Empirical Evidence and Survey Data

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NBER Behavioral Macroeconomics Research Boot Camp
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- Surveys by themselves can't discipline our thinking much without models (bridge to Joel and Chen's lectures)

Outline

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- It is a quarterly-frequency survey of forecasters at large financial institutions, in which respondents are asked to forecast a long list of macro variables at horizons from 0 to 4 (or 5) quarters
  - Usual suspects: GDP, inflation (deflator, CPI, PCE), unemployment
  - GDP components: consumption vs. investment vs. net exports
  - 5-year and 10-year forecasts of GDP growth, productivity growth, inflation
  - etc.

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  - GDP components: consumption vs. investment vs. net exports
  - 5-year and 10-year forecasts of GDP growth, productivity growth, inflation
  - etc.
- Very straightforward to download data and compare predictions with actual statistical indicators (caveat: first release vs. later release)
- Might be considered a "conservative" test of all sorts of departures from rational expectations, since respondents are "sophisticated"

An Example Survey

SPF 2023:Q1

Section 1. U.S. Business Indicators

Forecaster:
Date:

		Quarterly Data						Annual Data [a]				
	L / G	2022:Q4	2023:Q1	2023:Q2	2023:Q3	2023:Q4	2024:Q1	2022	2023	2024	2025	2026
1. Nominal GDP		26132.5						25461.4				
2. GDP Price Index (Chain)		129.37						127.19				
3. Corporate Prof After Tax		.						.				
4. Civilian Unemp Rate	L	3.6						3.6				
5. Nonfarm Payroll Employment [b]		153509						152041				
6. Industrial Prod Index		104.1						103.9				
7. Housing Starts		1.403						1.555				
8. T-Bill Rate, 3-month	L	4.04						2.02				
9. Moody's AAA Corp Bond Yield [c]	L	.						.				
10. Moody's BAA Corp Bond Yield [c]	L	.						.				
11. Treasury Bond Rate, 10-year	L	3.83						2.95				

Do your forecasts for Nonfarm Payrolls include the February 3, 2023 benchmark revision?

Did you use (check one): **Unrevised Data?** **Revised Data?**

A Question to Ponder

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What would you do if you had to fill out the SPF in the next hour?

Would your answer change if you were making these projections for...

- guiding corporate strategy at a large investment bank?
- an input to a quantitative trading strategy?
- a friendly wager among your friends?

Other Similar Datasets

- The Livingston Survey, a binannual survey of academia and industry that has run since 1946
- The Blue Chip Economic Indicators survey, a monthly survey with similar scope and target audience as the SPF (you need a subscription or library access for these data)
- The Blue Chip Financial Forecasts survey, which is similar to the above but asks about more financial variables
- The Federal Reserve staff's Greenbook (Tealbook) forecasts, which are released with a five-year delay and provide insight to how monetary policymakers view the economy (and if they disagree with the market professionals)

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- *Key Fact.* If $Y \in \mathcal{F}_{it}$, then it shouldn't predict i's forecast error:

$$\begin{aligned} \mathbb{E}[Y(X - \mathbb{E}_{it}[X])] &= \mathbb{E}[\mathbb{E}_{it}[Y(X - \mathbb{E}_{it}[X])] \\ &= \mathbb{E}[Y\mathbb{E}_{it}[X] - Y\mathbb{E}_{it}[\mathbb{E}_{it}[X]]] \\ &= 0 \end{aligned} \tag{1}$$

A Test of Common-Information Rational Expectations

- Assumption 0: (maintained always) measured expectations correspond with those derived from Bayes' rule, given available information
- Assumption 1: information accumulates, or $\mathcal{F}_{is} \subseteq \mathcal{F}_{it}$ for $s \leq t$
- Assumption 2: common information, or $\mathcal{F}_{it} = \mathcal{F}_{jt}$
- Note that these assumptions are standard from most macroeconomic models in first-year macro, which have a representative agent or heterogeneous agents who form expectations (at least about aggregates) with the same information
- These assumptions together with the logic from the last slide imply that no agent j's forecast should predict any other agent i's forecast error (immediate from assuming that $\mathbb{E}_{jt}[Y] \in \mathcal{F}_{jt} = \mathcal{F}_{it}$)

Key Test 1: Coibion and Gorodnichenko (2015)

Time-series regression:

$$\underbrace{z_{t+h} - \bar{\mathbb{E}}_t[z_{t+h}]}_{\text{Forecast error}} = a + K_{CG} \cdot \underbrace{(\bar{\mathbb{E}}_t[z_{t+h}] - \bar{\mathbb{E}}_{t-1}[z_{t+h}])}_{\text{Forecast revision}} + u_t \tag{2}$$

- $\bar{\mathbb{E}}[\cdot]$ denotes mean or median over the SPF panel
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- If Assumptions 1 and 2 from the last slide hold ("common information rational expectations"), then $K_{CG} = 0$
- Informally, if $K_{CG} > 0$, expectations "underreact" and, if $K_{CG} < 0$, they "overreact"

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- On next slide, we will consider results for unemployment and GDP deflator inflation at horizon $h = 3$, from 1968-2017

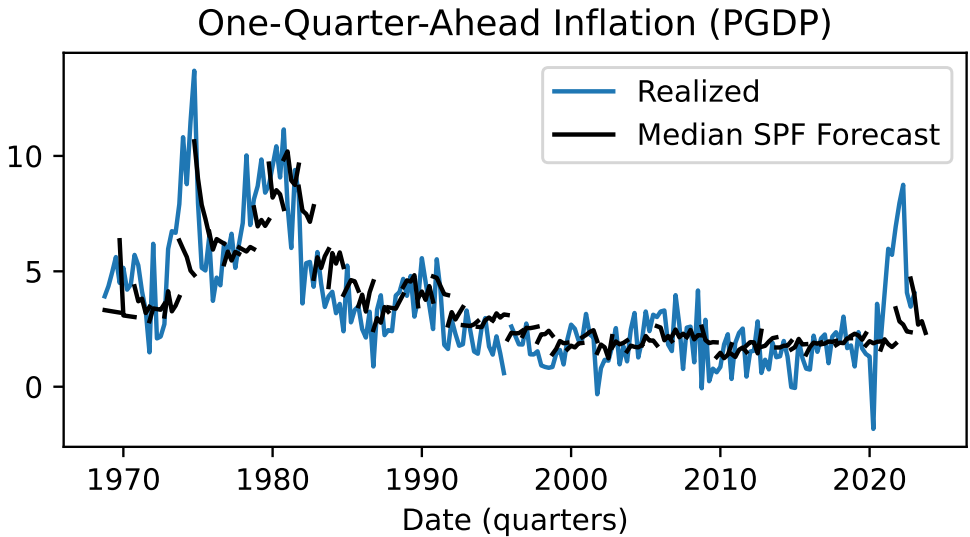
Key Result 1: Underreaction in Aggregate Forecasts

$$\underbrace{z_{t+h} - \bar{\mathbb{E}}_t[z_{t+h}]}_{\text{Forecast error}} = a + K_{CG} \cdot \underbrace{(\bar{\mathbb{E}}_t[z_{t+h}] - \bar{\mathbb{E}}_{t-1}[z_{t+h}])}_{\text{Forecast revision}} + u_t \quad (3)$$

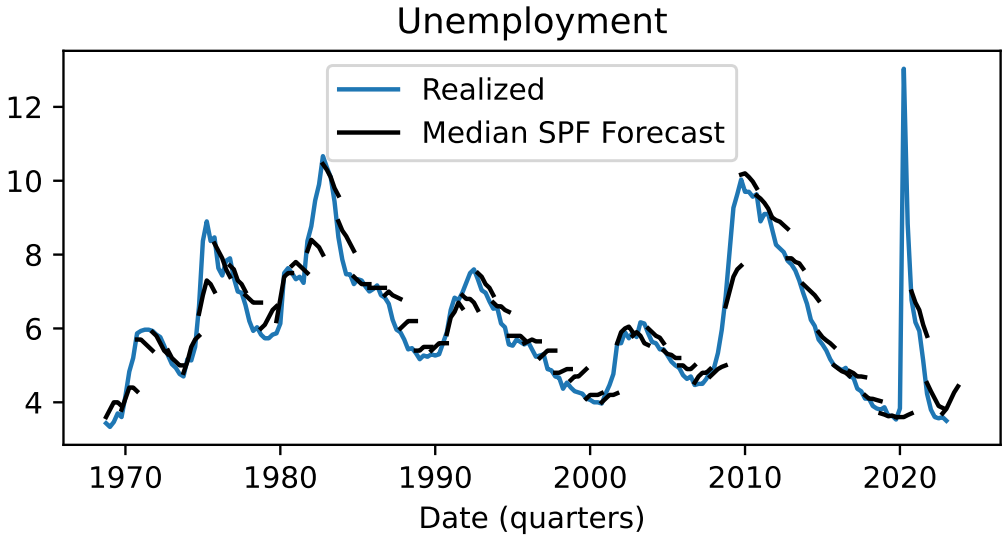
	(1)	(2)	(3)	(4)
variable	Unemployment		Inflation	
sample	1968-2017	1984-2017	1968-2017	1984-2017
$\text{Revision}_t\,(K_{CG})$	0.741	0.809	1.528	0.292
	(0.232)	(0.305)	(0.418)	(0.191)
R^2	0.111	0.159	0.278	0.016
Observations	191	136	190	135

Notes: The dataset is the Survey of Professional Forecasters and the observation is a quarter between Q4-1968 and Q4-2017. The forecast horizon is 3 quarters. Standard errors are HAC-robust, with a Bartlett ("hat") kernel and lag length equal to 4 quarters. The data used for outcomes are first-release.

Why is This True? View for Inflation



Why is This True? View for Unemployment



Key Test 2: Bordalo, Gennaioli, Ma, and Shleifer (2021)

Panel regression, for forecasters i in quarters t:

$$\underbrace{z_{t+h} - \mathbb{E}_{it}[z_{t+h}]}_{\text{Forecast error}} = a + K_{\text{BGMS}} \cdot \underbrace{(\mathbb{E}_{it}[z_{t+h}] - \mathbb{E}_{i,t-1}[z_{t+h}])}_{\text{Forecast revision}} + u_{it} \tag{4}$$

- Can vary outcome variable Y and horizon h
- Important: can be large outliers (in next slide, $>$ 4 x IQR away from median)

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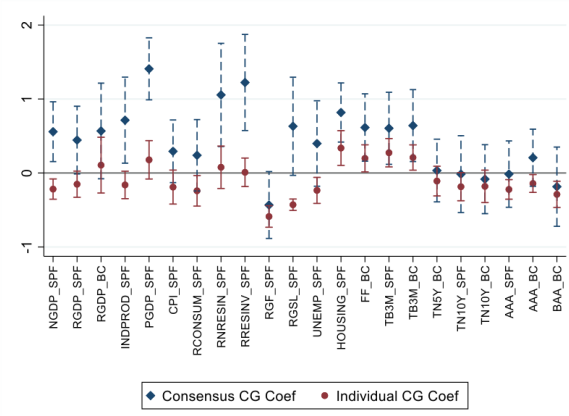
- If Assumption 1 holds (information accumulates), then $K_{\text{BGMS}} = 0$
- Informally, if $K_{\text{BGMS}} > 0$, expectations "underreact" and, if $K_{\text{BGMS}} < 0$, they "overreact"

Key Result 2: Individual Forecasts "Over-react" More

Figure 1. Forecast Error on Forecast Revision (CG) Regression Results

This figure plots the forecast error on forecast revision regression coefficients. The diamonds represent the coefficient β_1 in Equation (1) using consensus forecasts, and the circles represent the coefficient β_1^p in Equation (2) using individual forecasts. Standard errors are Newey-West for consensus time series regressions, and clustered by forecaster and time for pooled individual level panel regressions.



A Combination of Facts 1 and 2

Panel regression:

$$\text{Error}_{i,t,k} = a + (-K_{\text{noise}}) \cdot (\text{Revision}_{i,t,k} - \text{Revision}_{t,k}) + K_{\text{agg}} \cdot \text{Revision}_{t,k} + u_{i,t,k} \quad (5)$$

	(1)	(2)	(3)	(4)
variable	Unemployment		Inflation	
sample	1968-2017	1984-2017	1968-2017	1984-2017
$\text{Revision}_{i,t}$ - Revision_{t} ($-K_{\text{noise}}$)	-0.166	-0.162	-0.346	-0.410
	(0.043)	(0.053)	(0.042)	(0.041)
Revision_{t} (K_{agg})	0.745	0.841	1.550	0.412
	(0.173)	(0.210)	(0.278)	(0.180)
R^2	0.103	0.152	0.211	0.072
Observations	5383	3769	5147	3643

Notes: The observation is a forecaster by quarter between Q4-1968 and Q4-2017. The forecast horizon is 3 quarters. Standard errors are clustered two-way by forecaster ID and time period. Both errors and revisions are winsorized over the sample to restrict to 4 times the inter-quartile range away from the median. The data used for outcomes are first-release.

Statistically, it would be useful to put more weight on others' forecasts

Key Test 3: Coibion and Gorodnichenko (2012) and Angeletos, Huo, and Sastry (2021)

So far: unconditional correlations of forecasts, outcomes, and errors

Unanswered question: how do forecasts (and errors) respond to macroeconomic "shocks"? (nerdier point: lots of moving average representations can lead to same correlations)

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Unanswered question: how do forecasts (and errors) respond to macroeconomic "shocks"? (nerdier point: lots of moving average representations can lead to same correlations)

Solution: estimate IRFs of forecasts to shocks

Shocks: usual suspects; or DSGE shocks; or "main BC shocks" (Angeletos, Collard & Dellas, 2020)

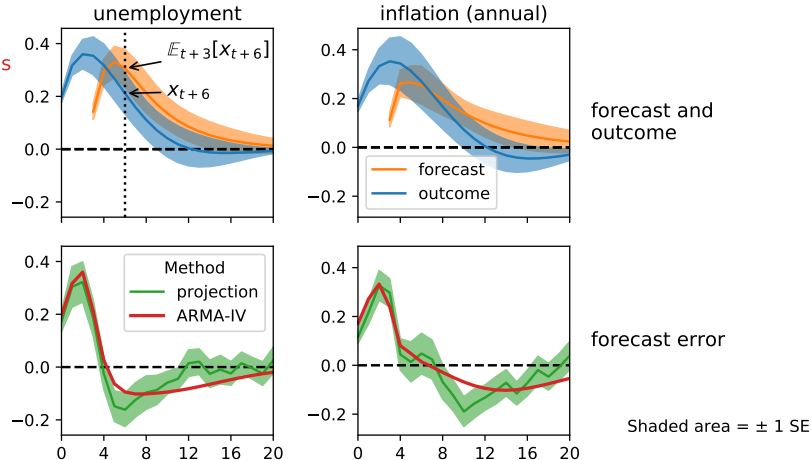
Estimation method: plain-vanilla linear projection;
or big VARs; or ARMA-IV

Moments of interest:

$$\left(\frac{\partial \text{ForecastError}_{t+k}}{\partial \text{BusinessCycleShock}_t} \right)_{k=0}^{K} = \text{Pattern of mistakes}$$

Key Result 3: Dynamic Over-Shooting

Each "slice" compares 3-Q-ahead forecasts with outcome

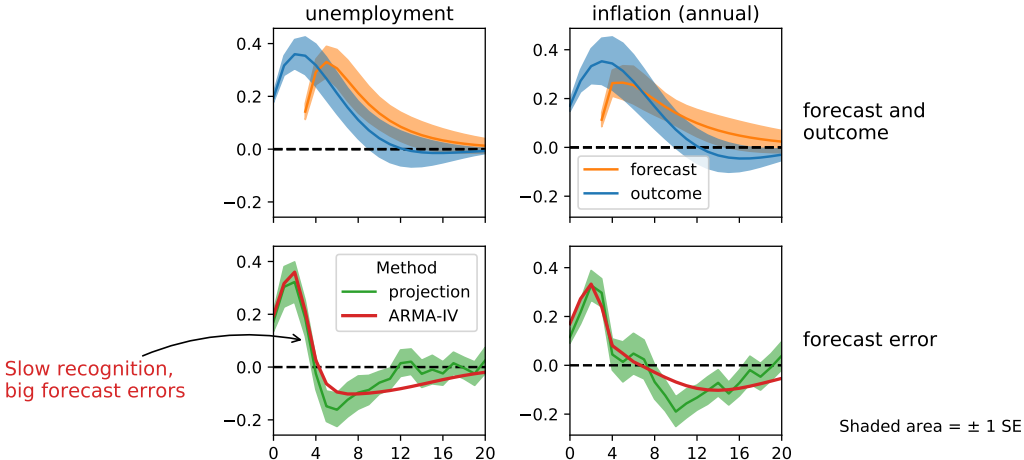


forecast and outcome

forecast error

Shaded area = ± 1 SE

Key Result 3: Dynamic Over-Shooting



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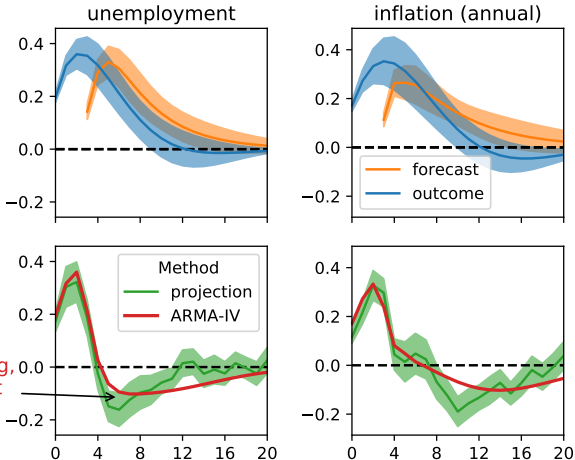
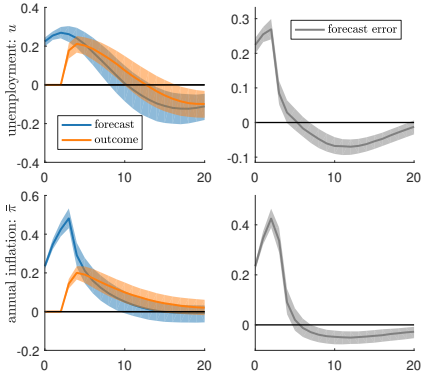


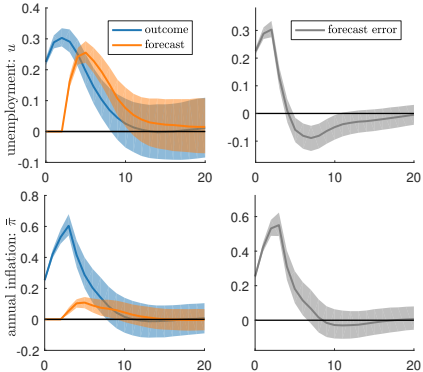
Same Pattern in a Structural VAR

13-Variable Model: "usual suspects" + unemployment and inflation forecasts

ACD, 2020 (max-share for BC)



Cholesky (one-step-ahead Error)



A Signal-Processing Model that Can Rationalize the Facts

Limited Information

Fundamental is Gaussian AR(1), unit variance shocks

$$z_t = (1 - \rho\mathbb{L})^{-1}\eta_t$$

Noisy Gaussian signal

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

Information set (stationary)

$$\mathcal{F}_{it} = (s_{i,r})_{r \leq t}$$

"Behavioral" Departures

Perception of signal

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

over/under confidence?

Perception of fundamental process

$$z_t = (1 - \hat{\rho}\mathbb{L})^{-1}\eta_t$$

over/under extrapolation?

Interpreting K_{CG}

$$K_{\text{CG}} = \kappa_1 \tau^{-1} - \kappa_2(\hat{\rho} - \rho) \tag{6}$$

where $\kappa_1 > 0, \kappa_2 > 0$ depend on $(\hat{\tau}, \rho, \hat{\rho})$.

1. When $\hat{\tau} = \tau$ and $\hat{\rho} = \rho$ (noisy but rational expectations), K_{CG} is non-negative and strictly increasing in the level of noise. In this sense, K_{CG} is a measure of the informational friction.
2. More generally, could also reflect under-extrapolation $(\hat{\rho} < \rho)$.

Interpreting K_{BGMS}

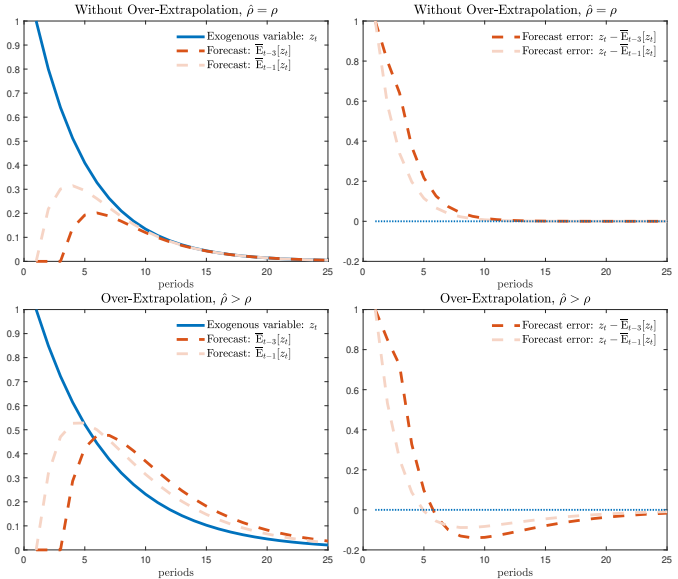
$$K_{\text{BGMS}} = -\kappa_5(\tau^{-1} - \hat{\tau}^{-1}) + \kappa_6(\rho - \hat{\rho}) \tag{7}$$

where $\kappa_5, \kappa_6 > 0$ depend on $(\tau, \hat{\tau}, \rho, \hat{\rho})$.

1. $\hat{\tau} = \tau$ and $\hat{\rho} = \rho$ (noisy but rational expectations) restrict $K_{\text{BGMS}} = 0$
2. $\hat{\tau} \geq \tau$ (overconfidence) and $\hat{\rho} \geq \rho$ (over-extrapolation), imply $K_{\text{BGMS}} < 0$, or over-reaction of individual forecasts
3. $\hat{\tau} \leq \tau$ (underconfidence) and $\hat{\rho} \leq \rho$ (under-extrapolation), imply $K_{\text{BGMS}} > 0$, or over-reaction of individual forecasts

Alternative explanation in BGMS (2021) paper based on *diagnostic expectations*

Dynamic Response: Delayed Overshooting



Discussion and Open Questions

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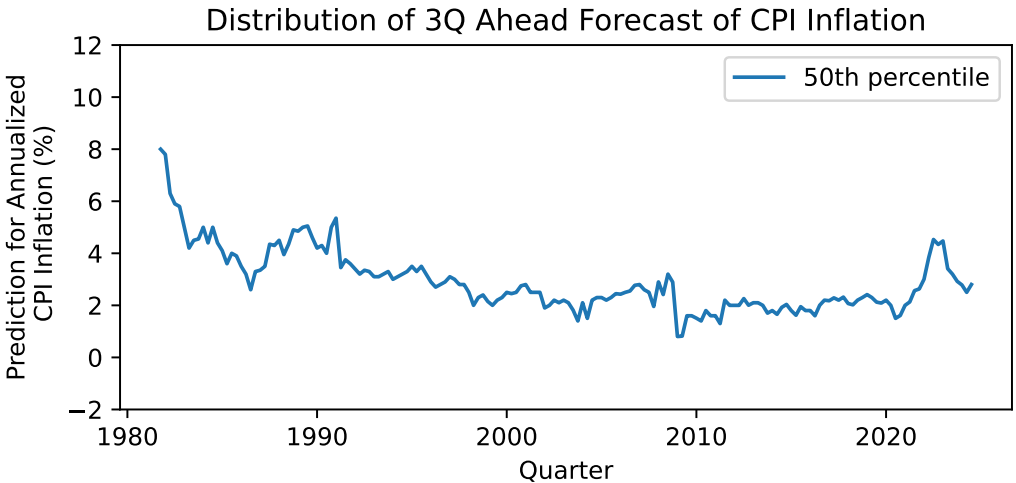
- Caveat two: we didn't give a sophisticated model of disagreement or forecast dispersion, which outside of linear models would be very important. These disagreements are large and persistent in the SPF. Focus of another very interesting literature that I couldn't cover in these slides.

Disagreements Within the SPF



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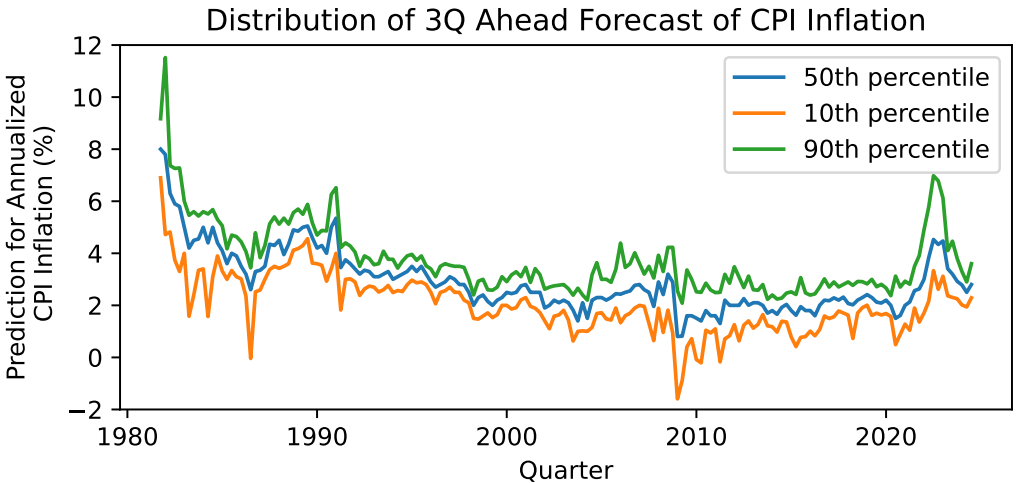

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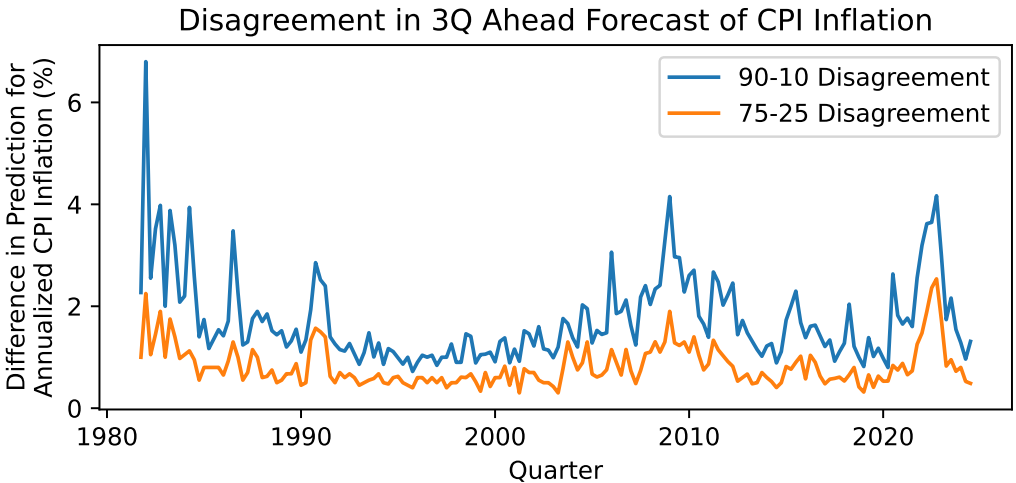
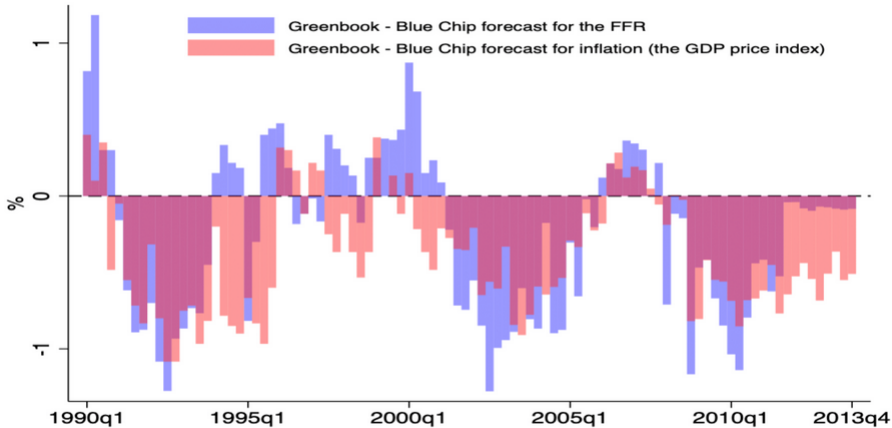


Disagreements Between Professionals and the Fed

From Caballero and Simsek, "Monetary Policy with Opinionated Markets" (2022)



Outline

The Michigan Survey of Consumers

- Monthly, nationally representative survey of Americans (about 500 participants, random digit dialing)
- Has existed in some form since the 1940s, and in "modern" form since 1979
- Asks a wide variety of questions about...
  - General economic outlook (optimism about "business conditions")
  - Expectations for inflation, gas prices, stock prices, and unemployment (latter two are *categorical*)
  - Attitude toward buying durable goods, buying houses, investing in stock market

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  - Attitude toward buying durable goods, buying houses, investing in stock market
- A more comprehensive, comparable dataset has been collected by the New York Fed since about 2013

Ingredients of the Index of Consumer Sentiment

The Index of Consumer Sentiment (ICS) is derived from the following five questions:

x_1 = PAGO_R = "We are interested in how people are getting along financially these days. Would you say that you (and your family living there) are better off or worse off financially than you were a year ago?"

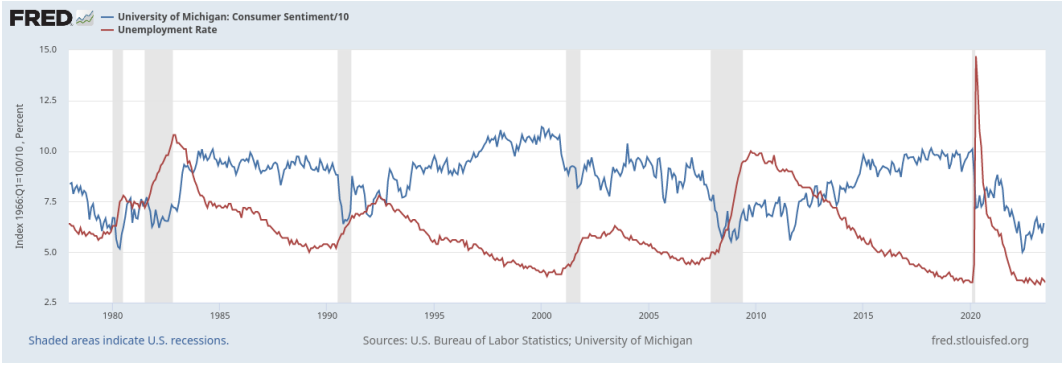
x_2 = PEXP_R = "Now looking ahead--do you think that a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?"

x_3 = BUS12_R = "Now turning to business conditions in the country as a whole--do you think that during the next twelve months we'll have good times financially, or bad times, or what?"

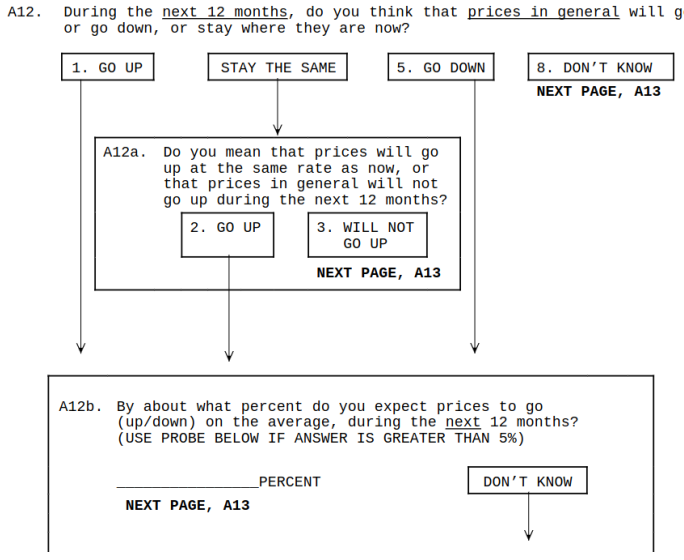
x_4 = BUS5_R = "Looking ahead, which would you say is more likely--that in the country as a whole we'll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?"

x_5 = DUR_R = "About the big things people buy for their homes--such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or bad time for people to buy major household items?"

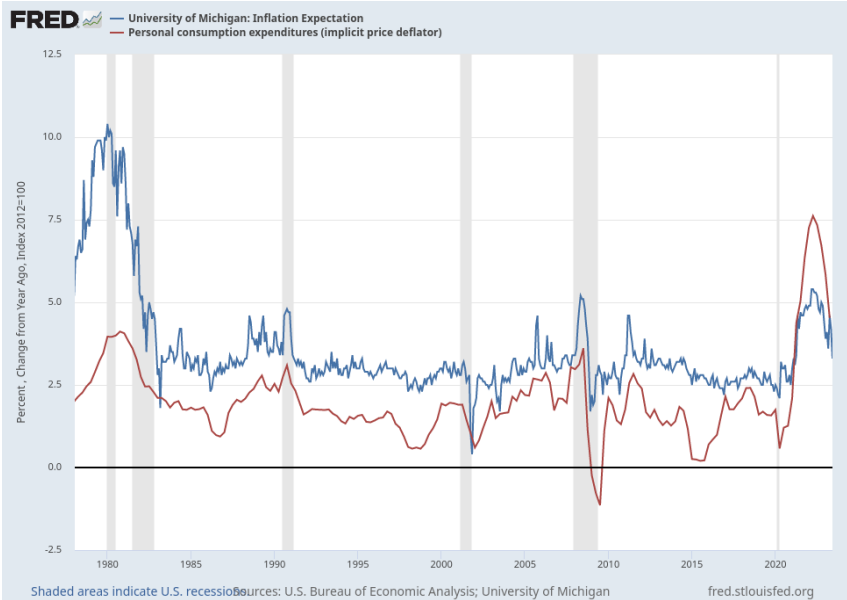
ICS Drops in Recessions, and Has Medium-Frequency Swing



The Inflation Expectations Questions



Inflation Expectations are Elevated, Slow to Adjust



Huge Divergence Based on Age

Figure 1 of Malmendier and Nagel (2016, "Learning from Inflation Expectations"). Dots are 1-year moving averages of mean inflation expectations.

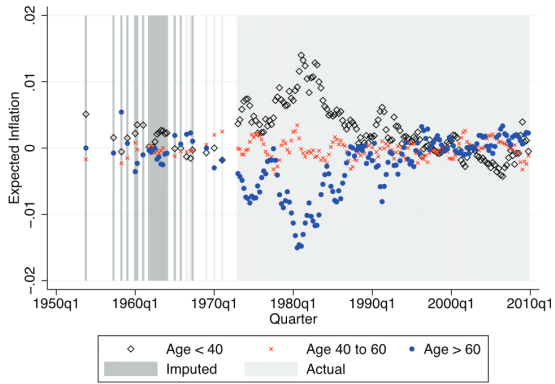


FIGURE I

Inflation Expectations by Age Group Relative to Cross-Sectional Mean

Malmendier and Nagel (2016): Learning with *Experience Effects*

- Almost self-evident starting point: people with different life experiences think about inflation differently
- But how can we incorporate this into a statistical model of learning? Everyone has access to the same "data"

Malmendier and Nagel (2016): Learning with *Experience Effects*

- Almost self-evident starting point: people with different life experiences think about inflation differently
- But how can we incorporate this into a statistical model of learning? Everyone has access to the same "data"
- Malmendier and Nagel propose a specific model of learning with "experience effects," that will make specific, testable predictions
  - Basic idea: people put too high of a weight on "data" from their lives, relative to what a Bayesian learner would do

Visualizing the Fit of Experience Effects

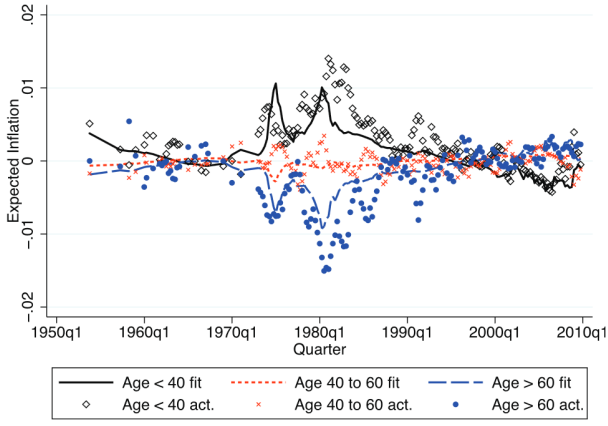


FIGURE IV

Comparison of Actual and Fitted One-Year Inflation Expectations by Age Group Relative to Cross-Sectional Mean

Does This Matter for Decisions?

- Hypothesis: inflation expectations affect portfolio decisions, especially whether to borrow or save at fixed nominal interest rates (e.g., for houses)
- MSC doesn't have data on "decisions"
- Turn to the Survey of Consumer Finances and run the cohort-by-time regression:

$$\text{FixedRateLiab}_{t,s} = \beta_1 \text{ExperienceForecast}_{t,s} + \beta_2' X_{t,s} + \delta_t + \delta_s + \epsilon_{t,s} \quad (8)$$

  where the FE are at the year and cohort levels and $X_{t,s}$ are other cohort characteristics (income, net worth)

- Where does identification come from with two-way cohort and time FE?

High Inflation Experience → More Fixed Rate Mortgages

TABLE III

INFLATION EXPERIENCES AND HOUSEHOLD NOMINAL POSITIONS

	(1) Fixed-rate mortgages	(2) Long-term bonds	(3) Fixed-rate mortgages	(4) Long-term bonds	(5) New fixed-rate mortgages	(6) New variable-rate mortgages
Learn.-from-exp. forecast	35.27	−20.56	26.77	−9.07	132.71	−42.82
	(8.39)	(13.74)	(4.47)	(6.92)	(25.08)	(55.57)
Log income	0.92	0.45	0.60	0.02	1.23	2.60
	(0.16)	(0.25)	(0.13)	(0.13)	(1.19)	(1.29)
Log net worth	−0.10	1.09	0.18	1.18	−0.56	−1.79
	(0.15)	(0.13)	(0.06)	(0.10)	(0.69)	(0.94)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full	Full	≥1983	≥1983	≥1983	≥1983
Adj. R^2	0.617	0.852	0.856	0.915	0.485	0.243
# Obs.	950	900	450	450	450	450

Another form of Experience Effect

- D'Acunto, Malmendier, Ospina, and Weber on "Exposure to Grocery Prices and Inflation Expectations" (*JPE*, 2021)
- Combines Nielsen scanner data with a new module asking about inflation expectations
  - Fine-grained measure of "exposure"
  - Quality control on what the inflation data measure
  - Direct link to decisions
- Data are from two survey weaves, about one year apart (with a few base years of linked data on spending patterns)

Best Predictor of Expectations is "Frequency-CPI"

TABLE 2
GROCERY SHOPPING AND INFLATION EXPECTATIONS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Household CPI	.171***	.174***	.192***				.046	.014	.070
	(4.50)	(4.59)	(2.82)				(.77)	(.24)	(.78)
Frequency CPI				.199***	.221***	.304***	.164***	.211***	.243**
				(5.19)	(5.83)	(3.40)	(2.73)	(3.56)	(2.04)
Observations	59, 126	56, 220	56, 220	59, 126	56, 220	56, 220	59, 126	56, 220	56, 220
Adjusted R^2	.028	.090	.245	.028	.091	.245	.028	.091	.245
Demographic controls		X	X		X	X		X	X
Expectation controls		X	X		X	X		X	X
County fixed effects		X	X		X	X		X	X
Individual fixed effects			X			X			X

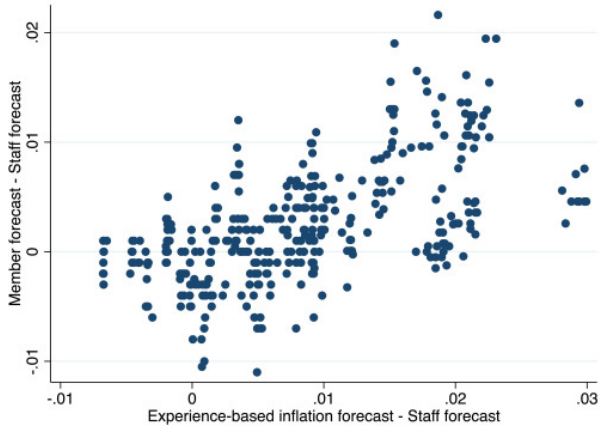
NOTE.—This table reports OLS estimates of regressing individuals' inflation expectations on the inflation rates in their household consumption bundles. Inflation expectations are from the customized CBEAS, fielded in June 2015 and June 2016. The inflation question is randomized to ask about changes in prices (as in the MSC) or about inflation (as in the SCE). Measures of household-level inflation are constructed from the KNCP. We use the 12 months before the June of each survey wave to measure price changes and the 12 months before that period as the base period. The Household CPI uses the Nielsen expenditure shares in the base periods as weights; the Frequency CPI uses the frequencies of purchase (overall quantity) in the base period as weights; both CPIs use volume-weighted net prices (gross prices net of discounts). Demographic controls include age, square of age, sex, employment status, 16 income dummies, homeownership, marital status, household size, college dummy, four race dummies, and reported risk tolerance. Expectation controls include household income expectations, aggregate economic outlook, and personal financial outlook. All columns include survey-wave, inflation-question, and county fixed effects. Standard errors are clustered at the household level; t-statistics are in parentheses.

** $p < .05$.

*** $p < .01$.

Further Application: FOMC Forecasts

from Malmendier, Nagel, and Yan (*JME*, 2021): "The Making of Hawks and Doves."



Taking Stock

- Experience effects, broadly defined, seem like a powerful model of household inflation expectations. But how does this matter?

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- Avenue 1: focus on the aggregate prediction that expectations are mostly adaptive, and run with the predictions of that
  - see Section V of Malmendier and Nagel for aggregation results
  - see Coibion and Gorodnichenko (*AEJ Macro*, 2015) for New Keynesian Phillips curve example ("missing disinflation")
- Avenue 2: Nail down what heterogeneity in inflation expectations implies for household portfolios, redistributive effects of monetary and fiscal policy, etc.
- Avenue 3: Nail down how "salient prices" affect inflation expectations, for better prediction, or even policy manipulation

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- Avenue 3: Nail down how "salient prices" affect inflation expectations, for better prediction, or even policy manipulation
- Key theme is understanding more about how expectations $\rightarrow$ actions

Outline

Motivation: What About Expectations of Price Setters?

- We have talked a lot so far about "consumer" expectations datasets. What about firm managers' expectations?
- Bernanke (2007): Information on the price expectations of businesses who are, after all, the price setters in the first instance (...) is particularly scarce."
- Why would these be different than consumers' (or professionals')? Otherwise, why would they be useful to have for researchers or central banks?

Coibion, Gorodnichenko, and Kumar: New Survey Evidence

- Coibion, Gorodnichenko, and Kumar (*AER*, 2020) design and implement a new survey of firms in New Zealand.

- Four design goals:
  1. Ask quantitative questions, instead of just qualitative questions
  2. Cover a wide range of "regular" firms (remember, SPF had "firms" too)
  3. Ask about both the future (forecasts) and past (backcasts, attention, awareness)
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- Survey consists of six waves, from 2013:IV to 2016:II. Included about 3,144 firms in total.

Some Details on Implementation

- Authors first bought a directory of "all firms"; excluded government, agriculture, energy, mining; balanced to ensure 2/3 coverage in manufacturing and professional/financial services
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- Wave 1 response rate of 20%
- Data hand-recorded (and checked); some outliers hand-removed
- Quality verification: checking reported age against official records; checking (subset) of firms' products and prices against what comes up online; checking consistency across waves

Firms Forecast like Households Do

TABLE 1—MACROECONOMIC FORECASTS OF FIRMS AND OTHER ECONOMIC AGENTS

	Central bank	Professional forecasters		Households		Firms	
		Mean	SD	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. 2013:IV (*wave 1, number of observations: 3,144*)							
Inflation	1.3	2.0	0.2	3.6	2.4	5.3	3.2
Panel B. 2014:I (*wave 2, number of observations: 712*)							
Inflation	1.9	2.0	0.3	3.7	2.1	6.1	2.7
Unemployment	4.9	5.3	0.3	NA	NA	5.2	0.7
GDP growth	3.5	3.4	0.5	NA	NA	3.1	0.7
Panel C. 2014:III (*wave 3, number of observations: 1,601*)							
Inflation	1.6	1.9	0.2	3.5	2.4	4.1	2.5
Panel D. 2014:IV (*wave 4, number of observations: 1,257*)							
Inflation	1.1	1.7	0.3	3.1	2.0	4.5	2.8
Unemployment	5.2	5.2	0.3	NA	NA	5.9	1.2
GDP growth	3.5	3.0	0.3	NA	NA	3.6	1.0
Panel E. 2016:II (*wave 5, number of observations: 2,040*)							
Inflation	1.6	1.3	0.2	2.3	2.1	2.8	2.3
Unemployment	5.2	5.5	0.2	NA	NA	5.5	0.6
GDP growth	3.4	2.6	0.3	NA	NA	2.7	0.5
Panel F. 2016:IV (*wave 6, number of observations: 1,404*)							
Inflation	1.7	1.6	0.2	2.8	2.6	2.7	2.4
Unemployment	4.7	4.8	0.3	NA	NA	5.5	0.6
GDP growth	3.4	3.0	0.4	NA	NA	2.4	0.6

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→ High mean and dispersion for inflation

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→ Both firms an HH do a little better in later periods

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GDP growth	3.4	3.0	0.4	NA	NA	2.4	0.6

Always more calibrated for unemployment

Inflation Expectations Well Above 2%, Follow Petrol

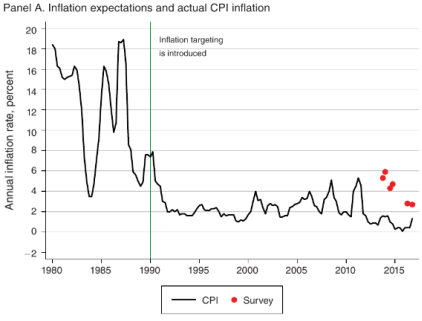
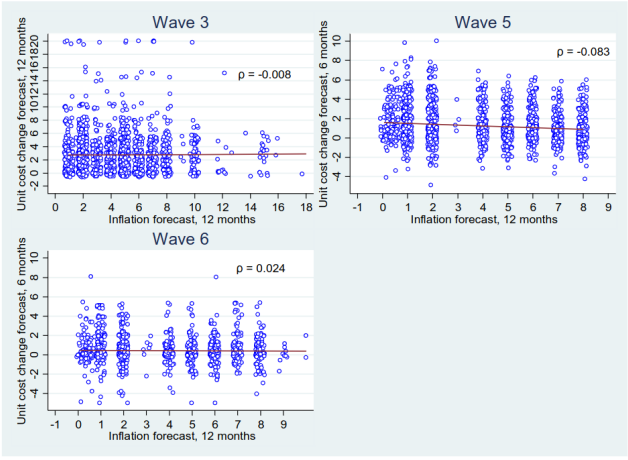


FIGURE 2. INFLATION IN NEW ZEALAND

Low Correlation with Expected Prices or Marginal Costs

Appendix Figure 3.3. Expectations of future inflation vs. future changes in own unit costs.



Inflation Backcasts Also Too High

TABLE 2—RECENT VALUES AND NOWCASTS OF FIRMS AND OTHER ECONOMIC AGENTS

	Recent data (1)	Households Mean (2)	Households SD (3)	Firms Mean (4)	Firms SD (5)
Panel A. 2013:IV (wave 1, number of observations: 3,144)					
Inflation	1.4	3.1	2.0	4.4	3.5
Panel B. 2014:I (wave 2, number of observations: 712)					
Inflation	1.6	2.9	1.8	5.5	3.3
Unemployment	5.6	NA	NA	6.5	1.4
Panel C. 2014:III (wave 3, number of observations: 1,601)					
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Panel E. 2016:II (wave 5, number of observations: 2,040)					
Inflation	0.4	1.8	1.5	2.6	2.1
Panel F. 2016:IV (wave 6, number of observations: 1,404)					
Inflation	0.4	2.4	2.4	NA	NA

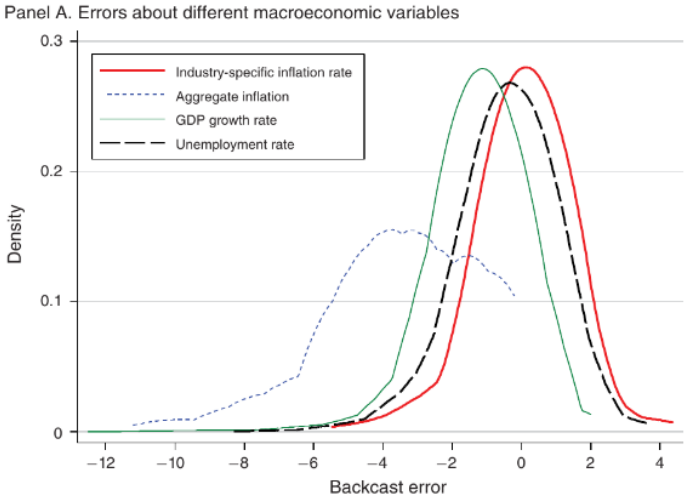
As before,

- upward bias for inflation
- calibrated for unemployment

Note that question is clear about definition of inflation

How is the interpretation different?

Inflation is Special – Compared also to Industry Prices



What Predicts Inattention?

Firm-level regression:

$$|\text{BackCastError}|_i = X_i'\beta + \gamma_{\text{industry}(i)} + \epsilon_{it} \tag{9}$$

What Predicts Inattention?

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$$|\text{BackCastError}|_i = X_i'\beta + \gamma_{\text{industry}(i)} + \epsilon_{it} \tag{9}$$

Significant positive coefficient on

- Age
- Employment
- Infrequency of price changes

Negative coefficient on

- Number of competitors – effects of competition? See also Afrouzi, 2023, on "Strategic Inattention"
- Past price change (i.e., whether past price went up) – indicative of inattention more than extrapolation?
- Slope of profit function (elicited by asking about hypothetical price changes and their hypothetical effects on profits) See also Flynn and Sastry, 2023, on "Attention Cycles"

Firms Don't Care Much about Inflation

TABLE 9—MACROECONOMIC VARIABLES: IMPORTANCE FOR BUSINESS DECISIONS AND TRACKING

Importance for business decisions (1 = high, 3 = low)	Follow (percent) (1)	Do not follow (percent) (2)	Willingness to pay for a professional forecast ($/year) (3)
Panel A. Inflation			
Shares, percent			
1	41.87	0.10	211.38
2	3.63	9.47	138.85
3	1.57	43.36	92.04
Total	47.07	52.93	148.26
Backcast error	1.10	4.96	
Forecast	3.34	5.85	
Forecast uncertainty (SD)	1.75	2.12	
Panel B. Unemployment			
Shares, percent			
1	18.02	1.13	166.60
2	39.32	8.83	115.88
3	13.99	18.71	110.73
Total	71.33	28.67	123.91
Backcast error	0.46	1.98	
Forecast	5.59	6.80	
Forecast uncertainty (SD)	0.79	0.71	
Panel C. GDP			
Shares, percent			
1	37.01	1.87	168.32
2	30.54	8.21	132.94
3	11.43	10.94	102.69
Total	78.99	21.01	139.93
Backcast error	1.02	2.42	
Forecast	3.50	4.15	
Forecast uncertainty (SD)	0.73	0.73	

If so, why do central bankers care what firms think about inflation?

More Concern in Hypothetical Recession

Suppose that you hear on TV that the economy is doing well [or poorly]. Would it make you more likely to look for more information?

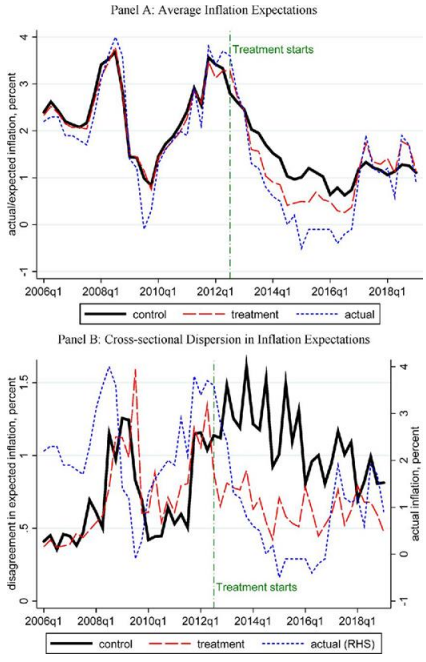
Response	Poorly	Well
Much more likely	44.96	9.77
Somewhat more likely	30.91	19.42
No change	12.56	8.67
Somewhat less likely	7.16	53.35
Much less likely	4.40	8.79
Total	100.00	100.00

Taking Experiments Further: Coibion, Gorodnichenko, and Ropele (2020)

- Authors implement a similar survey in Italy to study *causal effects of information treatments* on firms' decisions.

Taking Experiments Further: Coibion, Gorodnichenko, and Ropele (2020)

- Authors implement a similar survey in Italy to study *causal effects of information treatments* on firms' decisions.
- Control group is merely asked about inflation expectations. Treatment group is given information, then asked:
  In [previous month], consumer price inflation measured by the 12-month change in the Harmonized Index of Consumer Prices was [X.X]% in Italy and [Y.Y]% in the Euro area. What do you think it will be in Italy...
- Note that, before researchers redesigned survey in 2012, *all* firms got the "treatment." In that sense, the new group was "control"


Panel A: Average Inflation Expectations
Treatment starts
actual/expected inflation, percent
-1
0
1
2
3
4
2006q1
2008q1
2010q1
2012q1
2014q1
2016q1
2018q1
control
treatment
actual
Panel B: Cross-sectional Dispersion in Inflation Expectations
disagreement in expected inflation, percent
0
.5
1
1.5
actual inflation, percent
-1
0
1
2
3
4
Treatment starts
2006q1
2008q1
2010q1
2012q1
2014q1
2016q1
2018q1
control
treatment
actual (RHS)

Regression Model: How Expectations Affect Decisions

Firm-level regression, two-stage least squares

$$
\begin{aligned}
y_{i,t+k} &= \alpha_k + \gamma_k \mathbb{E}_{i,t-1}[\pi_{t,12m}] + \beta_k' X_{t-2} + \chi_{\text{season}(t),\text{sector}(i)} + \epsilon_{ik} \\
\mathbb{E}_{i,t-1}[\pi_{t,12m}] &= \tau \cdot \text{InfoTreatment}_i + \xi_k' X_{t-2} + u_{ik}
\end{aligned}
\tag{10}
$$

- $y_{i,t+k}$ is firm action k periods ahead (e.g., prices, employment credit utilization, loan applications), winsorized for top and bottom 2%
- Controls X include expectations of ther variables (firm-specific business conditions, employment growth, liquidity, general Italian economic situation)
- Fixed effects: seasonal trends for each sector
- Treatment is binary

Main Result: Prices Slightly Up, Employment Persistently Down

TABLE III

EFFECTS OF INFLATION EXPECTATIONS ON FIRM DECISIONS

	y_t^i (1)	y_{t+1}^i (2)	y_{t+2}^i (3)	y_{t+3}^i (4)	y_{t+4}^i (5)	y_{t+5}^i (6)
Panel A: Effect on prices (source: SIGE)						
$F_{t-1}^i \pi^{(12m)}$	0.205**	0.185*	0.063	0.008	0.020	−0.077
	(0.096)	(0.097)	(0.126)	(0.103)	(0.092)	(0.090)
Observations	16,227	13,765	12,878	12,011	11,208	10,419
R-squared	0.162	0.152	0.129	0.105	0.102	0.097
First-stage F-stat	112.9	113.7	117.2	112.7	112.6	112.5
Panel B: Effect on employment (source: SIGE)						
$F_{t-1}^i \pi^{(12m)}$	−0.074	−0.277*	−0.489***	−0.712***	−0.755***	−1.037***
	(0.067)	(0.149)	(0.156)	(0.196)	(0.219)	(0.196)
Observations	16,227	13,765	12,878	12,011	11,208	10,419
R-squared	0.018	0.025	0.036	0.055	0.052	0.049
First-stage F-stat	112.9	113.7	117.2	112.7	112.6	112.5
Panel C: Effect on employment (source: INPS)						
$F_{t-1}^i \pi^{(12m)}$	−0.186***	−0.232*	−0.609***	−1.081***	−1.195***	−1.522***
	(0.066)	(0.131)	(0.209)	(0.285)	(0.283)	(0.447)
Observations	15,062	12,764	11,907	11,090	10,321	9,570
R-squared	0.024	0.032	0.045	0.062	0.063	0.063
First-stage F-stat	114.8	118.4	117.4	114.2	113.5	116.5

Why? Treated Firms Expect Worse Macro Outcomes

TABLE VI

EFFECTS OF INFLATION EXPECTATIONS ON OTHER EXPECTATIONS AND PLANS

Row	Outcome variable	Coef. on $F^i_{t-1}\pi^{(12m)}$ (std. err.) (1)	Obs. (2)	R^2 (3)	First-stage F-stat (4)
	Macroeconomic conditions				
(1)	General economic situation relative to 3 months ago	−0.235***	20,256	−0.021	144.30
		(0.039)			
(2)	Probability of improved situation in the next 3 months	−2.287***	20,432	−0.009	145.16
		(0.553)			
	Firm-specific conditions				
(3)	Expected business conditions for company, next 3 months	−0.160***	20,421	−0.003	146.28
		(0.023)			
(4)	Expected demand for products, next 3 months	−0.104***	19,033	−0.008	95.45
		(0.026)			
(5)	Expected liquidity for company, next 3 months	−0.073***	20,181	0.000	146.33
		(0.018)			
(6)	Access condition to credit relative to 3 months ago	−0.118***	20,115	0.001	146.1
		(0.012)			
	Uncertainty				
(7)	3-month ahead	0.005**	20,110	0.001	145.50
		(0.003)			
(8)	3-year ahead	0.009***	20,122	0.001	147.84
		(0.002)			

Why? Treated Firms Expect Worse Macro Outcomes

TABLE VI
CONTINUED

Row	Outcome variable	Coef. on $F^i_{t-1}\pi^{(12m)}$ (std. err.) (1)	Obs. (2)	R^2 (3)	First-stage F-stat (4)
(9)	Expected employment change, next 3 months	−0.066*** (0.014)	20,379	0.002	144.29
(10)	Expected investment change, next calendar year	−0.117*** (0.041)	18,282	−0.004	114.17
(11)	Expected price change, next 12 months	0.100* (0.057)	20,512	0.003	146.31
	Factors affecting future price changes				
(12)	Expected change in demand	−0.134*** (0.020)	19,956	−0.002	147.08
(13)	Expected raw material prices	0.083*** (0.026)	19,894	0.003	147.99
(14)	Expected labor costs	0.018 (0.013)	19,912	0.001	147.03
(15)	Expected prices of competitors	−0.033 (0.022)	19,870	0.001	147.75

How to Think About Mapping to the Model? (I)

- Let's say that the outcome is the price change over the next quarter and that I want to interpret this in a version of the vanilla New Keynesian model

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- Does the IV regression estimate β? If so, why are we doing this?
- A better guess is that we get

$$\gamma^{\text{NKTheory}} = \beta + \kappa \frac{\bar{\Delta}\mathbb{E}_{it}[\text{RealMC}_{it}]}{\bar{\Delta}\mathbb{E}_{it}[\pi_{i,t+1}]} \tag{12}$$

where the "$\bar{\Delta}$" denotes the expected difference between treatment and control (i.e., OVB where OV is Real MC Expectations)

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- More generally, should a policymaker look at the regression results and think: "this is what would happen if we tried to move inflation expectations in the aggregate"? Why or why not?

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- Models matter!!

Outline

Motivation

- We've talked a lot about firms' macroeconomic expectations
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Motivation

- We've talked a lot about firms' macroeconomic expectations
- And also why the macroeconomic expectations may be unimportant, inducing inattention toward macro conditions
- So what are firms paying attention to? Are their "microeconomic" forecasts of firm-specific variables really good? Or are they also subject to animal spirits, misspecifications, over- and under-extrapolations?

Gennaioli, Ma, and Shleifer on "Expectations and Investment"

- These authors take data on a long-standing survey of firm CFOs run by John Graham and Campbell Harvey at Duke University
- Possible to link survey evidence on firm managers' expectations for their own business plans and future sales to eventual firm level decisons
- Easy to link these data to more familiar and easily available on equity analysts' expectations
  - What are the costs and benefits of focusing on the CFO's expectation vs. the analysts'?

Microeconomic Expectations in the Duke Survey

Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? (e.g., +3%, –2%, etc.) [Leave blank if not applicable]

Earnings: _____; Cash on balance sheet: _____; Capital spending: _____;

Prices of your product: _____; Number of domestic full-time employees: _____;

Wage: _____; Dividends: _____.

Straw man: vanilla Q theory models suggest that such expectations are *completely redundant* with the expectations of stochastically discounted cash flows that are embedded in asset prices.

Model: Do Expectations Predict Investment?

Firm-by-quarter model

$$\Delta_{12}\text{CAPX}_{it} = \alpha + \beta \cdot \mathbb{E}_{it}[\Delta_{12}\text{Earnings}_i] + \gamma' X_{it} + \xi_i + \epsilon_{it} \tag{13}$$

- where Δ_{12} denotes forward difference of 12 months; CAPX is realized capital expenditure
- Controls include a number of "Q-theory usual suspects"
- Estimation with and without firm fixed effects; *no time fixed effects*; standard errors single-clustered by fimr

Result: Expectations Matter, Net of Q Theory

	Planned Investment Growth in the Next 12 Months										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
CFO expectations of next 12m earnings growth	0.4200 (4.44)	0.4259 (4.50)	0.4639 (4.40)	0.3487 (3.25)	0.3887 (3.94)	0.3713 (3.99)	0.4172 (4.25)	0.3420 (3.16)	0.4139 (4.35)	0.4233 (4.28)	0.3149 (2.80)
Q			0.0384 (1.53)								
Book-to-market				−0.2303 (−4.32)							
Past 12m firm stock returns					0.0833 (3.49)						
Past 12m credit spread change						−0.1130 (−4.39)					−0.1391 (−2.99)
Past 12m change of net income/asset							0.0025 (2.23)				0.0025 (1.16)
Past 12m firm stock vol. change								−0.0905 (−2.87)			−0.0148 (−0.33)
Bloom policy uncertainty index (Past 12m change)								−0.0764 (−2.35)			0.0385 (0.96)
Past 12m GDP growth									1.0087 (1.86)		0.6293 (0.95)
Past 12m investment growth										0.0010 (0.05)	0.0048 (0.19)
Past 12m asset growth		0.1163 (1.37)	0.1089 (1.15)	0.0529 (0.63)	0.0626 (0.69)	0.0964 (1.17)	0.0929 (0.97)	0.0393 (0.40)	0.0800 (1.00)	0.1276 (1.39)	0.0008 (0.01)
Observations	850	834	740	761	764	834	809	719	834	790	692
R-squared	0.095	0.104	0.125	0.139	0.132	0.132	0.114	0.115	0.109	0.105	0.132
Number of firms	194	190	171	172	176	190	187	168	190	187	164

Result: Firms are Optimistic After Recent Good Performance

B. Firm-Level Evidence

	Realized – Analyst Expected Next 12m Earnings Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Past 12m firm earnings/asset (%)	−0.0080 (−7.43)		−0.0081 (−7.36)		−0.0061 (−6.71)	−0.0062 (−6.63)
Past 12m GDP growth		−1.6167 (−3.83)		−1.6235 (−3.72)		
Firm stock vol.			0.0158 (0.26)	−0.0256 (−0.50)		−0.0123 (−0.40)
Firm fixed effects	Y	Y	Y	Y	Y	Y
Time fixed effects			No		Yes	
Observations	103,930	123,430	100,451	115,120	103,930	100,451
R-squared	0.005	0.004	0.006	0.004	0.003	0.003
Number of firms	4,432	5,080	4,227	4,606	4,432	4,227

What questions can we answer with just this reduced-form evidence? What else would we want to know to draw aggregate conclusions?

Further Directions

- Barrero (2021): using US survey data, shows that firm managers are unbiased on average but overextrapolative; embeds this is a dynamic general equilibrium model; and shows effects on macroeconomic volatility, productivity dynamics

- My own work with Joel Flynn on "Macroeconomics of Narratives": in essence, a model of "micro beliefs," where they come from, and what their effects are; and different measurement of belief shifters from textual analysis, which we validate by linking to managerial guidance and analyst forecasts (will come up later in the course)

Key Themes

- Survey data on forecasts provide a valuable window into how decisionmakers think about macroeconomic and microeconomic variables
- The most developed arm of the literature studies *mean forecasts* of *professionals*, so there is lots of room to grow
- "Off the shelf" surveys are not designed precisely to answer our questions, so there are high returns to designing your own (bridge to Chris' lectures)
- Survey answers could be cheap talk, unless we can *empirically* show a link to decisions (bridge to Joel and Chen's lectures)
- Surveys by themselves can't discipline our thinking much without models (bridge to Joel and Chen's lectures)