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Monetary Policy, Expectations and Commitment

ASSA 2003

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Summary

- Model

$$x_t = \mathrm{E}_t^* x_{t+1} - \varphi(i_t - \mathrm{E}_t^* \pi_{t+1}) + g_t \quad (1)$$
$$\pi_t = \beta \mathrm{E}_t^* \pi_{t+1} + \lambda x_t + u_t \quad (2)$$
$$g_t = \mu g_{t-1} + \tilde{g}_t \quad (3a)$$
$$u_t = \rho u_{t-1} + \tilde{u}_t \quad (3b)$$

E_t^* private-sector expectations, not necessarily rational
E_t rational expectations
Monetary-policy loss function

$$\mathrm{E}_t \sum_{s=0}^{\infty} \beta^s (\pi_{t+s}^2 + \alpha x_{t+s}^2) \quad (4)$$

- Optimal rational-expectations equilibrium (REE)
  Optimal targeting rule

$$\pi_t + \frac{\alpha}{\lambda}(x_t - x_{t-1}) = 0 \quad (8)$$

Combine with (2) ⇒ REE

$$x_t = \bar{b}_x x_{t-1} + \bar{c}_x u_t \quad (9)$$
$$\pi_t = \bar{b}_\pi x_{t-1} + \bar{c}_\pi u_t \quad (10)$$

Combine with (1) ⇒ Reaction function

$$i_t = \psi_x x_{t-1} + \psi_g g_t + \psi_u u_t \quad (13)$$

- Adaptive learning
  Period t, E_t^*, PLM: (a_t, b_t, c_t), $\quad y_t \equiv (x_t, \pi_t)'$, $v_t \equiv (g_t, u_t)'$

$$y_s = a_t + b_t y_{s-1} + c_t v_s \quad (18)$$
$$\mathrm{E}_t^* y_{t+1} = a_t + b_t \mathrm{E}_t^* y_t + c_t \mathrm{E}_t^* v_{t+1}$$
$$= a_t + b_t(a_t + b_t y_{t-1} + c_t v_t) + c_t F v_t, \quad F = \begin{bmatrix} \mu & 0 \\ 0 & \rho \end{bmatrix} \quad (19)$$

Combine (19) with (1), (2) and, for instance, reaction function (13), solve for y_t ⇒ new observation, ALM:

$$y_t = \tilde{a}_t + \tilde{b}_t y_{t-1} + \tilde{c}_t v_t$$

Period $t+1$, E_{t+1}^*, PLM: $(a_{t+1}, b_{t+1}, c_{t+1})$, update by recursive least squares, $\quad \xi_t = (a_t', b_t', c_t')'$, $z_t = (1, y_{t-1}', v_t')'$

$$\xi_{t+1} = \xi_t + \frac{1}{t+1} R_t^{-1} z_t (y_t - \xi_t' z_t)$$
$$R_{t+1} = R_t + \frac{1}{t+1}(z_t z_t' - R_t)$$

- Question: Is REE learnable (does $\mathrm{E}_t^* \to \mathrm{E}_t$ when $t \to \infty$) under alternative assumptions about monetary-policy implementation?
- Results
  - Depends on the monetary-policy implementation and parameters (and private-sector information: lagged/current variables)
  - Learnability if monetary-policy implementation takes E_t^* into account (expectations-based reaction function) to achieve optimal targeting rule (8)

Comments

- Microfoundations of model
- Focus on optimal targeting rule rather than instrument rule
- Alternative reaction functions

• Microfoundations of model?

– Distinction aggregate/individual?

– Individual information? Includes representative agent, aggregate equilibrium?

– Preston 2002a,b:

∗ Individual less information

∗ Consumption plans rely on PLM w/ individual budget constraint rather than w/ aggregate equilibrium/representative agent

∗ Not use law of iterated expectations for *aggregate* expectations

$$\mathrm{E}_t^* \equiv \int_j \mathrm{E}_{jt}^* dj$$

∗ Different results

• Focus on optimal targeting rule rather than instrument rule

– Commitment to optimal targeting rule rather than to particular reaction function

∗ CB transparency, announcements: Influence private-sector expectations directly

– Learning: Combine (19) with (3) and (8)

∗ Cross-equation restriction on E_t^*?

∗ Same as CB using E_t^* to implement (8)

∗ Real-world CBs take actual private-sector expectations into account

· Extract private-sector expectations

· “Credibility”

• Alternative reaction functions

– McCallum-Nelson

$$i_t = \pi_t + \theta[\pi_t + \frac{\alpha}{\lambda}(x_t - x_{t-1})]$$

Very large θ to achieve optimal targeting rule

Svensson-Woodford “Implementing Optimal Policy...”: Dangerous, observation/estimation errors

– Svensson-Woodford (w/ current x_t, π_t predetermined)

$$\begin{aligned} i_{t+1,t} &= \bar{\imath}_{t+1,t} + \theta[\pi_{t+1|t} + \frac{\alpha}{\lambda}(x_{t+1|t} - x_{t|t-1})] \\ \bar{\imath}_{t+1,t} &\equiv \psi_x x_{t|t-1} + \psi_g g_{t+1|t} + \psi_u u_{t+1|t} \end{aligned}$$

Implements $\pi_{t+1|t} + \frac{\alpha}{\lambda}(x_{t+1|t} - x_{t|t-1}) = 0$

Out-of-equilibrium commitment achieves determinacy

$\theta > \bar{\theta}$ implies determinacy