens the terms of trade one to one (PCP)

$$\mathcal{T}_t \equiv \frac{P_{F,t} \uparrow}{\mathcal{E}_t P_{H,t}^*} = \frac{\mathcal{E}_t \uparrow \cdot P_{F,t}^*}{P_{H,t}} \quad \Rightarrow \quad \widehat{\Delta}_{H,t} = 0$$

and re-directs demand towards the Home good.

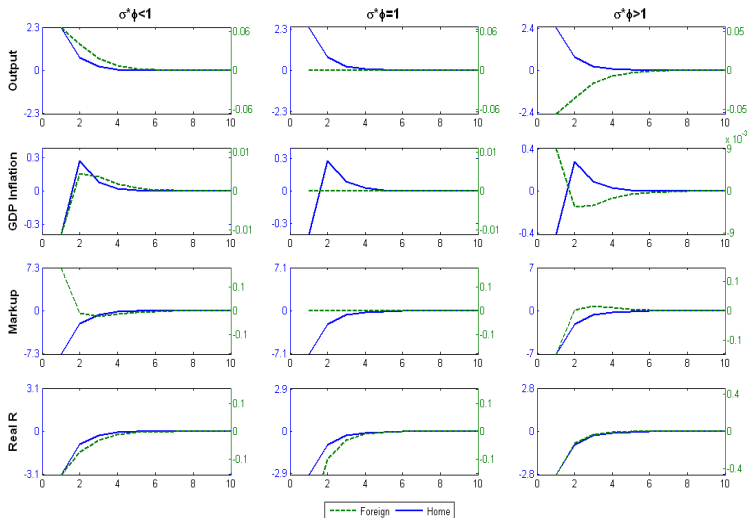
## The loss function under CM and PCP

$$\propto -\frac{1}{2} \left\{ \begin{aligned} & (\sigma + \eta) \left( \tilde{Y}_{H,t}^{fb} - \hat{Y}_{H,t} \right)^2 + (\sigma + \eta) \left( \tilde{Y}_{F,t}^{fb} - \hat{Y}_{F,t} \right)^2 + \\ & \frac{\theta\alpha (1 + \theta\eta)}{(1 - \alpha\beta)(1 - \alpha)} \pi_{H,t}^2 + \frac{\theta\alpha^* (1 + \theta\eta)}{(1 - \alpha^*\beta)(1 - \alpha^*)} \pi_{F,t}^{*2} + \\ & 2a_H (1 - a_H) (\sigma\phi - 1) \Phi \left( \tilde{T}_t^{fb} - \hat{T}_t \right)^2 \end{aligned} \right\},$$

- ▶ Misalignment  $\tilde{T}_t^{fb} - \hat{T}_t$  proportional to inefficient output differential.
- ▶ Optimal monetary policy identical as in the baseline closed economy model:
  - ▶ complete stabilization of producers' prices against **efficient shocks**: technology, preferences...
  - ▶ trade-offs only against **inefficient shocks** (markup), shaped by interdependence ( $\sigma\phi \leq 1$ ).

# Markup shocks: trade-offs and interdependence

Response to a favorable markup shock in the Home economy





## 2. Pessimism on the classical view: low pass through

- ▶ The stability of import prices in local currency is a pervasive phenomenon.
- ▶ A purely nominal view: import prices are sticky in local currency (LCP):
  - ▶ 2 Phillips curves in each country:  $\pi_H$  and  $\pi_H^*$ .
  - ▶ Deviations from the law of one price.

$$\mathcal{T}_t \equiv \frac{P_{F,t}}{\mathcal{E}_t \uparrow \cdot P_{H,t}^*} \neq \frac{\mathcal{E}_t \uparrow \cdot P_{F,t}^*}{P_{H,t}} \Rightarrow \hat{\Delta}_{H,t} \neq 0$$

- ▶ Lack of expenditure switching effects: nominal depreciation may actually raise the terms of trade.
- ▶ Monetary transmission: a Home expansion appreciating  $\mathcal{T}_t$  raises demand for foreign output.
- ▶ Flex-price (efficient) allocation is not attainable.

## The loss function under CM and LCP

$$-\frac{1}{2} \left\{ \begin{aligned} & (\sigma + \eta) \left( \tilde{Y}_{H,t}^{fb} - \hat{Y}_{H,t} \right)^2 + (\sigma + \eta) \left( \tilde{Y}_{F,t}^{fb} - \hat{Y}_{F,t} \right)^2 + \\ & \frac{\theta \alpha (1 + \theta \eta)}{(1 - \alpha \beta) (1 - \alpha)} \left( \underbrace{a_H \pi_{H,t}^2 + (1 - a_H) \pi_{H,t}^{*2}}_{\neq \text{CPI}, \neq \text{GDP deflator}} \right) + \\ & \frac{\theta \alpha^* (1 + \theta \eta)}{(1 - \alpha^* \beta) (1 - \alpha^*)} \left( a_H \pi_{F,t}^{*2} + (1 - a_H) \pi_{F,t}^2 \right) + \\ & 2a_H (1 - a_H) \left( \frac{\sigma \phi - 1}{\sigma} \right) \Phi \left( \tilde{\mathcal{T}}_t^{fb} - \hat{\mathcal{T}}_t \right)^2 + \\ & \frac{a_H (1 - a_H) \phi}{2 (1 - a_H) a_H \phi \sigma + (2a_H - 1)^2} \hat{\Delta}_t^2 \end{aligned} \right\}$$

- ▶ New terms:  $\left\{ \pi_{H,t}^{*2}, \pi_{F,t}^2, \hat{\Delta}_t^2 \right\}$  blow the efficient/inefficient shock divide.

## Optimal policy under LCP

Optimal monetary policy trades off output gaps with sectoral inflation and relative price misalignment including  $\hat{\Delta}$ .

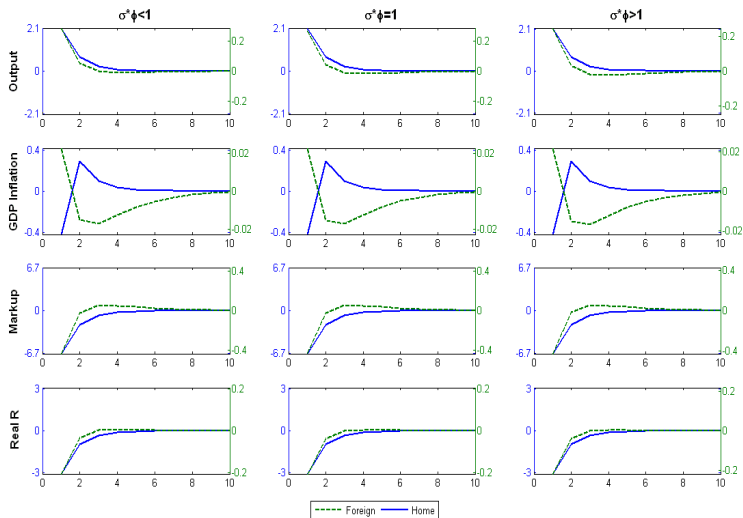
- ▶ does not target the GDP deflator  $\Rightarrow$  closer to the CPI.
- ▶ limits terms of trade variability, as exchange rate move them in the 'wrong direction.'

# Volatilities

Statistics	With PCP		With LCP	
	Productivity and Preference Shocks	With Markup Shocks	Productivity and Preference Shocks	With Markup Shocks
Standard deviation (in percent)				
CPI Inflation	0.12	0.11	0.01	0.02
GDP Deflator Inflation	0.00	0.01	0.03	0.03
Output Gap	0.00	0.04	0.22	0.22
Markup	0.00	0.07	0.15	0.16
Standard deviation (Relative to Output)				
Real Exchange Rate	1.43	1.43	1.68	1.68
Terms of Trade	1.79	1.79	1.43	1.43

# Markup stabilization

LCP reduces the role of complementarity/substitutability in shaping interdependence

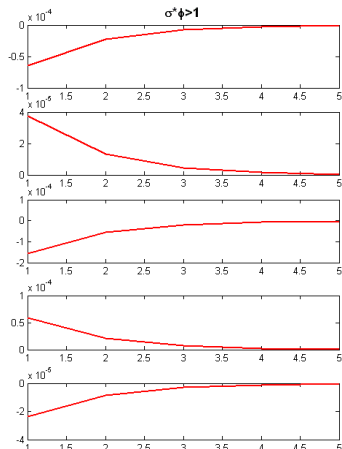
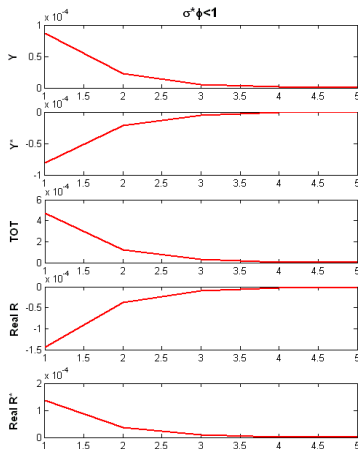


### 3. Competitive devaluations and strategic interactions

- ▶ Strategic interactions: further incentive to deviate from 'divine coincidence'.
- ▶ Contrast optimal cooperative policy with Nash allocation solution, in the class analyzed e.g. by Benigno and Benigno 2006.
- ▶ No incentives in very special cases, requiring CM, PCP, no government spending and
  - ▶ efficient shocks,  $\sigma\phi = 1$  (implying no interdependence) or
  - ▶ symmetric (global) productivity shocks.
- ▶ Otherwise, incentive to manipulate the terms of trade

# Competitive devaluations revisited

Difference between Nash and cooperative responses to Home productivity shock (CM and PCP)



— Difference Between Nash and Efficient Allocations

## Strategic manipulation of the terms of trade

In response to a positive Home productivity shock, under complete markets and PCP:

- ▶ if  $\sigma\phi > 1$ 
  - ▶ policymakers keep output short of the efficient level (save effort)
  - ▶ too little output strengthens the terms of trade
  - ▶ households get good substitute for domestic goods at a lower price.
- ▶ if  $\sigma\phi < 1$ 
  - ▶ policymakers brings output above the efficient level
  - ▶ too much output weakens the terms of trade
  - ▶ but allow households to raise joint consumption of complementary goods.
- ▶ In the example, the difference in allocations are small: so are gains from cooperation.
- ▶ But the issue of assessing these gains is wide open: other types of shocks, incomplete markets.



## New Directions: financial imperfections

- ▶ Policy trade-offs from deeper and potentially more consequential distortions:
- ▶ Economies with financial imperfections preventing asset markets from supporting efficient allocation
- ▶ Different from the classical view:
  - ▶ The exchange rate acts as a shock absorber (in its dual role of price in both the goods and the asset markets),
  - ▶ yet its adjustment does not necessarily contribute to achieve a desirable allocation;
  - ▶ RER misalignments lead to inefficient levels of consumption and employment, both domestically and globally.

## New Directions: financial imperfections

- ▶ Exchange rates give the wrong price signal in response to fundamentals:
  - ▶ inefficient demand and output within countries,
  - ▶ cross country output and demand divergence.
- ▶ Additional welfare relevant measures of divergences is the relative demand gap

$$D - gap = \left( \sigma \left( \hat{C}_t - \hat{C}_t^* \right) - \hat{\Theta}_t \right) - \left( \sigma \left( \tilde{C}_t^{fb} - \tilde{C}_t^{*fb} \right) - \tilde{\Theta}_t^{fb} \right)$$

- ▶ zero in an efficient allocation
  - ▶ positive if excessive demand in the Home country.
- ▶ With PCP, the policy loss function will include the D-gap, in addition to the same terms as under complete markets.

# The loss function (no asset trade)

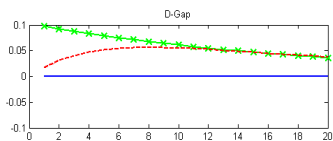
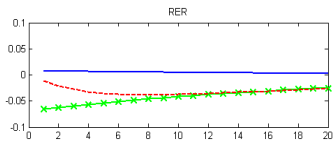
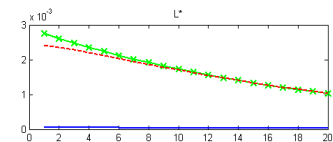
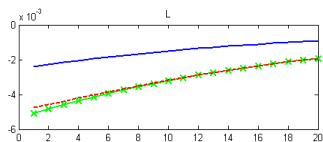
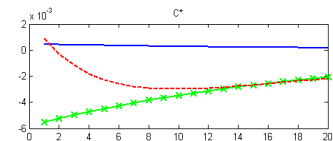
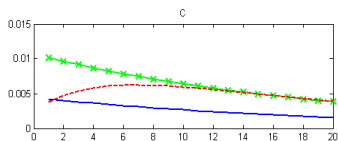
Generalizes CP OR

$$-\frac{1}{2}\bar{C}^{1-\sigma} \left\{ \begin{aligned} & (\sigma + \eta) \left( \tilde{Y}_{H,t}^{fb} - \hat{Y}_{H,t} \right)^2 + (\sigma + \eta) \left( \tilde{Y}_{F,t}^{fb} - \hat{Y}_{F,t} \right)^2 + \\ & \frac{\theta\alpha(1+\theta\eta)}{(1-\alpha\beta)(1-\alpha)} \pi_{H,t}^2 + \frac{\theta\alpha^*(1+\theta\eta)}{(1-\alpha^*\beta)(1-\alpha^*)} \pi_{F,t}^{*2} + \\ & 2a_H(1-a_H)(\sigma\phi-1)(1-2a_H(1-\phi)) \left[ \left( \tilde{T}_t^{fb} - \hat{T}_t \right)^2 + \right. \\ & \left. (1-a_H) \frac{2a_H(\phi-1)}{\sigma(2a_H\phi-1)-(2a_H-1)} \right. \\ & \left. \left[ \underbrace{\left( \hat{\zeta}_{C,t} - \hat{\zeta}_{C,t}^* \right)}_{\sigma(\tilde{C}_t^{fb} - \tilde{C}_t^{*fb}) - \hat{\Theta}_t^{fb}} - \underbrace{\left( \sigma(2a_H\phi-1) - (2a_H-1) \right) \hat{T}_t}_{\sigma(\hat{C}_t - \hat{C}_t^*) - \hat{\Theta}_t} \right]^2 \right] \end{aligned} \right\}$$

## Optimal policy

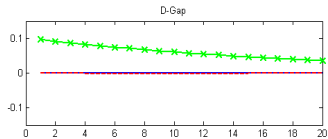
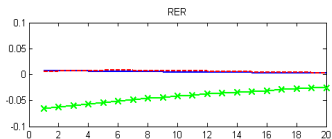
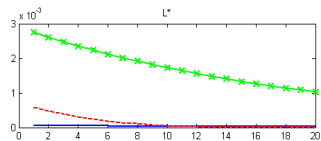
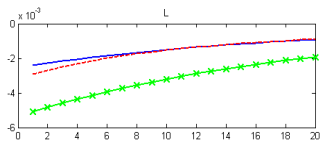
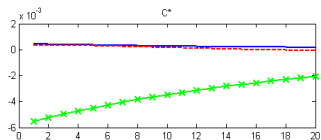
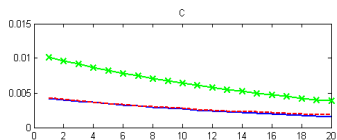
- ▶ acts to redress large distortions in good and asset markets,
  - ▶ closing domestic and global demand imbalances,
  - ▶ and leaning against inefficient currency over-valuation.
- ▶ Success however differs across PCP and LCP economies.
- ▶ NK example of optimal policy with large distortions: financial autarky with low trade elasticity.

# Optimal policy with large distortions in financial autarky: PCP



— CM + Flex prices    —x— IM + Flex prices    - - - Optimal policy

# Optimal policy with large distortions in financial autarky: LCP



— CM + Flex prices    x IM + Flex prices    - - - Optimal policy

# Interactions of financial imperfections and nominal distortions

- ▶ Optimal policy leans against currency misalignments and demand/employment inefficiencies domestically and globally.
- ▶ Under PCP — tradeoffs between demand and employment stabilization;
- ▶ Under LCP — alleviates the above trade-off at the cost of law of one price deviations.
- ▶ Results carry over to standard bond economy (CDL 2009).
- ▶ Note: redressing distortions does not hinge on manipulating ex-post the value of assets via surprise inflation/devaluation.

# Conclusions

- ▶ The Classical View of the international transmission of monetary policy stands on
  - ▶ complete markets and
  - ▶ expenditure switching/high pass through (PCP).
- ▶ leading to instances of open-economy divine coincidence.
  
- ▶ The (NOEM) literature has mostly debated nominal misalignments (PCP versus LCP).
- ▶ The chapter questions the classical view as regards the frictionless financial market assumption.



# Conclusions

- ▶ Financial market imperfections open new areas for analysis of policy trade-offs:
  - ▶ Misalignment and imbalances can and are likely to arise independently of nominal distortions.
  - ▶ Optimal policy acts to correct these inefficiencies, typically leaning against the wind of over- (under-) valuation in the short run.
- ▶ The agenda:
  - ▶ Interaction of financial imperfections in different asset and credit markets.