# Monetary Policy & Anchored Expectations
# An Endogenous Gain Learning Model

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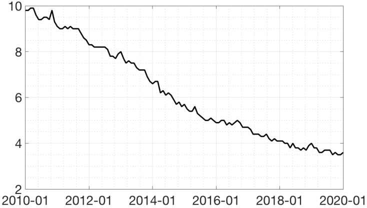
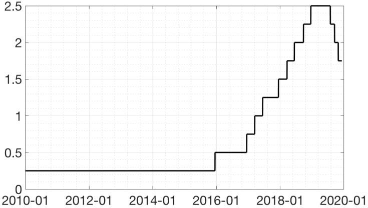
April 15, 2020

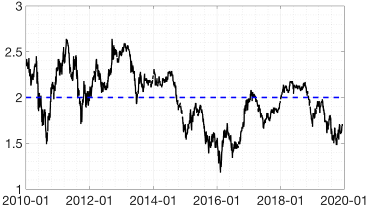
# Puzzling Fed behavior fall 2019




(a) Unemployment rate, %




(b) Fed funds rate target, upper limit, %




(c) Market-based inflation expectations, 10 year, % average

# Structure of talk

1. Model

# Preview of results

1. Two layers of new intertemporal tradeoffs

2. Optimal monetary policy time-inconsistent

$\rightarrow$ Illustrate analytically in special case: target criterion

3. Not today: short-run costs vs. long-run benefits of anchoring expectations

# Related literature

- **Optimal monetary policy in New Keynesian models**
  Clarida, Gali & Gertler (1999), Woodford (2003)

- **Econometric learning**
  Evans & Honkapohja (2001), Preston (2005), Molnár & Santoro (2014)

- **Anchoring / endogenous gain**
  Carvalho et al (2019), Svensson (2015), Hooper et al (2019), Milani (2014)

# Expectations: $\hat{\mathbb{E}}$ instead of $\mathbb{E}$

- If use $\mathbb{E}$ (rational expectations, RE)

  Model solution

$$s_t = h s_{t-1} + \epsilon_t \qquad \epsilon_t \sim \mathcal{N}(\mathbf{0}, \Sigma) \tag{1}$$
$$y_t = g s_t \tag{2}$$

  $s_t \equiv (r_t^n, u_t)'$ (states)
  $y_t \equiv (\pi_t, x_t, i_t)'$ (jumps)

- If use $\hat{\mathbb{E}}$ $\rightarrow$ private sector does not know $g$
  $\rightarrow$ estimate using observed states & knowledge of (1)

- Households and firms don't know they are identical

# Conclusion

# Short-run costs, long-run benefits

Assume Taylor rule and no concern for output gap stabilization

$$i_t = \psi_\pi \pi_t \qquad \lambda_x = 0$$

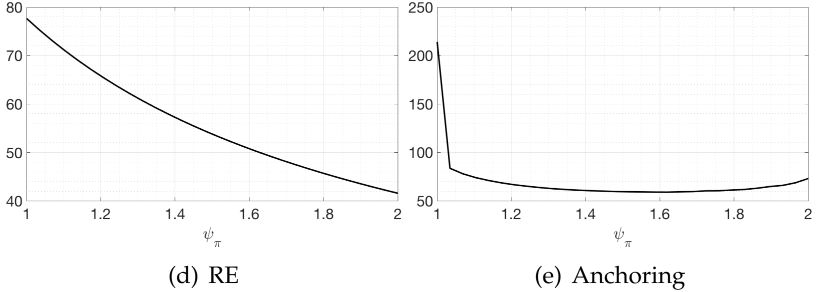



Figure: Central bank loss as a function of $\psi_\pi$

Short-run costs

# Functional forms for **g**

- Smooth anchoring function

$$k_t = k_{t-1} - c + dfe^2_{t|t-1} \tag{3}$$

$c, d > 0$

- Kinked anchoring function

$$k_t = \begin{cases} \frac{1}{t} & \text{when} \quad \theta_t < \bar{\theta} \\ k & \text{otherwise.} \end{cases} \tag{4}$$

$\theta_t$ criterion, $\bar{\theta}$ threshold value

Return

# Choices for criterion $\theta_t$

- Carvalho et al. (2019)'s criterion

$$\theta_t^{CEMP} = \max |\Sigma^{-1}(\phi_{t-1} - T(\phi_{t-1}))| \tag{5}$$

$\Sigma$ variance-covariance matrix of shocks
$T(\phi)$ mapping from PLM to ALM

- CUSUM-criterion

$$\omega_t = \omega_{t-1} + \kappa k_{t-1}(fe_{t|t-1} fe'_{t|t-1} - \omega_{t-1}) \tag{6}$$

$$\theta_t^{CUSUM} = \theta_{t-1} + \kappa k_{t-1}(fe'_{t|t-1} \omega_t^{-1} fe_{t|t-1} - \theta_{t-1}) \tag{7}$$

$\omega_t$ estimated forecast-error variance

Return