COMMENT TO ANGELETOS, HUO, AND SASTRY'S "IMPERFECT MACROECONOMIC EXPECTATIONS: THEORY AND EVIDENCE"

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3rd of April, 2020
NBER Macroeconomics Annual
NBER, Cambridge via zoom

COMMENT TO ANGELETOS, HUO, AND SASTRY'S "IMPERFECT MACROECONOMIC EXPECTATIONS: THEORY AND EVIDENCE"

YES, BUT, WE DISAGREE

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Yes

Twenty years of progress in modeling expectations

- Models: dispersed private info and higher order beliefs, inattention, sticky info, least-squares learning, memory, over-extrapolation, cognitive discounting, …
- Empirics: aggregate time-series, survey evidence, disagreement within survey, disagreement across surveys, info treatments, markets vs people, horizons, …

Current state: wilderness of alternatives

- Two conflicting facts: under-reaction versus over-reaction
- Missing a CRRA, or a Cobb-Douglas, or a Calvo.

Yes: a parsimonious model

Underlying process $z_t = R(L)\varepsilon_t$

Perceived process $z_t = \hat{R}(L)\varepsilon_t$

Bayesian beliefs with noisy signals

$$\hat{E}_{i,t}\left[z_t\right] = \mathbb{E}_{i,t}\left[z_t | z_t + \tau^{-1/2} u_{i,t}\right]$$

Equilibrium

$$z_t = f\left(\left\{\hat{E}_{i,t}\left[z_t\right]\right\}_{i\in[0,1]}\right)$$

Yes: a new regression

Survey data to build

$$Error_{i,t} = z_{t+1} - \mathbb{E}_{i,t}\left[z_{t+1}\right] \qquad Revision_{i,t} = \mathbb{E}_{i,t}\left[z_{t+1}\right] - \mathbb{E}_{i,t-1}\left[z_{t+1}\right]$$

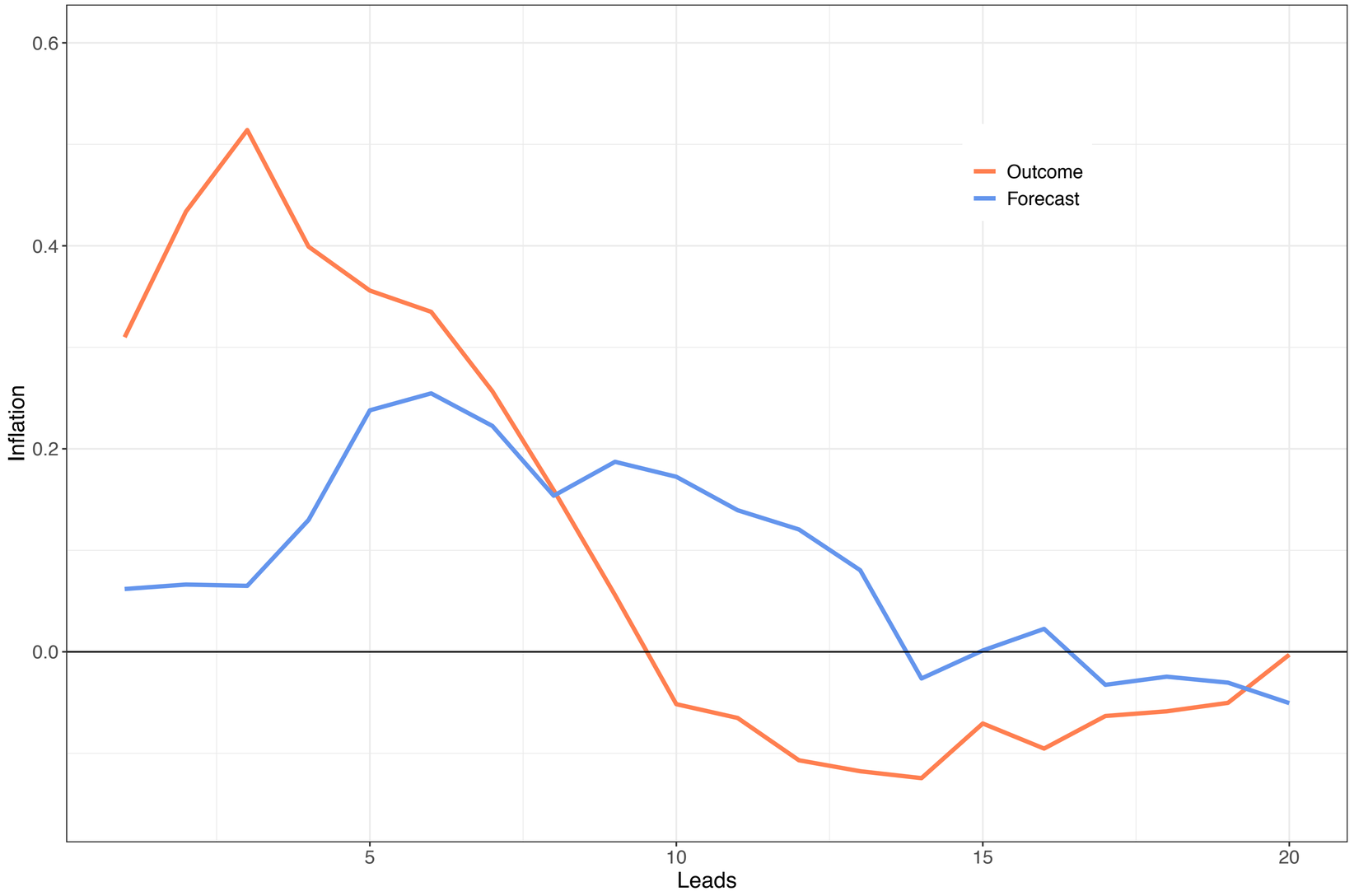
Regression

$$Error_{i,t} = \kappa AvRevision_t + \chi\left(Revision_{i,t} - AvRevision_t\right) + u_{i,t}$$

Intuition (on the conflicting fact: under-react versus over-react)

- If average over agents, get $\kappa>0$ the "stickiness of expectations".
- If forget the average, get $\chi<0$ the over-reaction or over-representativeness.
- Together: *time-series versus cross-sectional variation!*

Yes: new empirical pattern



- Forecast crosses outcome from below

- Errors first **+**, then **-**.

Caveats:

1) not precisely estimated

2) interpretation

$$\mathbb{E}_t\left[\frac{\partial}{\partial \varepsilon_t}\hat{E}_{i,t+h}(z_{t+h+4})\right] \neq \frac{\partial}{\partial \varepsilon_t}\mathbb{E}_{i,t}(z_{t+h+4})$$

Yes, **but**, we disagree

But

Needed features to fit the inflation data

- With an exogenous autoregressive model, find: $(1-\rho\mathbb{L})z_t = r\varepsilon_t$

1. Slow learning: $\tau \ \text{is small}$
2. Over-extrapolation: $\hat{\rho} > \rho$

Intuition for why using the exogenous AR model:

- From regression estimates: $\kappa > 0, \ \text{learning} \qquad \chi < 0 \ \text{over-reaction}$
- From the crossing fact: expectations on average first under react because of learning, but then overreact because of over-extrapolation

But, can see persistence from horizon

In their model, outcomes versus expectation

$$\mathbb{E}_{i,t}(z_{t+1}) = \hat{\rho}\mathbb{E}_{i,t}(z_t)$$

$$\mathbb{E}_{i,t}(z_{t+T}) = \hat{\rho}^T\mathbb{E}_{i,t}(z_t)$$

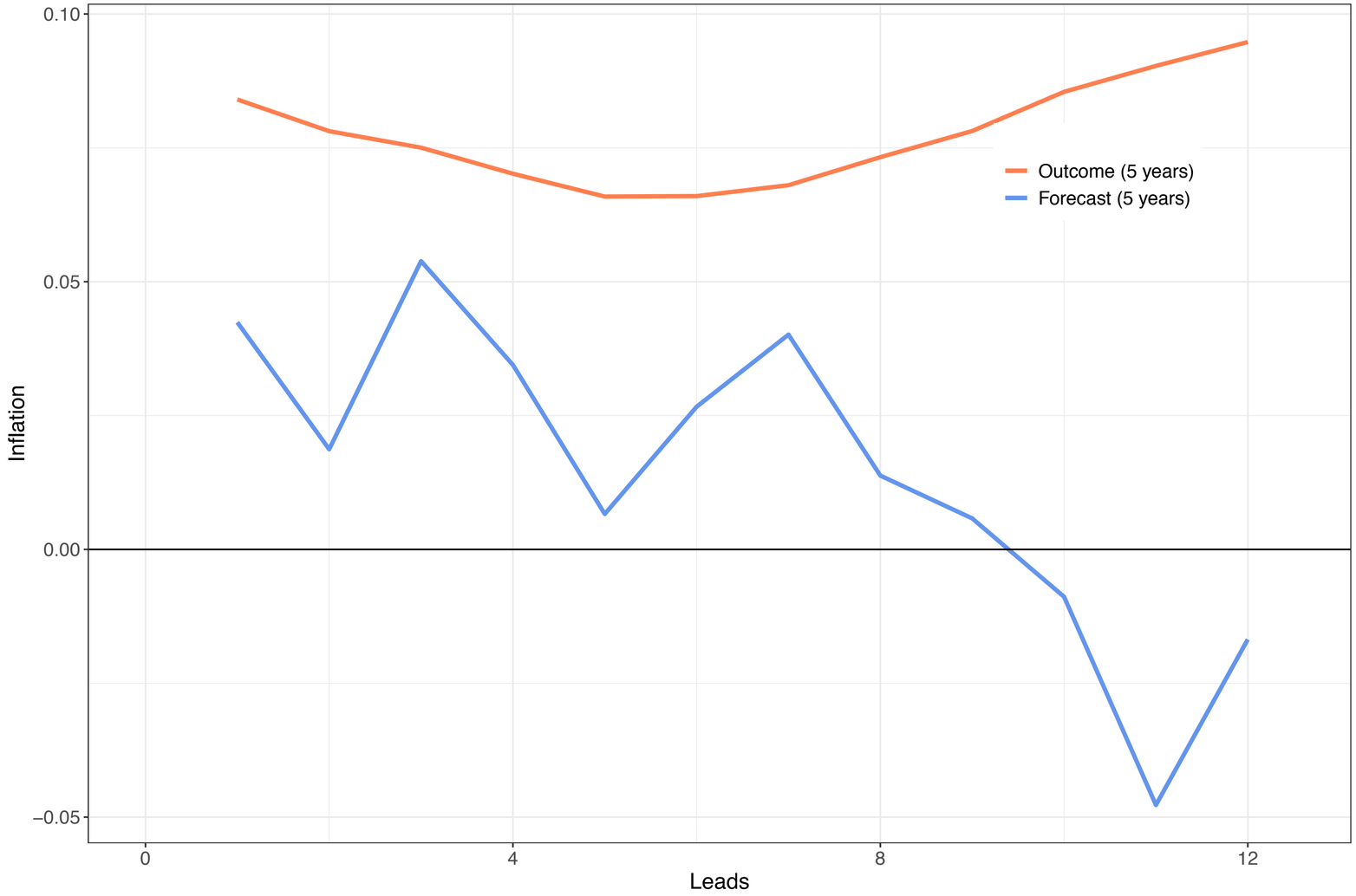
Long-horizon expectations:

$$\frac{\sum_{h=1}^{H}\mathbb{E}_{i,t}(z_{t+h})/H}{\mathbb{E}_{i,t}(z_{t+1})} = \frac{1}{H}\frac{1-\hat{\rho}^H}{1-\hat{\rho}}$$

- Redo regression using 5-year-ahead expectations from same survey
- *Still support for over-extrapolation:*

$$\rho = 0.26, \quad \hat{\rho} = 0.81$$

But, look further



$$\pi_t = \pi_t^P + \pi_t^T$$

$$\pi_t^P = \pi_{t-1}^P + u_t^P$$

$$\pi_t^T = u_t^T$$

$$\Rightarrow \pi_t = \pi_{t-1} + \varepsilon_t - \theta\varepsilon_{t-1}$$

Long-horizon outcome reveals persistent RW

$$\rho \approx 1$$

Long-horizon expectation mistake transitory WN

$$\hat{\rho} \approx 0$$

People under-extrapolate

Yes, but, **we disagree**

Disagreement in the literature

Important part of the expectations literature of the last twenty years

- Disagreement, Communication, and Transparency
- In theory: strategic complementarities, inattention models. In policy: policy statements, changes in regime. In data: look at second moment of surveys

From that literature learned that:

- Shocks raise disagreement temporarily
- Policy communication lowers disagreement that results from the shock
- Regime changes that raise transparency can permanently lower disagreement
- So, need model where disagreement is endogenous

Disagreement in the current model

Equations:

$$V_t = \int \left(\mathbb{E}_{i,t}(z_{t+1}) - \int \mathbb{E}_{i,t}(z_{t+1}) di \right)^2 di$$

$$V_t = \hat{\lambda}^2 V_{t-1} + (\hat{\rho} - \hat{\lambda})^2$$

No shocks, so stay forever in steady state

- Disagreement is constant: does not depend on ε_t.
- Communication makes no difference: does not depend on r.
- Transparency regime switch: raises disagreement as blow-up differences, lower λ

Disagree constructively

Modified model (still very parsimonious)

- Fraction θ knows current state, makes unbiased forecasts of future:

$$\mathbb{E}_t^I(z_{t+1}) = \rho z_t$$

- Fraction 1-θ looks just like the Angeletos-Huo-Sastry agents
- Added one parameter (had subtracted one earlier)
- In literature this is: neoclassical model; canonical imperfect information model

Law of of motion for disagreement:

$$(1-\hat{\lambda})^2 V_t = \theta(1-\theta)\hat{\lambda}^2 r^2 \varepsilon_t^2 + (1-\theta)(\hat{\rho}-\hat{\lambda})^2$$

Disagree constructively

Law of of motion for disagreement:

$$(1-\hat{\lambda})^2 V_t = \theta(1-\theta)\hat{\lambda}^2 r^2 \varepsilon_t^2 + (1-\theta)(\hat{\rho}-\hat{\lambda})^2$$

Predictions:

- Disagreement varies over time and is affected by shocks: it follows an AR(2) after a shock $\boldsymbol{\varepsilon_t}$.
- Policy communication lowers disagreement: lower $\boldsymbol{r}$ lowers disagreement on impact and in the steady state
- Transparency regime switch: lower $\boldsymbol{\lambda}$ but higher $\boldsymbol{\theta}$ will lower disagreement

Conclusion

YES, BUT, WE DISAGREE