



Imperfect Macroeconomic Expectations: Theory and Evidence

Discussion by
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- ▶ Full information rational expectations is an increasingly untenable assumption
 - ▶ Qualitative implications of the best FIRE models are way off.
 - ▶ However, non-FIRE models involve a “wilderness.”
 - ▶ A literature studies deviations from FIRE based directly on surveys of macroeconomic expectations
 - ▶ Coibion and Gorodnichenko (2015)
 - ▶ Bordalo, Gennaioli, Ma, Shleifer (Forthcoming)
- CG and BGMS directly map moments of from surveys into underlying explanations for failure of FIRE.
- ▶ Perhaps survey evidence can tame the wilderness.



- ▶ Agents forecast z_t (inflation or unemployment).
- ▶ Terminology:
 - ▶ Revisions: $\mathbb{E}_t[z_{t+k}] - \mathbb{E}_{t-1}[z_{t+k}]$
 - ▶ Errors: $z_{t+k} - \mathbb{E}_t[z_{t+k}]$.
- ▶ CG: When \mathbb{E} is for the median, revisions forecast errors with a positive sign (under-reaction).
- ▶ BGMS: When \mathbb{E} is for an individual, revisions sometimes forecast errors with a negative sign (over-reaction), and sometimes with a positive sign.



- ▶ Regressions of $z_{t+k} - \mathbb{E}_t[z_{t+k}]$ on $\mathbb{E}_t[z_{t+k}] - \mathbb{E}_{t-1}[z_{t+k}]$.

	Unemployment		Inflation	
	Full sample	1984–2017	Full sample	1984–2017
K_{CG}	0.74 (0.23)		1.52 (0.42)	
K_{BGMS}	0.32 (0.11)	0.40 (0.15)	0.14 (0.12)	-0.26 (0.05)



- ▶ Main message: these moments from survey data do inform theory, but not in the way we might first think.
- ▶ Three exercises
 - ▶ Section 2–3: Summary of evidence, additional tests.
 - ▶ Section 4: A model reconciling seemingly contradictory findings in the survey evidence, taking the DGP as given.
 - ▶ Section 5: Put the model in GE (!). Main conclusions go through.

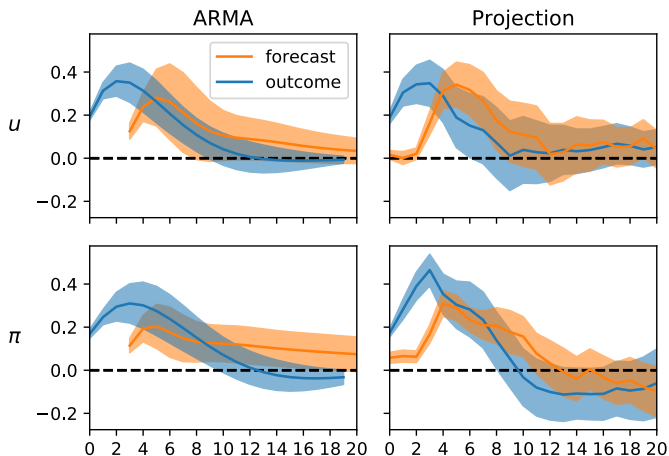


- ▶ The authors augment the survey evidence with evidence from a VAR using shocks to unemployment and inflation.
- ▶ Consider

$$x_t = \alpha + \sum_{i=1}^I \gamma_i x_{t-i}^{IV} + \beta_0 \epsilon_t + u_t$$

where x_t could be the underlying series or its forecast, and ϵ_t is a shock.

- ▶ x_{t-i}^{IV} are instrumented regressors, so γ_i correctly measures the response of x_t to x_{t-i} .





- Agents forecasts z_t , where

$$(1 - \rho L)z_t = \epsilon_t \sim N(0, 1).$$

- Agent i observes signal $s_{i,t}$, where

$$s_{i,t} = z_t + \frac{u_{i,t}}{\sqrt{\tau}}.$$

(dispersed private information).

- The agent believes

$$(1 - \hat{\rho}L)z_t = \epsilon_t$$

(over, or under-extrapolation) and

$$s_{i,t} = z_t + \frac{u_{i,t}}{\sqrt{\hat{\tau}}}$$

(over, or under-confidence).



- ▶ Agents' beliefs are governed by Bayes rule (in this sense they are rational).
- ▶ If we put these agents into an economy with asset prices, asset prices would obey no-arbitrage
- ▶ However, not RE in the “communism of beliefs” sense.
 - ▶ The true DGP \neq subjective DGP
- ▶ Agents cannot learn the true DGP (in a sense they have dogmatic priors over $\hat{\tau}$ and $\hat{\rho}$).
- ▶ Also: is private dispersed information rational?



- ▶ Coefficient for individual forecasts

$$K_{BGMS} \propto -\kappa_1(\tau^{-1} - \hat{\tau}^{-1}) + \kappa_2(\rho - \hat{\rho})$$

Evidence: < 0 for inflation and > 0 for unemployment

- ▶ Coefficient for the aggregate forecast

$$K_{CG} \propto \kappa_1\tau^{-1} + V_{\text{ind}}K_{BGMS}$$

Evidence: > 0 .

- ▶ Measure of over-shooting:

$$K_{IRF} = \frac{\log(\hat{\rho} - \rho) - \log(\hat{\rho} - \hat{\lambda})}{\log \hat{\lambda} - \log \rho}$$

Evidence: > 1 (want big $\hat{\rho}$).



- ▶ $K_{CG} > 0 \Rightarrow$ dispersed private information
 - ▶ Could $K_{CG} > 0$ imply level- k thinking, higher-order doubts, or cognitive discounting?
 - ▶ No: beliefs eventually overshoot.
 - ▶ No: $K_{BGMS} < 0$
- ▶ Overshooting and $K_{BGMS} < 0 \Rightarrow$ over-extrapolation.
 - ▶ Could these also be explained by over-confidence?
 - ▶ No. Over-confidence does not affect over-shooting.
- ▶ $K_{BGMS} > 0$ (say, for unemployment) \Rightarrow underconfidence



Yes, provided the agents are running same Kalman filter as the authors.

- ▶ $K > 0$ could be that the agent forgets the previous signal (Mullainathan, 2002).
- ▶ $K < 0$ could be that the agent makes mistakes relative to Bayesian updating
 - ▶ If the forecast is a positive outlier (relative to the previous forecast) it is more likely to be an error. The truth will lie below the forecast.
 - ▶ Authors accept this (Winsorization).
 - ▶ Expectations a more extreme version of actionable beliefs (Giglio et al., 2020)



- ▶ Moore and Healy (2008)
 - ▶ Difficult tasks: subjects over-estimate their own performance, but believe they are worse than others
 - ▶ Easy tasks: subjects under-estimate their own performance, but believe they are better than others.
- ▶ Explanation: not over or under-confidence but regression toward the mean.
 - ▶ When performance is high, subjects shade it downwards, and when it is low, they shade it upwards.
 - ▶ When the task seems difficult, subjects assume others found it less difficult.
 - ▶ When the task seems easy, subjects assume others found it less easy.
- ▶ This behavior is rational if agents assume they receive a noisy signal.



This paper: $\hat{\rho} > \rho$. Two potential cognitive foundations:

1. Extrapolation:

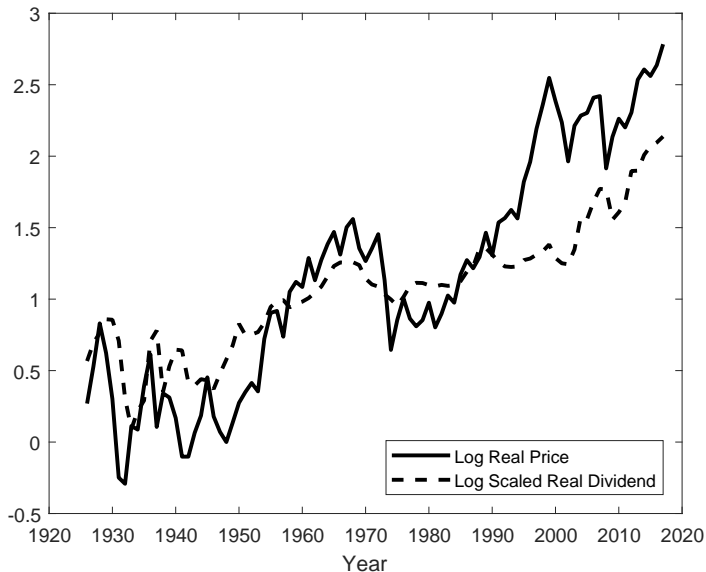
- ▶ Recency effects (agents more likely to remember recent events) well-established in laboratory experiments.
- ▶ Agents (incorrectly) extrapolate past stock price behavior to future stock returns (Barberis et al., 2015)

The recent past matters in investor decision-making.

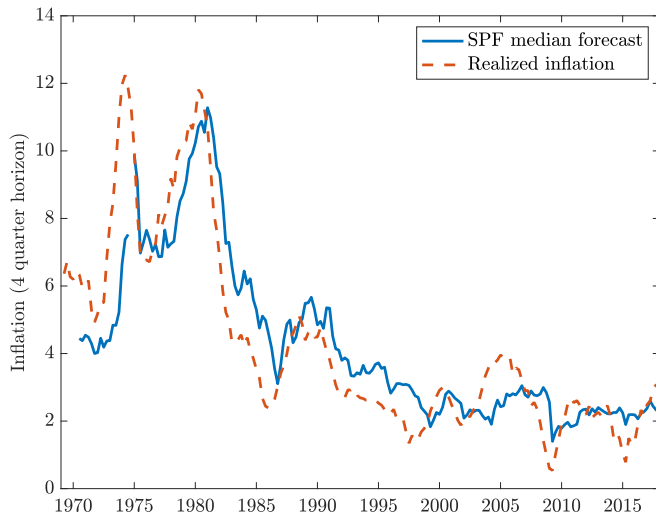
2. Representativeness heuristic

- ▶ Tendency of items to become representative of a class is well-documented in psychology (Tversky and Kahneman, 1973)
- ▶ Stocks with high growth forecasts underperform (Bordalo et al., 2019)

Comment 3: For over-extrapolation, look to asset prices



Comment 4: Cognitive response to inflation decline





- ▶ Inflation series not well-characterized by a VAR
- ▶ Professional forecasters (and consumers) are persistently wrong about inflation
- ▶ Suggests a different type of model might be needed.



What might a model eventually look like?

- ▶ This paper: dispersed private information, under-confidence, over-extrapolation.
- ▶ But how do we know τ , $\hat{\tau}$, $\hat{\rho}$?
- ▶ Why would these differ in different series?

Is this the correct explanation for, say, the failure of forward guidance?



1. Long-run experience effects.

- ▶ Experience effects persist far longer than they should.
- ▶ For example, inflation: Malmendier and Nagel (2016, 2020)
- ▶ Back-of-the envelope suggests forecasters permanently influenced by the inflation of the 1980s.

Side benefit: endogenizes “private dispersed information”

- ## 2. Slow updating to new information, with eventual over-shooting (replaces under-confidence, over-extrapolation)
- ## 3. Representativeness heuristic, aka diagnostic expectations (replaces over-extrapolation)



- ▶ The temporal context model \Rightarrow agents possess a persistent mental context.
- ▶ Agents possess associations
- ▶ The context and associations (themselves endogenous) influence what comes to mind.
- ▶ Context responds endogenously to features of the environment based on associations.



- ▶ Context is slow-moving \Rightarrow in the short run agents under-react to novel features of the environment
- ▶ If the novel features become the new normal, agent's context will update too much (over-shooting) \Rightarrow they temporarily forget what came before.
- ▶ Endogeneity of associations implies that agents beliefs can be self-reinforcing
 - ▶ Experience effects (very long-term under-reaction)
 - ▶ Representativeness heuristic (features of the environment can become over-associated with mental contexts).



Paper's message:

- ▶ Survey evidence a powerful tool for understanding where we are in the wilderness.
- ▶ But be cautious in interpreting reduced-form autocorrelations.
- ▶ There needs to be some mechanism (here a bias in persistence) leading to over-reaction.

My comments:

- ▶ The tractability and generality of this framework shows real promise
- ▶ But we lose something in cognitive foundations
 - ▶ Especially problematic if the statistical model is mis-specified.
- ▶ Ultimately, want to have as portable a cognitive theory as possible.