Monetary Policy & Anchored Expectations

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October 1, 2019

Motivation

A quote or a plot, something about how policy-makers worry about anchored inflation expectations

- What is anchoring?
- (Why) do we want expectations to be anchored?

This paper

1. Defines anchoring from the lens of a learning model

2. Embeds anchoring in a New Keynesian (NK) model with econometric learning

3. Goal: Derive optimal monetary policy, and contrast it with rational expectations (RE)

4. Today: some initial simulations with different specifications for monetary policy

In words

1. Expectations anchored if unresponsive to short-run fluctuations

2. Blessing or curse for monetary policy?

Related literature

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

- Econometric learning
  Evans & Honkapohja (2001), Preston (2005), Graham (2011)

- Anchoring
  Carvalho et al (2019), Svensson (2015), Hooper et al (2019)

Roadmap

1. Intuition: what is anchoring and why should it matter?
2. A formal notion of anchoring
3. NK model with anchoring
4. Simulations

New Keynesian Phillips Curve

$$\pi_t = \beta \hat{\mathbb{E}}_t \pi_{t+1} + \kappa x_t$$

- $\pi_t =$ inflation
- $x_t =$ output gap
- $\hat{\mathbb{E}}_t =$ expectation-operator (not necessarily rational)

Suppose a negative demand shock:

$$\pi_t = \beta \hat{\mathbb{E}}_t \pi_{t+1} + \kappa \underset{\downarrow}{x_t}$$

If expectations do not move:

$$\underset{\downarrow}{\pi_t} = \beta \hat{\mathbb{E}}_t \pi_{t+1} + \kappa \underset{\downarrow}{x_t}$$

If seeing $\underset{\downarrow}{\pi_t}$, expectations adjust:

$$\underset{\downarrow\downarrow}{\pi_t} = \beta \hat{\mathbb{E}}_t \underset{\downarrow}{\pi_{t+1}} + \kappa \underset{\downarrow}{x_t}$$

Keeping expectations stable may be desirable

$\rightarrow$ Anchoring as a notion of stable expectations

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Anchoring definition

Suppose firms

- observe everything up to time t
- do not observe future variables
- KEY: are unsure about the long-run mean of inflation, $\bar{\pi}$

Anchoring definition II

Firms construct one-period-ahead inflation forecasts as
CHECK

$$\hat{\mathbb{E}}_t \pi_{t+1} = \bar{\pi}_{t-1} + b s_t \tag{1}$$

$\bar{\pi}$ = drift in inflation (= long-run mean, “target”)

$\hat{\mathbb{E}}$ = subjective expectation operator (not rational expectations, $\mathbb{E}$)

b = matrix of constants

s = shocks

Anchoring definition III

And update their estimate of the inflation drift as
(Carvalho et al, 2019) CHECK

$$\bar{\pi}_t = \bar{\pi}_{t-1} + k_t \overbrace{(\pi_t - (\bar{\pi}_{t-1} + bs_t))}^{\text{short-run forecast error}} \tag{2}$$

$$k_t = \mathbb{I} \times \frac{1}{k_{t-1} + 1} + (1 - \mathbb{I}) \times \bar{g} \tag{3}$$

$\bar{g}$ = constant

k = gain $\rightarrow$ sensitivity to short-run forecast errors

Anchoring: when k decreases over time.

Anchoring definition IV

$$\mathbb{I} = \begin{cases} 1 & \text{if } \theta_t \leq \bar{\theta} \\ 0 & \text{otherwise.} \end{cases} \tag{4}$$

$$\theta_t = |\hat{\mathbb{E}}_{t-1}\pi_t - \mathbb{E}_{t-1}\,\pi_t|/\sigma_s \tag{5}$$

$\bar{\theta} =$ constant

$\theta =$ difference between subjective and objective (model-consistent) expectations, scaled by noise

Anchoring $\equiv$ when the deviation between objective and subjective expectations is small enough such that firms choose decreasing gains

Intuition

- When my expectation far from what is implied by the model, I update my estimate of the drift strongly
- When the two are close, I load less on my forecast error because it matters less
- Unanchored if: π deviates from target

  i) strongly enough

  ii) long enough

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3-Equation New Keynesian Model

$$x_t = -\sigma i_t + \hat{\mathbb{E}}_t \sum_{T=t}^{\infty} \beta^{T-t} \big((1-\beta) x_{T+1} - \sigma(\beta i_{T+1} - \pi_{T+1}) + \sigma r_T^n \big) \tag{6}$$

$$\pi_t = \kappa x_t + \hat{\mathbb{E}}_t \sum_{T=t}^{\infty} (\alpha\beta)^{T-t} \big(\kappa\alpha\beta x_{T+1} + (1-\alpha)\beta\pi_{T+1} + u_T \big) \tag{7}$$

$$i_t = \psi_\pi \pi_t + \psi_x x_t + \bar{i}_t \tag{8}$$

"Long-horizon forecasts" $\rightarrow$ firms do not know beliefs of others (Preston, 2005)

Compact notation

$$z_t = A_1 f_{a,t} + A_2 f_{b,t} + A_3 s_t \tag{9}$$

$$s_t = P s_{t-1} + \epsilon_t \tag{10}$$

where

$$z_t \equiv \begin{pmatrix} \pi_t \\ x_t \\ i_t \end{pmatrix} \qquad s_t \equiv \begin{pmatrix} r_t^n \\ \bar{i}_t \\ u_t \end{pmatrix} \tag{11}$$

and

$$f_{a,t} \equiv \hat{\mathbb{E}}_t \sum_{T=t}^{\infty} (\alpha\beta)^{T-t} z_{T+1} \qquad f_{b,t} \equiv \hat{\mathbb{E}}_t \sum_{T=t}^{\infty} (\beta)^{T-t} z_{T+1} \tag{12}$$

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Calibration

β	0.98
σ	0.5
α	0.5
ψ_π	1.5
ψ_x	1.5
$\bar{g}$	0.145^{-1}
$\bar{\theta}$	1
ρ_r	0.9
ρ_i	0.9
ρ_u	0.9
σ_i	0.1
σ_r	0.359
σ_u	0.277

Carvalho et al, 2019

Role of learning

VARYING $\bar{\theta}$

Varying Taylor-rule coefficients

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$$D = \begin{bmatrix} d_{11} & \gamma_{12} & \gamma_{13} & d_{14} & \cdots \\ d_{21} & \gamma_{22} & \gamma_{23} & d_{24} & \cdots \\ \vdots & \vdots & \vdots & \ddots & \vdots \end{bmatrix} \tag{13}$$

◂ Return