Materials for Peter - Where we stand now

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Overview

1 Model summary - constant vs. decreasing gains (no anchoring here)

$$x_t = -\sigma i_t + \hat{\mathbb{E}}_t \sum_{T=t}^{\infty} \beta^{T-t}\big((1-\beta)x_{T+1} - \sigma(\beta i_{T+1} - \pi_{T+1}) + \sigma r_T^n\big) \tag{1}$$

$$\pi_t = \kappa x_t + \hat{\mathbb{E}}_t \sum_{T=t}^{\infty} (\alpha\beta)^{T-t}\big(\kappa\alpha\beta x_{T+1} + (1-\alpha)\beta\pi_{T+1} + u_T\big) \tag{2}$$

$$i_t = \psi_\pi \pi_t + \psi_x x_t + \rho i_{t-1} + \bar{i}_t \tag{3}$$

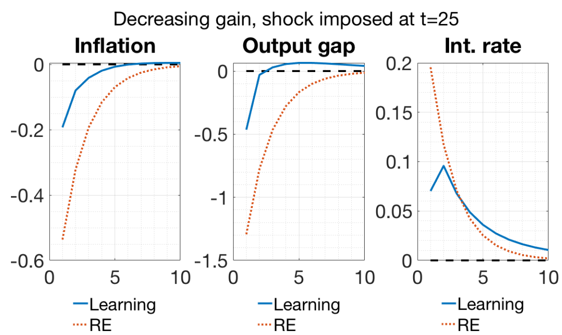
$$\hat{\mathbb{E}}_t z_{t+h} = \begin{bmatrix} \bar{\pi}_{t-1} \\ 0 \\ 0 \end{bmatrix} + b h_x^{h-1} s_t \quad \forall h \geq 1 \qquad b = g_x\, h_x \qquad \text{PLM} \tag{4}$$

$$\bar{\pi}_t = \bar{\pi}_{t-1} + k_t^{-1} \underbrace{\big(\pi_t - (\bar{\pi}_{t-1} + b_1 s_{t-1})\big)}_{\text{fcst error using (4)}} \qquad (b_1 \text{ is the first row of } b) \tag{5}$$

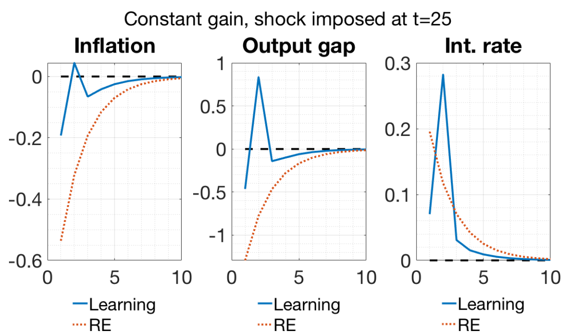
$$k_t = \begin{cases} k_{t-1} + 1 & \text{for decreasing gain learning} \\ \bar{g}^{-1} & \text{for constant gain learning.} \end{cases} \tag{6}$$

2 IRFs for monetary policy shock - dampening, persistence and overshooting (oscillations)

Figure 1: Monetary policy shock - observables

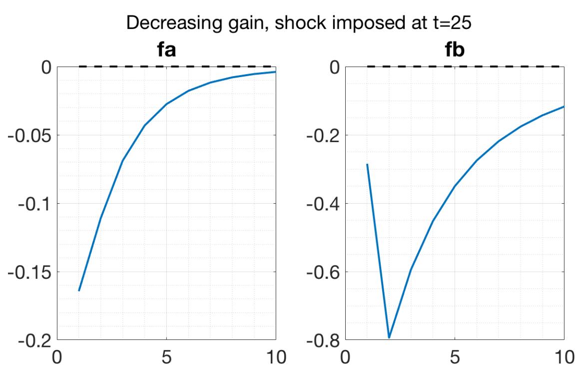


(a) Decreasing gain, $t = 25$

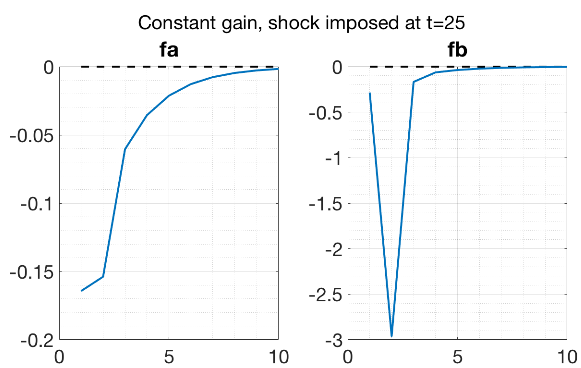


(b) Constant gain, $t = 25$

Figure 2: Monetary policy shock - long-horizon expectations

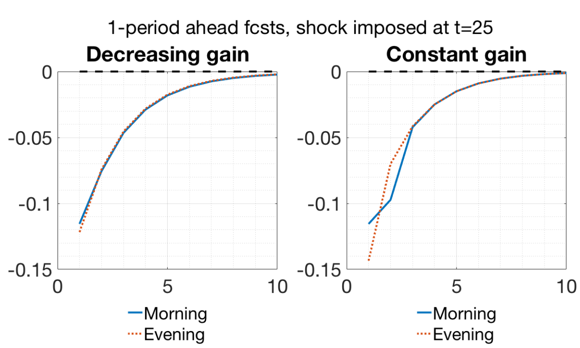


(a) Decreasing gain, $t = 25$

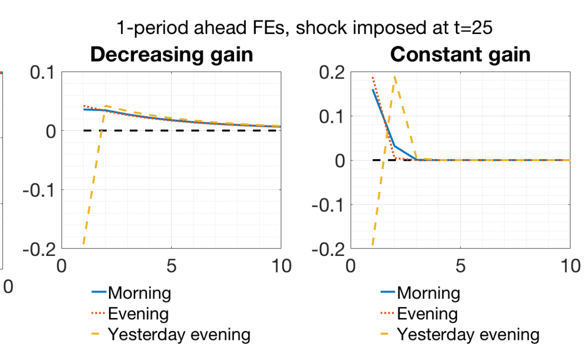


(b) Constant gain, $t = 25$

Figure 3: Monetary policy shock - 1-period ahead forecasts and forecast errors



(a) Decreasing gain, $t = 25$



(b) Constant gain, $t = 25$

3 Implications of learning models for IRFs

1. Intuitive: **dampening** and **persistence**, both due to timing of expectations

2. Counterintuitive: overshooting (convergent **oscillations**)

   (a) Mathematical intuition: the difference equation for forecast errors must have negative roots.

   (b) Economic intuition (Susanto): Ball's " **disinflationary boom**"-effect (Ball 1994): in the NK model (RE or learning) an expansionary monetary policy shock has an expansionary effect via contemporaneous variables but a contractionary one due to movements in expectations. Expectations need to move sufficiently for the contractionary effect to dominate.

   A note: Ball argued that we don't see disinflationary booms in the data, so central banks must have credibility issues (expectations don't move enough in data). The learning alternative however goes the wrong way here b/c it makes expectations move more, not less.

   (c) What parameters are responsible for this?

   (d) The **gain** ($\bar{g}$) is responsible for the extent of adjustment of expectations.

   (e) The **coefficient on inflation** in the Taylor rule (ψ_π) governs the policy response and thus also the direction and size of adjustment in expectations. Needs to be $< 1/\beta$ to shut off oscillations, and if exceeds a threshold value, oscillations become divergent.

   $\rightarrow$ Related to the notion of **instrument instability** (Holbrook, 1972): "with a feedback-type policy rule with lags, the policy instrument may need to exhibit larger and larger fluctuations to keep the target variable stable to offset the effect of its own lags."

   You can think of expectations as the policy instrument (which indeed exhibit a lag structure) but it's not the case that fluctuating expectations can stabilize observables; on the contrary.

   (f) IES parameter (σ) mitigates but does not qualitatively change the situation. Ryan also seemed quite opposed to changing σ.

3. Direction to go (based on my conversation with Ryan)

   (a) Either: take model seriously and explore policy implications

   (b) Or: change something about the model

      i. Change expectation formation

      ii. or change policy (e.g. add $\mathbb{E}(\pi)$ instead of π to Taylor rule)