Materials 13 - Still looking for a version of the model w/o overshooting

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Overview

1 Model summary

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

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

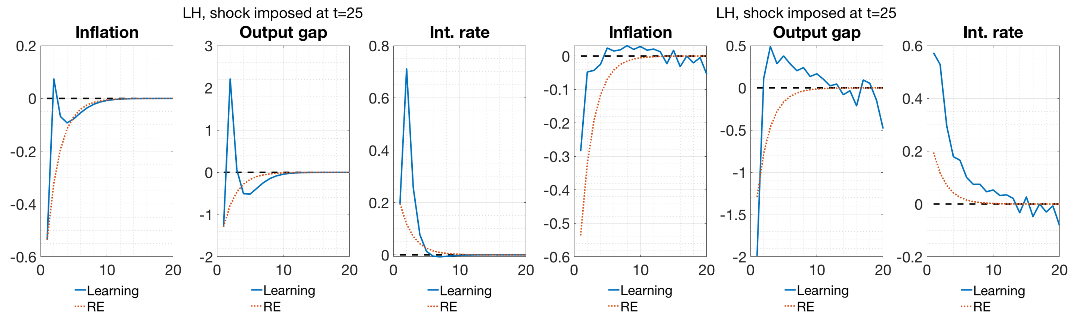
$$i_t = \psi_\pi \pi_t + \psi_x x_t + \bar{i}_t \tag{3}$$

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

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

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

Figure 1: Reference: baseline model



(a) Learning constant only (b) Learning slope and constant

2 Ideas

1. Check ψ_π above but close to 1

   $\rightarrow$ works but only quantitatively; qualitatively, the overshooting is still there, likely because this only cancels out one of the two channels through which $\mathbb{E}\,\pi$ affects x_t negatively.

2. Fix shock for simulation

   Indeed the issue was that for learning, I accidentally scaled down the shock by $\sigma_i < 1$, while for RE I had maintained $\sigma_i = 1$.

3. Interest rate smoothing as $i_t = \rho i_{t-1} + (1-\rho)(\psi_\pi \pi_t + \psi_x x_t) + \bar{i}_t$

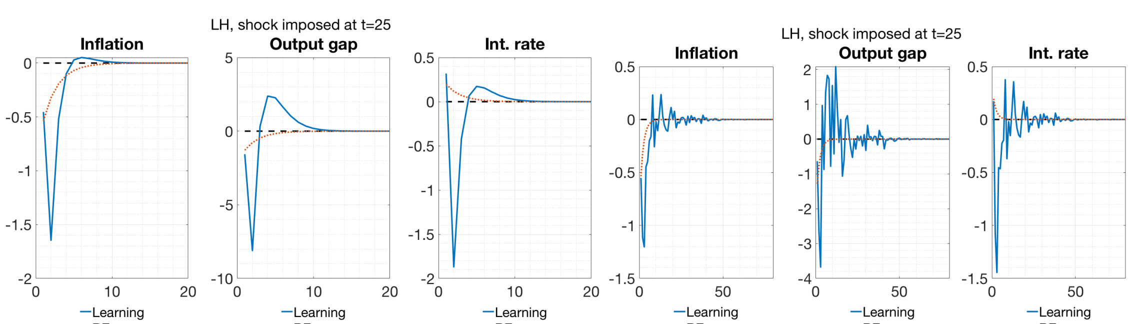
   Doesn't work either - it doesn't change the model except reduces ψ_π.

4. Indexation in NKPC

   Doesn't work either - same model dynamics.

5. Learn h_x

Figure 2: Learning h_x, baseline



(a) Learning constant only (b) Learning slope and constant

Like learning the Taylor rule b/c agents initially don't know if the shock will continue.

6. Central bank's $\mathbb{E}\,\pi_{t+1}$ in TR?

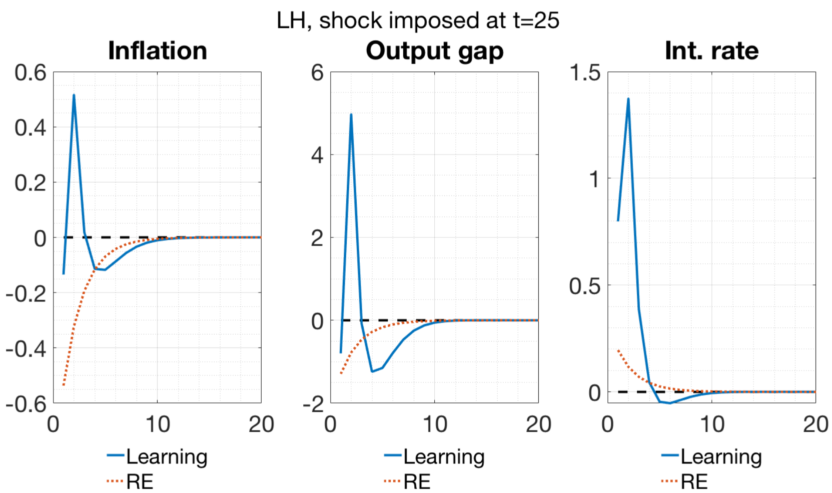
   Done a correction for $\hat{\mathbb{E}}\pi_{t+1}$ in TR, now both are stable, but overshooting is still there in both.

7. Initialize beliefs away from RE somehow

   Slobodyan & Wouters do this, but in an estimation context, which I think is necessary because you need pre-sample data to condition priors on.

8. Slobodyan & Wouters' "VAR-learning": use lagged observables to learn from, not from states.

   Figure 3: VAR learning, baseline, learning only constant

   For learning both slope and constant, not E-stable. Kind of makes sense since I'd think that this amplifies positive feedback.

9. Davig & Leeper-style switching Taylor rule where only generalized Taylor principle holds?

10. Some kind of moving average of inflation (or average) in the TR?

A quick question on projection facility: checking `eig(phi)` when ϕ isn't square?