Belief Distortions, Asset Prices, and Unemployment Fluctuations

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Belief overreaction to cash flow news explains 60% of U.S. unemployment volatility

Beliefs overreact to cash flow news
⇒ Excess volatility in firm valuations
⇒ Drives both asset prices and unemployment.

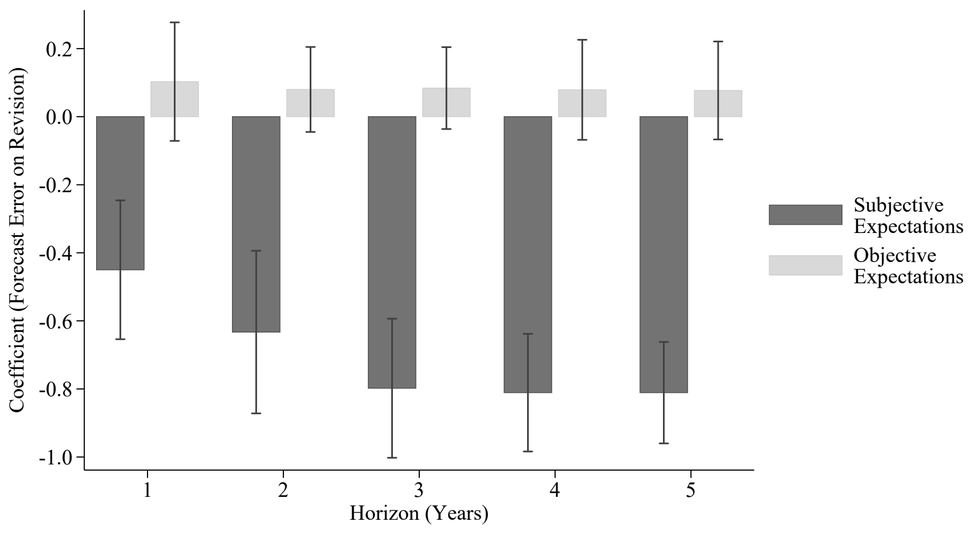
Data and Measurement:

- **Subjective** $\mathbb{F}_t$: Survey forecast (IBES equity analyst)
- **Objective** $\mathbb{E}_t$: Machine learning forecast (neural net)
- **Belief Distortion** $= \mathbb{F}_t - \mathbb{E}_t$

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1. Survey Overreaction ⇒ Belief Distortion

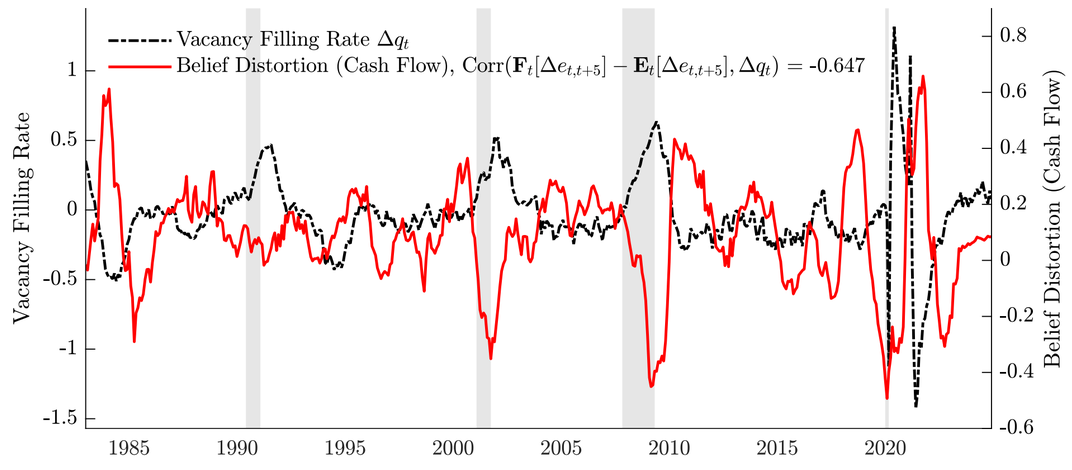
Survey (subjective) overreacts, machine (objective) does not



Notes: The figure reports estimates of β_1 from cross-sectional regressions of forecast errors on forecast revisions and lagged forecast levels for a quarterly panel of publicly listed firms, with firm and time fixed effects. The forecast target is earnings growth Δe_{t+h} (cash flows). Cross-sectional survey forecasts $\mathbb{F}_t$ are taken from IBES, and machine learning forecasts $\mathbb{E}_t$ are generated in real time using a Long Short-Term Memory (LSTM) neural network trained on macroeconomic, financial, textual, and firm-level data. The sample spans 1999Q1–2023Q4. Each bar shows 95% confidence intervals under two-way clustering by firm and quarter.

2. Belief Distortion ⇒ Labor Market

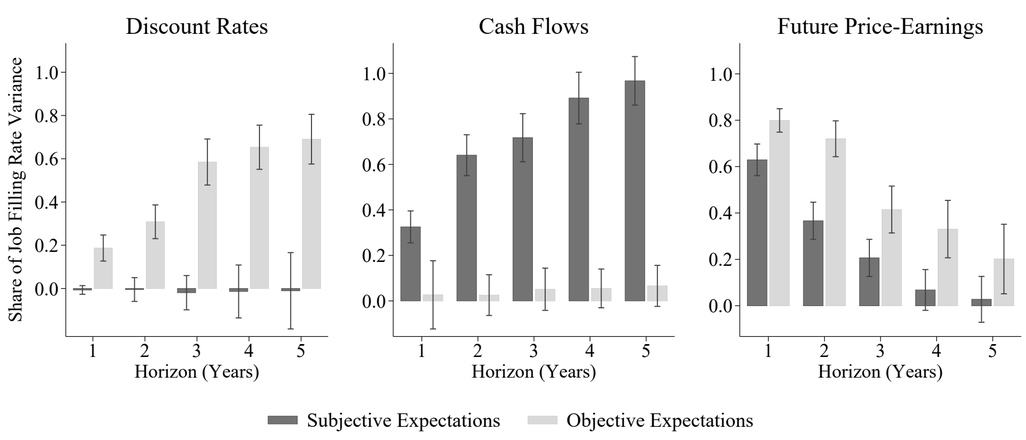
Recession: Belief distortion ↓ (pessimism),
Vacancy filling rate ↑ (high unemployment)



Notes: Figure plots the annual log growth of the U.S. vacancy filling rate Δq_t (left axis) against the belief distortion in cash flows, which is measured as expectational errors $\mathbb{F}_t[\Delta e_{t,t+5}] - \mathbb{E}_t[\Delta e_{t,t+5}]$ in 5-year forecasts of annualized S&P 500 earnings growth (right axis). Survey expectations $\mathbb{F}_t[\Delta e_{t,t+5}]$: IBES median analyst forecasts for the next four fiscal years and long-term growth (LTG). Objective expectations $\mathbb{E}_t[\Delta e_{t,t+5}]$: Machine learning forecasts from Long Short-Term Memory (LSTM) neural networks. The vacancy filling rate, defined as total hires divided by total vacancies, measures the rate at which posted job openings are filled. Sample is quarterly from 1983Q1 to 2023Q4. Gray shaded areas indicate NBER recessions.

3. Variance Decomposition of U.S. Vacancy Filling Rate (Aggregate)

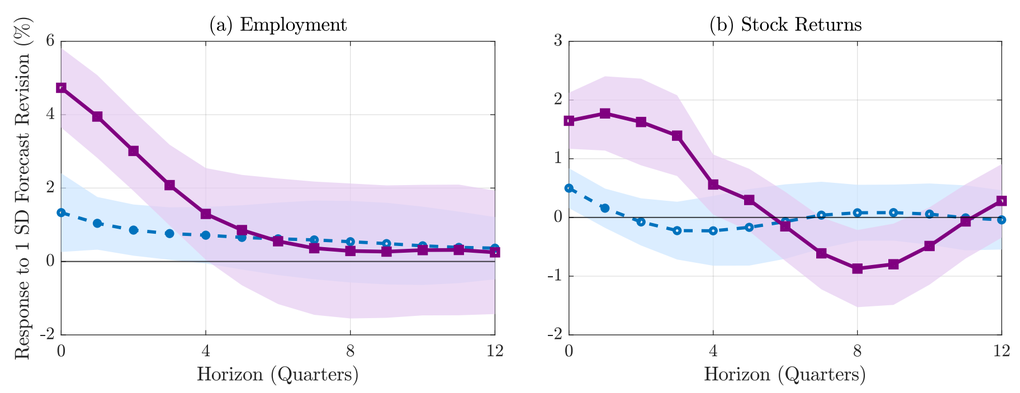
Belief distortion (subjective – objective) about cash flow explains 90% of variation in vacancy filling rate



Notes: Figure illustrates the discount rate, cash flow, and future price-earnings components from the time-series decomposition of the U.S. aggregate vacancy filling rate. Light bars show contributions under objective expectations; dark bars show contributions under subjective expectations. Subjective expectations $\mathbb{F}_t$ are constructed from CFO survey forecasts (discount rates) and IBES analyst forecasts (cash flows). Objective expectations $\mathbb{E}_t$ are based on machine learning forecasts from Long Short-Term Memory (LSTM) neural networks. x-axis denotes the forecast horizon h. Sample: 2005Q1 to 2023Q4. Each bar shows Newey-West 95% confidence intervals with lags = 4.

4. Impulse Response to Idiosyncratic Shocks (Firm-Level)

Compared to objective response, belief distortion leads to excessive response in hiring and stock returns



Notes: Figure displays impulse responses to earnings growth forecast revisions, estimated via local projections with firm and time fixed effects. Panel (a): log employment $\log(L_{i,t+h})$. Panel (b): annual stock returns over horizon h. Blue dashed line: impulse response under machine forecasts (objective expectations), where forecast revision is the machine learning earnings growth revision $\mathbb{E}_t[\Delta e_{i,t+1}] - \mathbb{E}_{t-1}[\Delta e_{i,t+1}]$. Violet solid line: impulse response under survey forecasts (subjective expectations), where forecast revision is the analyst earnings growth revision $\mathbb{F}_t[\Delta e_{i,t+1}] - \mathbb{F}_{t-1}[\Delta e_{i,t+1}]$. Observations weighted by each firm's market value. Shaded areas: two-way clustered 90% confidence intervals by firm and time. Data sample: 1999Q1–2023Q4.

5. Search and Matching Model with Learning

Environment: True cash flow process follows AR(1) in logs:

$$e_{i,t} = \mu_i + \phi\, e_{i,t-1} + v_{i,t}$$

- Objectively $\mu_i = 0$ for all firms, but firms don't know this

Subjective beliefs: Update beliefs at constant rate ν:

$$\mathbb{F}_t[\mu_i] = \mathbb{F}_{t-1}[\mu_i] + \nu\,(\Delta e_{i,t} - \mathbb{F}_{t-1}[\Delta e_{i,t}])$$

- Fading memory: Smaller weight on older observations
- Initial beliefs objective ($\nu = 0$ case rational expectation)

Intuition: Fading memory ⇒ Overreaction to cash flow news
⇒ Firm valuations ⇒ Drives stock returns & hiring

6. Model vs. Data Moments

Aggregate volatility: 60% (learning) vs. 16% (rational)

Firm-level Dispersion: 66% (learning) vs. 30% (rational)

Moment	**Data**	**Learning**	**Rational**
Asset Market			
$\mathrm{SD}(pe_t) \times 100$	47.0	**43.5**	13.0
$\mathrm{SD}_i(pe_{i,t}) \times 100$	22.6	**21.1**	4.2
Labor Market			
$\mathrm{SD}(u_t) \times 100$	2.10	**1.28**	0.34
$\mathrm{SD}(q_t) \times 100$	8.70	**6.16**	0.91
$\mathrm{SD}_i(hl_{i,t}) \times 100$	15.70	**10.39**	4.65

Notes: This table compares empirical moments with model-generated moments with and without constant-gain learning. $\mathrm{SD}(\cdot)$ denotes the time-series standard deviation of aggregate variables. $\mathrm{SD}_i(\cdot)$ denotes the cross-sectional standard deviation across firms at each point in time, averaged over time. $\mathrm{AC}(\cdot)$ denotes the first-order autocorrelation coefficient. $\mathrm{Corr}(\cdot)$ denotes the correlation between two time series. pe_t is the log price-earnings ratio, r_t is the log stock return, Δe_t is log earnings growth, q_t is the job-filling rate, u_t is the unemployment rate, and $hl_{i,t}$ is the firm-level hiring rate. $\mathbb{F}_t[\cdot]$ denotes subjective expectations formed at time t. Data column reports empirical moments estimated from historical data. Learning model reports moments from simulations of the constant-gain learning model. Rational model reports moments from the rational expectations benchmark where agents have perfect knowledge of the earnings process.