New experimental evidence on expectation formation by H. Afrouzi, S. Kwon, A. Landier, Y. Ma, D. Thesmar

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Summary

- Survey experiment: forecasting an AR(1) process
  - respondents see 40 observations, then 40 rounds of forecasting
  - mean, persistence parameter & innovation variance unknown
- Stylized fact: "overreaction"
  - forecasts depends more on last observation than true AR(1) forecast
  - especially pronounced for low persistence & longer forecast horizons
- Common models of forecast dynamics inconsistent with facts
- New model of forecast dynamics
  - forecast responds rel. less to last obs if process more persistent
  - why? learning about long run mean with costly attention
  - persistence known $\rightarrow$ look less at past data when more persistence
- Very interesting & creative paper!

- Discussion
  - parameter learning vs stationary forecast dynamics

What were the respondents thinking?

- Approach in paper
  - stationary true DGP & forecast dynamics
  - common in models of regular patterns; e.g. business cycles
  - typical finding: survey forecasts reflect more persistence than econometricians' time series models (estimated with hindsight)
  - justification often invokes agents' concern with structural change; captures "this time is different", secular stagnation etc.
- Experimental setting here
  - people are told the process "is stable" or "is an AR(1)"
  - can be understood as learning constant parameters
  - distingushing mean & AR(1) coefficient is difficult!
- Two properties of parameter learning help understand facts
  1. (used in paper) guessing a parameter with dispersed signals always looks like overreaction
  2. (not used) easier to learn true persistence if it is high $\rightarrow$ another mechanism for more overreaction to less persistent processes
  - now illustrate both with minimal (Bayesian) examples

Learning about means

- Three dates $t = 0, 1, 2$
  - true data generating process
    $$y_t^i = \mu + u_t^i; \qquad t = 1, 2$$
  - u_1^i iid normal noise, known variance σ_u^2; true mean $\mu = 0$ for all agents
  - date 0: common priors $\mu \sim \mathcal{N}\left(0, \sigma^2\right)$
- Forecasting y_2^i at date 1
  - Bayesian updating with known variance
    $$F_{1,2}^i = E\left[y_2^i | y_1^i\right] = \frac{\sigma^2}{\sigma^2 + \sigma_u^2} y_1^i$$
  - overreaction relative to rational expectations forecast $\hat{F}_{1,2} = \mu = 0$
  - idiosyncratic signals used to learn about parameter!
- Forecast error vs forecast revision
  - common date 0 forecast = prior mean: $F_{0,2}^i = E^i\left[y_2\right] = 0$
  - forecast error
    $$y_2^i - F_{1,2}^i = \mu + u_2^i - F_{1,2}^i = u_2^i - \left(F_{1,2}^i - F_{0,2}^i\right)$$
  - in cross section of agents, negatively correlated with forecast revision

Learning about persistence

- Three dates $t = 0, 1, 2$
  - true data generating process

$$y_t^i = \rho y_{t-1}^i + u_t^i; \qquad t = 1, 2$$

  - u_1^i iid normal noise, y_0^i drawn from stationary distribution
  - date 0: common priors about ρ
- Forecasting y_2 at date 1
  - Information content of sample y_0^i, y_1^i for ρ

$$\frac{y_1^i}{y_0^i} = \rho + \frac{u_1^i}{y_0^i}$$

  - growth is noisy signal of ρ, more noisy if y_0^i smaller
- Responses across experiments with different ρs
  - agents who observe higher y_0^is get better signals
  - higher ρ experiments have larger variance of y_t^i
  - so more agents with good signals in high ρ experiments

Parameter learning in this paper

- Incorporating parameter learning into forecasting models
  - difficult: Bayes' rule with many parameter is messy
  - have to take a stand on stationarity
- Paper strikes interesting compromise
  - simplify by making persistence known
  - make stationary by assuming costly recall of data
  - costly recall also gets us more accurate forecast if persistence high
- Characterization of forecast dynamics
  - costly recall problem imposes mild assumptions
  - no explicit formula for optimal forecast as function of past recalled data
  - but can still characterize "overreaction" regression coefficients
- Going forward (towards more applications)
  - explicit formula that allows time series tests with data on individual agents, perhaps with more specific assumptions on cost?
  - incorporate learning about persistence?

Whither models of beliefs?

- Models of stationary forecast dynamics
  - all the action is in means; conditional uncertainty varies little
  - blend well with linearized macro models
- Parameter learning models
  - beyond simplest functional forms, get time variation in uncertainty
  - uncertainty can be large: agents worry about long run outlook
  - interesting extra effects for financial markets: structural change $\longrightarrow$ higher uncertainty $\longrightarrow$ lower prices
- Also relevant for macro!
  - Bachmann-Carstensen-Lautenbacher-Schneider 2020: firm survey data on one-quarter-ahead sales growth
  - forecasts of firms that grow or shrink quickly are too conservative $\longrightarrow$ again an overreaction to recent experience
  - those firms also report more subjective uncertainty
  - subjective uncertainty not well proxied by conditional volatility: growing firms too confident given the shocks they face
  - calls for models that jointly study means and uncertainty