Materials 16 - Preparing Clough rough draft, simulation-based results

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Overview

1 Model summary

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

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

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

$$\hat{\mathbb{E}}_t z_{t+h} = \bar{z}_{t-1} + b h_x^{h-1} s_t \quad \forall h \geq 1 \qquad b = g_x \; h_x \qquad \text{PLM} \tag{4}$$

$$\bar{z}_t = \bar{z}_{t-1} + k_t^{-1} \underbrace{\big(z_t - (\bar{z}_{t-1} + b s_{t-1}) \big)}_{\text{fcst error using (4)}} \tag{5}$$

(Vector learning. For scalar learning, $\bar{z} = \begin{pmatrix} \bar{\pi} & 0 & 0 \end{pmatrix}'$. I'm also not writing the case where the slope b is also learned.)

$$k_t = \begin{cases} k_{t-1} + 1 \quad \text{when} \quad \theta^{CEMP} < \bar{\theta} \quad \text{or} \quad \theta_t < \tilde{\theta} \\ \bar{g}^{-1} \quad \text{otherwise.} \end{cases} \tag{6}$$

1.1 The CEMP vs. the CUSUM criterion

CEMP's criterion

$$\theta_t^{CEMP} = \max |\Sigma^{-1}(\phi - \begin{bmatrix} F & G \end{bmatrix})| \tag{7}$$

where Σ is the VC matrix of shocks, ϕ is the estimated matrix, $[F, G]$ is the ALM.

CUSUM-criterion

$$\omega_t = \omega_{t-1} + \kappa k_{t-1}^{-1} (f_t f_t' - \omega_{t-1}) \tag{8}$$

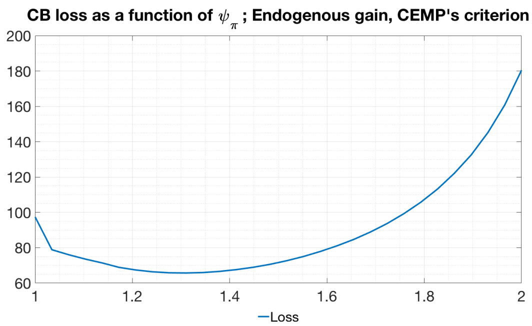
$$\theta_t^{CUSUM} = \theta_{t-1} + \kappa k_{t-1}^{-1} (f_t' \omega_t^{-1} f_t - \theta_{t-1}) \tag{9}$$

where f is the most recent forecast error and ω is the estimated FEV.

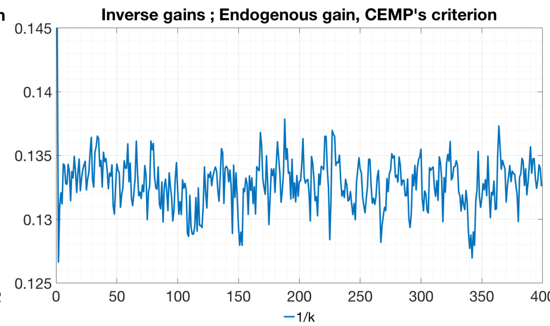
2 Simulated ψ_π^* and CB losses, RE against learning, fixing $\psi_x = 0$

2.1 RE against CEMP-criterion

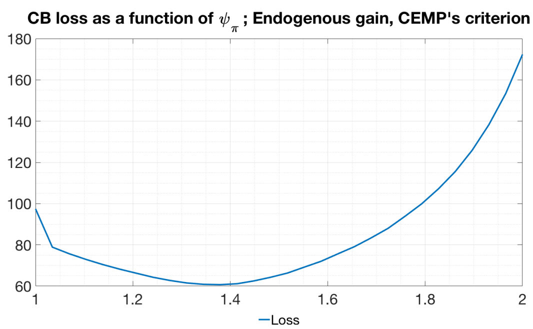
Figure 1: CB losses, RE against learning with CEMP's criterion



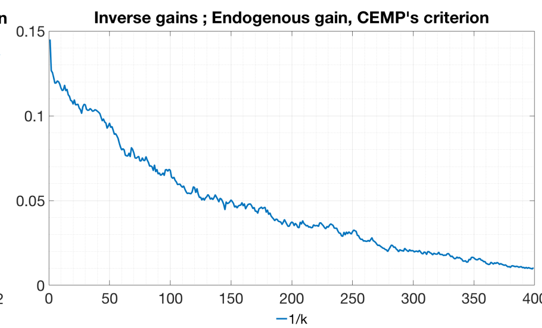
(a) $\bar{\theta} = 2$, Loss



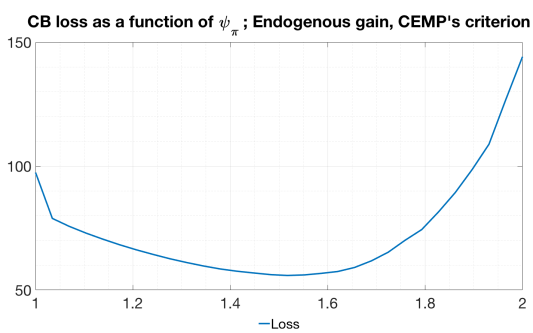
(b) $\bar{\theta} = 2$ Inverse gains for optimal ψ_π^*



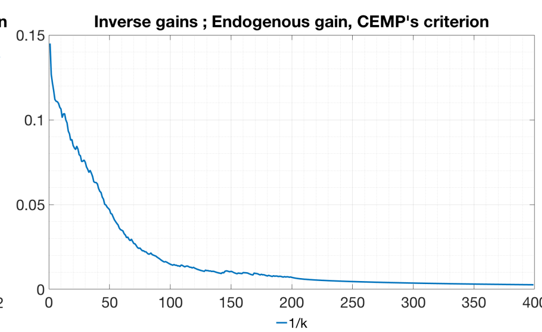
(c) $\bar{\theta} = 4$, Loss



(d) $\bar{\theta} = 4$ Inverse gains for optimal ψ_π^*



(e) $\bar{\theta} = 6$, Loss



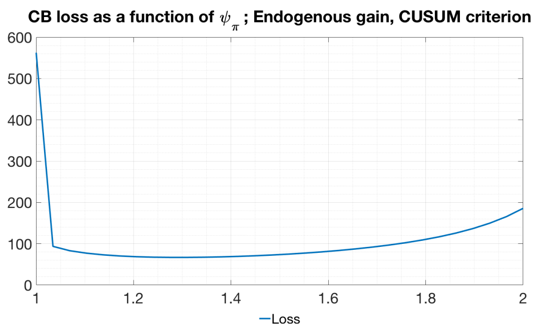
(f) $\bar{\theta} = 6$ Inverse gains for optimal ψ_π^*

- When $\bar{\theta} = 2$, you get unanchored for or $\psi_\pi \geq 1.25$
- When $\bar{\theta} = 4$, you get unanchored for or $\psi_\pi \geq 1.8$
- When $\bar{\theta} = 6$, you get unanchored for $\psi_\pi \geq 2.5$

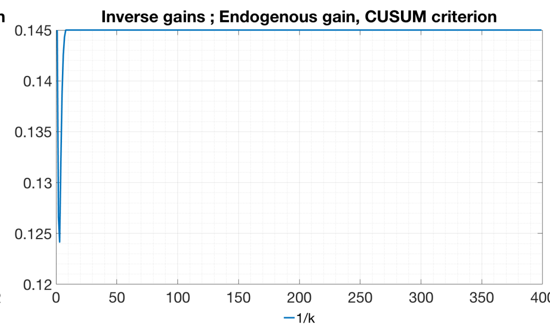
$\rightarrow$ so usually when the choice of aggressiveness on inflation matters for anchoring, mon pol chooses to anchor. But not when this would involve a "too low" ψ_π.

2.2 RE against CUSUM-criterion

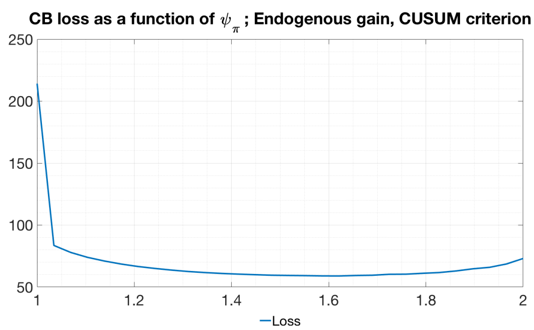
Figure 2: CB losses, RE against learning with CUSUM criterion



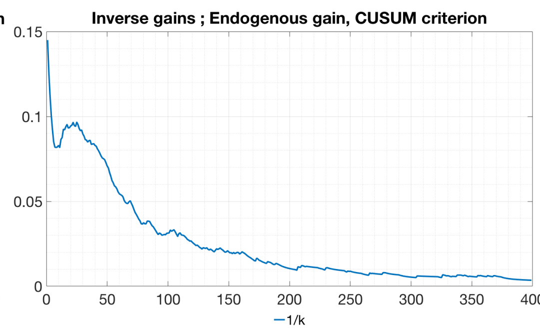
(a) $\tilde{\theta} = 1$, Loss



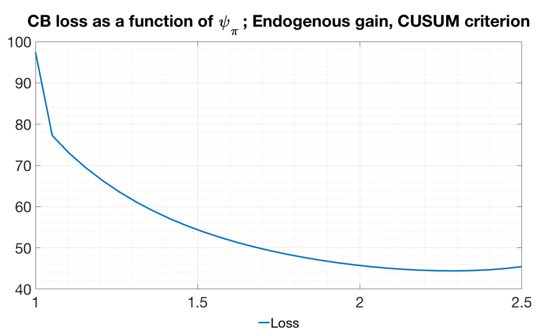
(b) $\tilde{\theta} = 1$ Inverse gains for optimal ψ_π^*



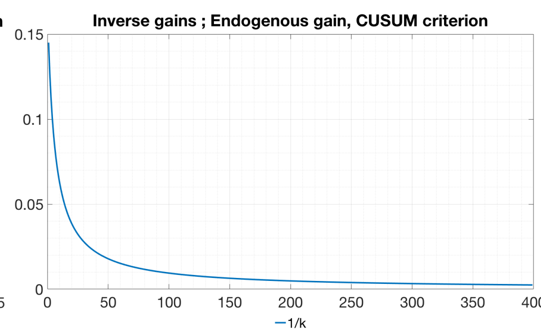
(c) $\tilde{\theta} = 2.5$, Loss



(d) $\tilde{\theta} = 2.5$ Inverse gains for optimal ψ_π^*



(e) $\tilde{\theta} = 4$, Loss



(f) $\tilde{\theta} = 4$ Inverse gains for optimal ψ_π^*

Note:

- When $\tilde{\theta} = 1$, you never get anchoring for any value of $\psi_\pi \in (1, 2]$
- When $\tilde{\theta} = 2.5$, you're unanchored for low ψ_π, anchored for high
- When $\tilde{\theta} = 4$, you always get anchoring for any value of $\psi_\pi \in (1, 2.5]$

$\rightarrow$ so $\tilde{\theta} = 2.5$ is the interesting case because this is where the choice of aggressiveness on inflation matters for anchoring. As we can see, when mon pol can, it chooses to anchor.