

Business Cycles when Consumers Learn by Shopping

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- They *learn by shopping*

This paper: **Learning by Shopping** in a New-Keynesian Model

The model: Standard NK model + HHs that **Learn by Shopping**

- Form beliefs about π based on **shopping experiences**
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- Make decisions **conditional on these beliefs**

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Study the implications of *learning by shopping* for...

- Business Cycles (in the paper)
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Key takeaway:

- *Learning by shopping* \Rightarrow **anchoring** of HH's beliefs
- Monetary policy \Rightarrow **Stabilize inflation** \Rightarrow **increase** degree of anchoring
- **Anchored** HH's beliefs \Rightarrow \uparrow impact of MP shocks

The Model: Standard NK + Info. Frictions among HH's

Firms and Central Bank: Business as usual

- **Full information**
- Firms face nominal rigidities a la Calvo
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Households i

- Dispersed information \Rightarrow condition decisions on own information set
 - Individual **labor supply**

$$\varphi n_{i,t} + \sigma c_{i,t} = w_{i,t} - E_{i,t} p_t$$

- Individual **Euler equation**

$$c_{i,t} = E_{i,t} c_{i,t+1} - \frac{1}{\sigma} (i_{i,t} - E_{i,t} \pi_{t+1})$$

- **Shopping experiences** \Rightarrow **Idiosyncratic** and **noisy** signal about π_t

Beliefs about Inflation

- Shopping experiences \Rightarrow Noisy signal about the *price level* and *inflation*

$$\pi_{i,t}^* = \pi_t + \epsilon_{i,t}, \quad \epsilon_{i,t} \stackrel{iid}{\sim} \mathcal{N}(0, \sigma_\epsilon^2)$$

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- **Bayesian updating** \Rightarrow Dispersion in perceptions \Rightarrow Dispersion in expectations

$$\mathbb{E}_{i,t} \pi_t = \psi_\pi \mathbb{E}_{t-1} \pi_t + (1 - \psi_\pi) \pi_t + \epsilon_{i,t}^*$$

... and endogenous **degree-of-anchoring**:

$$\psi_\pi = 1 - \frac{\text{Var}[\pi_t | \mathcal{I}_{i,t}]}{\text{Var}[\pi_t | \mathcal{I}_{i,t}] + \sigma_\epsilon^2}$$

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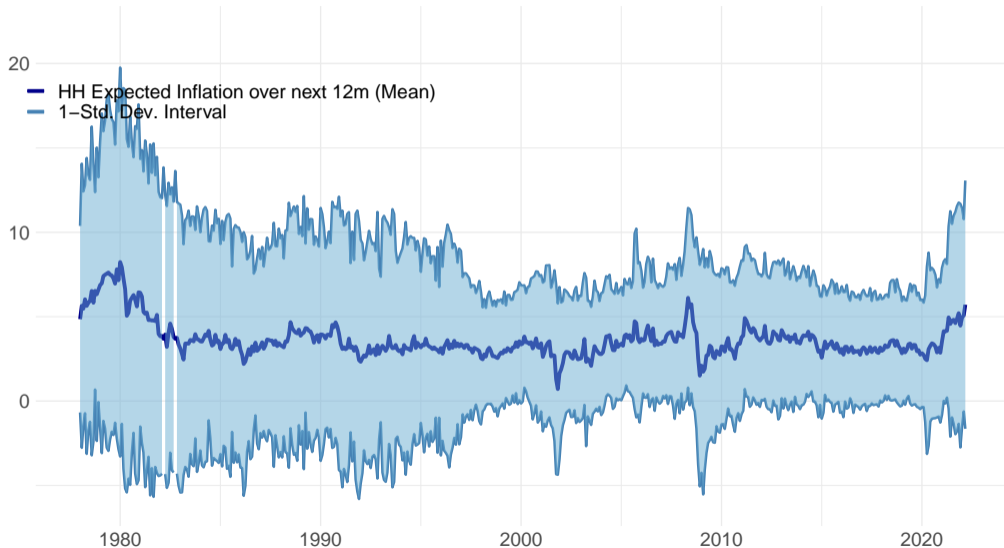
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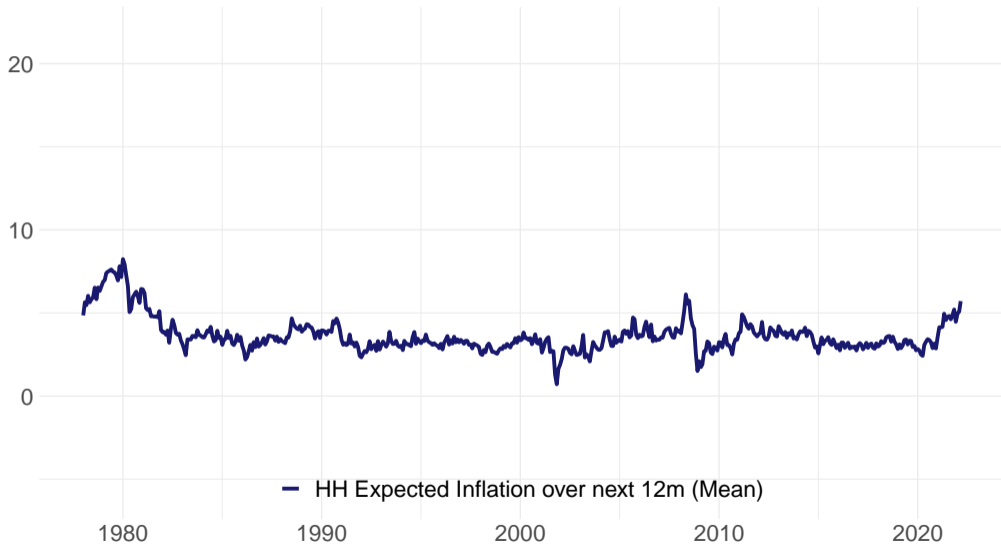
- **Anchoring** \Rightarrow **Underreaction** of average beliefs

$$\bar{\mathbb{E}}_t \pi_t = \psi_\pi \mathbb{E}_{t-1} \pi_t + (1 - \psi_\pi) \pi_t$$

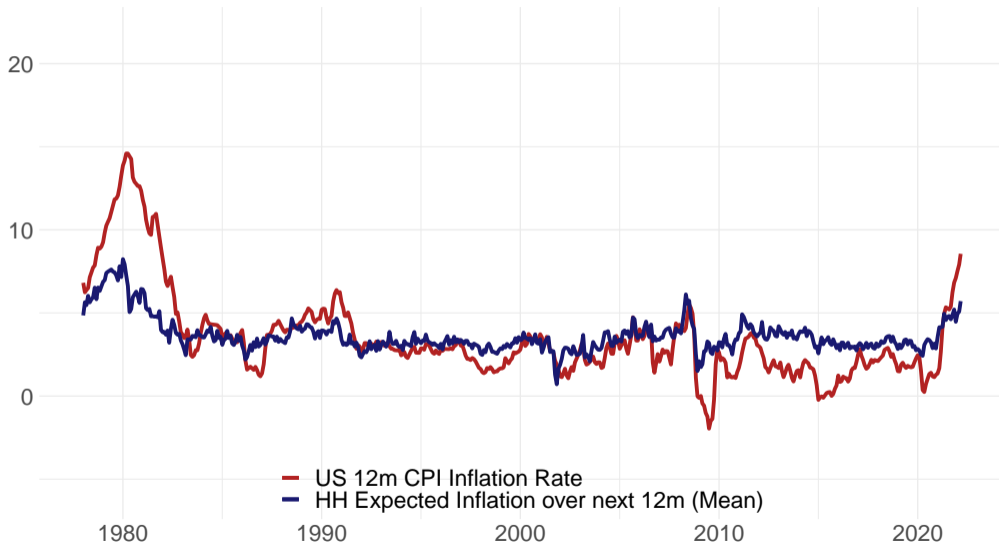
Inflation expectations in the Michigan Survey of Consumers



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Anchored HH's beliefs flatten the slope of the NKPC

Standard relationship between inflation and marginal costs...

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \lambda^{-1} \underbrace{(w_t - p_t)}_{\text{Marg. Cost.}}; \quad \lambda \equiv \frac{\theta}{(1 - \theta)(1 - \beta\theta)}$$

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...but not standard labor supply

$$y_t = \left(\frac{1}{\varphi + \sigma} \right) \left(w_t - p_t + \underbrace{p_t - \bar{\mathbb{E}}_t p_t}_{\text{Disagreement}} \right)$$

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⇒ NKPC when consumers *learn by shopping*

$$\pi_t = (1 - \Psi_\pi) \beta \mathbb{E}_t \pi_{t+1} + \Psi_\pi \mathbb{E}_{t-1} \pi_t + \alpha_{PC} y_t$$

$$\alpha_{PC} \equiv \frac{\sigma + \varphi}{\lambda + \psi_\pi}$$

$$\Psi_\pi \equiv \frac{\psi_\pi}{\lambda + \psi_\pi}$$

$$\psi_\pi = 1 - \frac{\text{Var}[\pi_t | \mathcal{I}_{i,t}]}{\text{Var}[\pi_t | \mathcal{I}_{i,t}] + \sigma_\epsilon^2}$$

Monetary Policy: A Counterfactual Exercise

- **Simple interest rate rule**

$$\dot{i}_t = \phi_\pi \pi_t$$

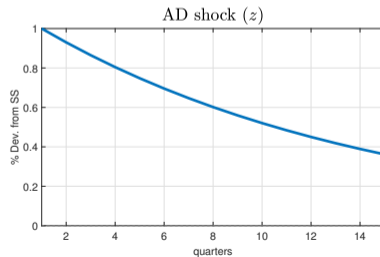
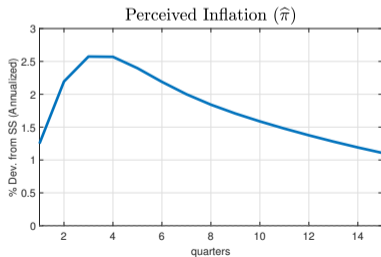
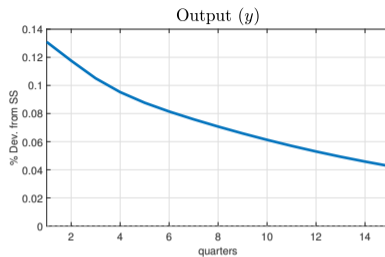
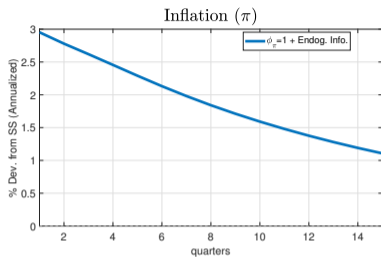
- **Calibration: post-Volcker period**

- Costs of attention \Rightarrow Behavior of HH inflation expectations in Mich. Survey
- Volatility and persistence of shocks \Rightarrow Match behavior of inflation post-Volcker

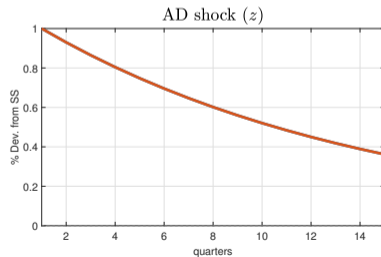
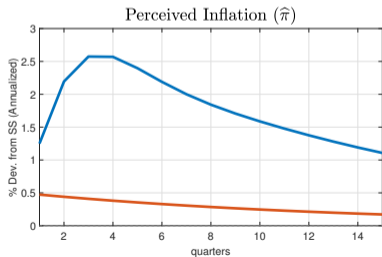
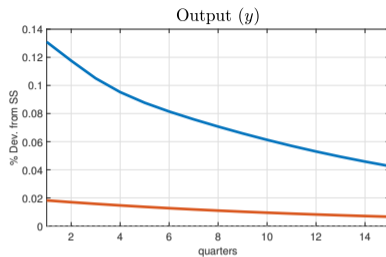
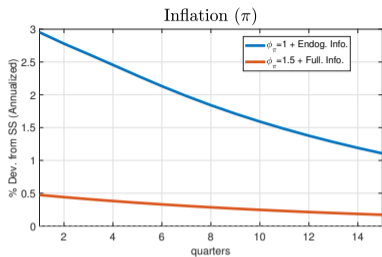
- **Counterfactual exercise**

- Change in MP stance: $\uparrow \phi_\pi$ from 1.0 to 1.5
- Study IRF to AD shock

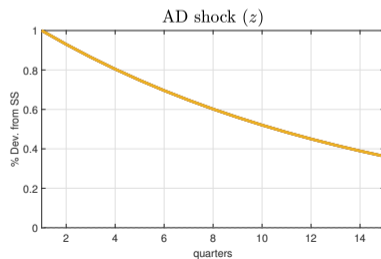
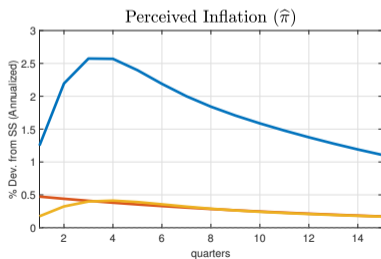
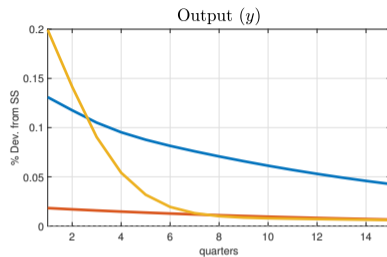
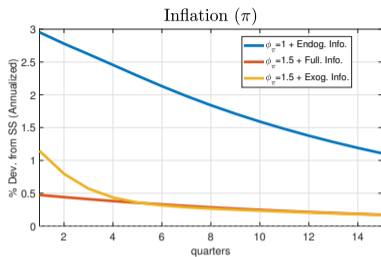
Counterfactual: AD shock Pre-Volcker



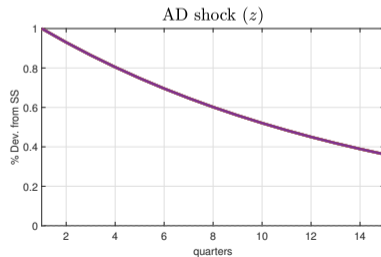
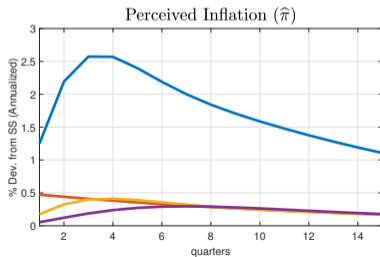
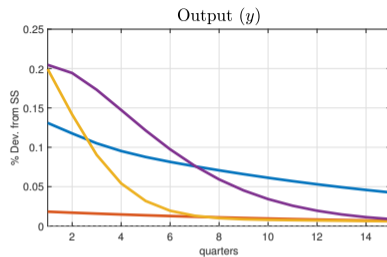
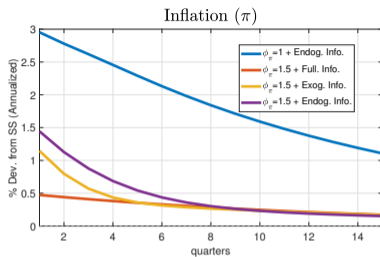
Counterfactual: AD shock Post-Volcker (Full Info)



Counterfactual: AD shock Post-Volcker (LBS + Exog. Info.)



Counterfactual: AD shock Post-Volcker (LBS + Rational Inattention)



Concluding remarks

- **HH's inflation expectations...**
 - Reveal information about their **expectations** of future...
 - But also reveal information about their **perceptions** of current inflation and cost of living
- Success stabilizing inflation **anchors** HH's beliefs about inflation
 - Reflected in **lack of knowledge** about CPI inflation
 - **Slow reaction** of average beliefs to news about inflation
 - Greenspan/Bernanke: *"price stability is when no-one is talking about inflation (sic)"*
- **Anchoring** HH's beliefs \Rightarrow **Amplification** of the impact of monetary policy on economic activity

Thank you for your attention!