Monetary Policy and the Open Economy

by

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Motivation

- The basic new Keynesian model for the closed economy

  - equilibrium dynamics: simple three-equation representation
  - ability to match much of the evidence on the effects of monetary policy and technology shocks
  - monetary policy: optimality of inflation targeting

- How does the introduction of open economy elements affect that analysis and prescriptions?

- Can a model with nominal rigidities account for the volatility of nominal and real exchage rates?

- What role should the exchange rate play in the design of policy? What is the optimal degree of exchange rate volatility?

Some References

- Kollmann (JIE 01): nominal and real exchange rates, SOE version of EHL, pricing to market, many shocks
- Chari et al. (RES 02): two country model, Taylor type contracts, MP shocks
- Benigno and Benigno (RES 03): one-period contracts, two country, conditions for optimality of price stability
- Svensson (JIE 00): not-fully-optimizing model, strict vs. flexible CPI inflation targeting
- Benigno (JIE 04): staggered, currency union, heterogeneity
- Galí and Monacelli (RES 05): staggered, small open economy, equivalence result, optimal policy.
- Monacelli (JMCB 05): staggered, GM with limited pass-through
- Benigno and Benigno (JME 06): staggered, two countries, optimal policy
- de Paoli (JIE 09), Faia and Monacelli (JMCB 08): generalization of GM
- Corsetti, Dedola and Leduc (2010): survey

A New Keynesian Model of a Small Open Economy (GM RES 05)

Households

$$\max \ E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi} \right)$$

subject to

$$\int_0^1 P_{H,t}(j) C_{H,t}(j) dj + \int_0^1 \int_0^1 P_{i,t}(j) C_{i,t}(j) dj di \ + E_t\{Q_{t,t+1} D_{t+1}\} \leq D_t + W_t N_t + T_t$$

$$C_t = \left((1-\alpha)^{\frac{1}{\eta}} {C_{H,t}}^{1-\frac{1}{\eta}} + \alpha^{\frac{1}{\eta}} {C_{F,t}}^{1-\frac{1}{\eta}} \right)^{\frac{\eta}{\eta-1}}$$

$$C_{H,t} = \left(\int_0^1 C_{H,t}(j)^{\frac{\epsilon-1}{\epsilon}} di \right)^{\frac{\epsilon}{\epsilon-1}}$$

$$C_{F,t} \equiv \left(\int_0^1 (C_{i,t})^{\frac{\gamma-1}{\gamma}} di \right)^{\frac{\gamma}{\gamma-1}} \quad ; \quad C_{i,t} \equiv \left(\int_0^1 C_{i,t}(j)^{\frac{\epsilon-1}{\epsilon}} dj \right)^{\frac{\epsilon}{\epsilon-1}}$$

Firms

$$Y_t(i) = A_t N_t(i)$$

$$a_t = \rho_a a_{t-1} + \varepsilon_t^a$$

Additional assumptions:

- Law of one price (full pass-through)
- Complete asset markets (at the international level)

Equilibrium Dynamics in the SOE: A Canonical Representation

$$\pi_{H,t} = \beta\ E_t\{\pi_{H,t+1}\} + \kappa_\alpha \widetilde{y}_t$$

$$\widetilde{y}_t = E_t\{\widetilde{y}_{t+1}\} - \frac{1}{\sigma_\alpha}(i_t - E_t\{\pi_{H,t+1}\} - r_t^n)$$

where

$$\begin{aligned} \widetilde{y}_t &= y_t - y_t^n \\ y_t^n &= \Omega + \Gamma a_t + \alpha \Psi y_t^* \\ r_t^n &\equiv \rho - \sigma_\alpha \Gamma (1 - \rho_a) a_t + \alpha \sigma_\alpha (\Theta + \Psi) E_t\{\Delta y_{t+1}^*\} \end{aligned}$$

$$\kappa_\alpha \equiv \lambda\left(\sigma_\alpha + \varphi\right) \quad ; \quad \sigma_\alpha \equiv \frac{\sigma}{(1-\alpha) + \alpha\omega} \quad ; \quad \omega \equiv \sigma\gamma + (1-\alpha)\left(\sigma\eta - 1\right)$$

$$\Gamma \equiv \frac{1+\varphi}{\sigma_\alpha + \varphi} \quad ; \quad \Psi \equiv -\ \frac{\Theta\ \sigma_\alpha}{\sigma_\alpha + \varphi}$$

Role of openness: assuming high substitutability (high η, γ)

$$\frac{\partial \sigma_\alpha}{\partial \alpha} < 0 \qquad ; \qquad \frac{\partial \kappa_\alpha}{\partial \alpha} < 0$$

Optimal Monetary Policy

Background and Strategy

A Special Case

$$\sigma = \eta = \gamma = 1$$

Optimality of Flexible Price Equilibrium:

$$(1-\tau)(1-\alpha) = 1 - \frac{1}{\epsilon}$$

Implied Monetary Policy Objectives

$$y_t = y_t^n$$

$$\pi_{H,t} = 0$$

for all t.

Implementation

$$i_t = r_t^n + \phi_\pi \pi_{H,t} + \phi_y \widetilde{y}_t$$

Evaluation of Alternative Monetary Policy Regimes

Welfare Losses (special case)

$$\mathbb{W} = -\frac{(1-\alpha)}{2} \sum_{t=0}^{\infty} \beta^t \left[\frac{\epsilon}{\lambda} \pi_{H,t}^2 + (1+\varphi) \widetilde{y}_t^2 \right]$$

Average period losses

$$\mathbb{V} = -\frac{(1-\alpha)}{2} \left[\frac{\epsilon}{\lambda} \, var(\pi_{H,t}) + (1+\varphi) \, var(\widetilde{y}_t) \right]$$

Three Simple Rules

Domestic inflation-based Taylor rule (DITR)

$$i_t = \rho + \phi_\pi \pi_{H,t}$$

CPI inflation-based Taylor rule (CITR):

$$i_t = \rho + \phi_\pi \pi_t$$

Exchange rate peg (PEG)

$$e_t = 0$$

Impulse Responses and Welfare Evaluation

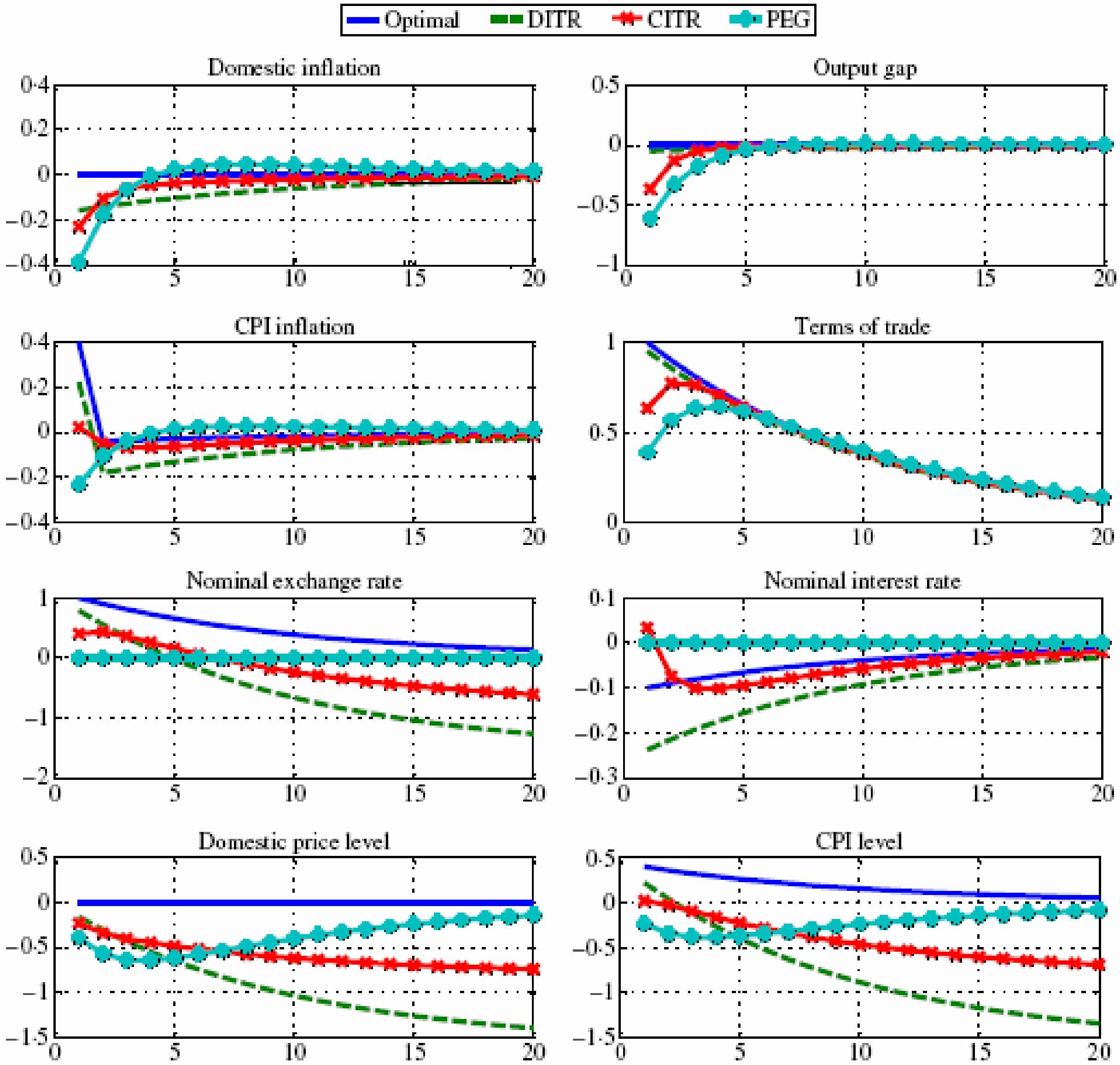

FIGURE 1

Impulse responses to a domestic productivity shock under alternative policy rules

Source: Galí-Monacelli (RES 05)

TABLE 2

Contribution to welfare losses

	DI Taylor	CPI Taylor	Peg
Benchmark $\mu = 1{\cdot}2, \varphi = 3$			
Var(Domestic infl.)	0·0157	0·0151	0·0268
Var(Output gap)	0·0009	0·0019	0·0053
Total	0·0166	0·0170	0·0321
Low steady state mark-up $\mu = 1{\cdot}1, \varphi = 3$			
Var(Domestic infl.)	0·0287	0·0277	0·0491
Var(Output gap)	0·0009	0·0019	0·0053
Total	0·0297	0·0296	0·0544
Low elasticity of labour supply $\mu = 1{\cdot}2, \varphi = 10$			
Var(Domestic infl.)	0·0235	0·0240	0·0565
Var(Output gap)	0·0005	0·0020	0·0064
Total	0·0240	0·0261	0·0630
Low mark-up and elasticity of labour supply $\mu = 1{\cdot}1, \varphi = 10$			
Var(Domestic infl.)	0·0431	0·0441	0·1036
Var(Output gap)	0·0005	0·0020	0·0064
Total	0·0436	0·0461	0·1101

Note: Entries are percentage units of steady state consumption.

Source: Galí-Monacelli (RES 05)

An Extension with Imperfect Pass-Through (Monacelli JIE 05)

Setup as in GM, with rest of the world modelled as a single economy.

Key Assumption:

- imports sold through retail firms
- price at the dock: $e_t + p^*_{F,t}(j)$
- staggered price setting by retailers $\Longrightarrow$ in general, $p_{F,t}(j) \neq e_t + p^*_{F,t}(j)$

Law of One Price Gap:

$$\psi_{F,t} \equiv e_t + p^*_t - p_{F,t}$$

Consistent with the evidence (Campa and Goldberg (REStat 05):

- partial pass-through in the short run
- full pass through in the long run (for most industries).

Imported Goods Inflation:

$$\pi_{F,t} = \beta E_t\{\pi_{F,t+1}\} + \lambda_F \; \psi_{F,t}$$

Domestic Goods Inflation

$$\pi_{H,t} = \beta E_t\{\pi_{H,t+1}\} + \lambda_H \; \widehat{mc}_t$$

$\Longrightarrow$ impossibility of replicating flexible price allocation

$\Longrightarrow$ emergence of a policy trade-off

$\Longrightarrow$ gains from commitment