Lectures on Monetary Policy, Inflation and the Business Cycle

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 (LSE dissertation): generalization of GM

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

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

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

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

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

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

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

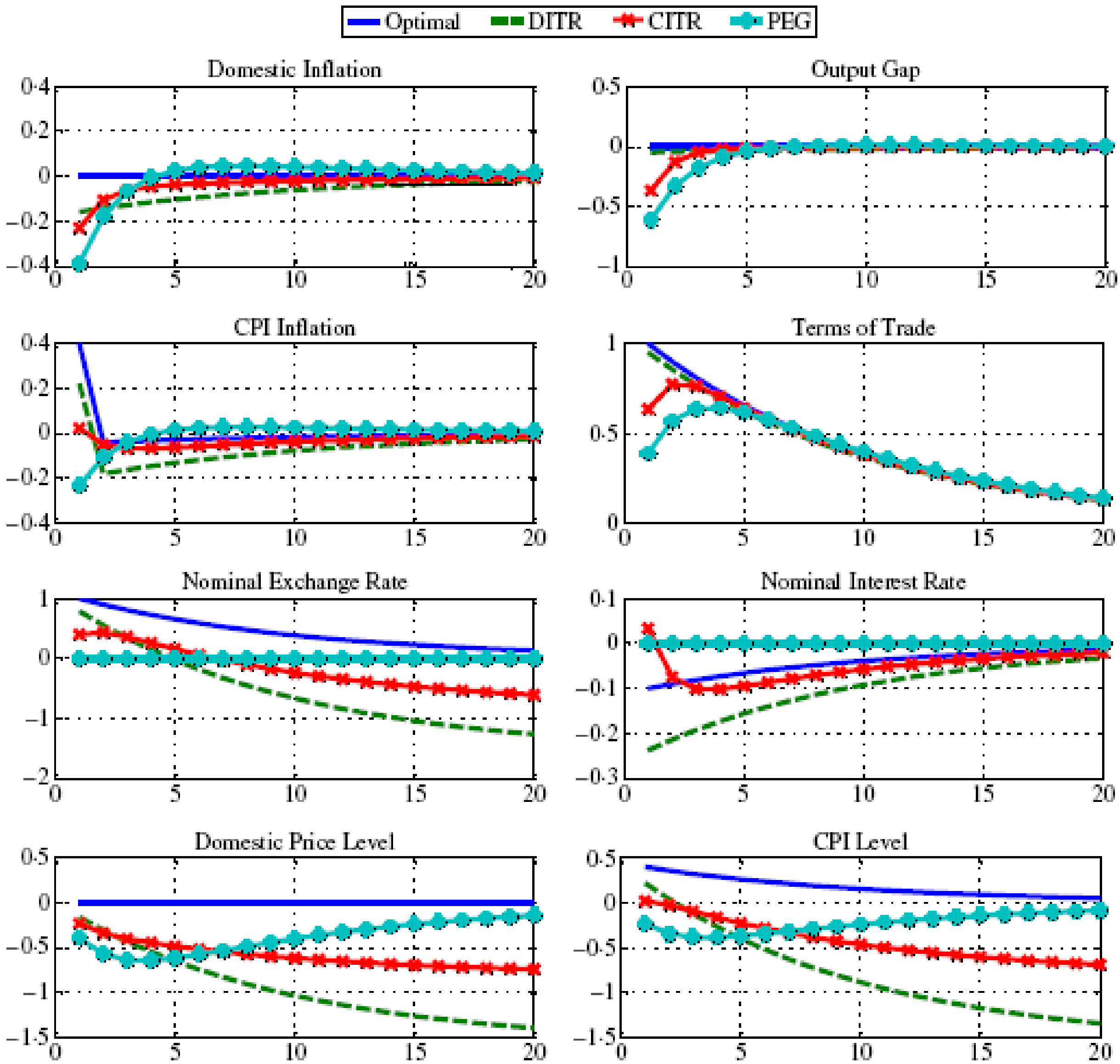

FIGURE 1

Impulse responses to a domestic productivity shock under alternative policy rules

TABLE 1

Cyclical properties of alternative policy regimes

	Optimal sd%	DI Taylor sd%	CPI Taylor sd%	Peg sd%
Output	0·95	0·68	0·72	0·86
Domestic inflation	0·00	0·27	0·27	0·36
CPI inflation	0·38	0·41	0·27	0·21
Nominal I. rate	0·32	0·41	0·41	0·21
Terms of trade	1·60	1·53	1·43	1·17
Nominal depr. rate	0·95	0·86	0·53	0·00

Note: Sd denotes standard deviation in %.

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.

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