Biased Surveys

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Do surveys reflect true beliefs?

- Expectations are crucial to both macroeconomics and finance
- Growing literature use surveys of professional forecasters to document
  - **Stickiness** in aggregate beliefs updating (Coibion & Gorodnishenko 15)
  - **Behavioral biases** in individual beliefs updating (Bordalo et al 20, BGMS)

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  - **Stickiness** in aggregate beliefs updating (Coibion & Gorodnishenko 15)
  - **Behavioral biases** in individual beliefs updating (Bordalo et al 20, BGMS)
- Typically assume surveys provide unbiased measure of respondents beliefs
  - Older literature considers strategic incentives biasing reported forecasts (Laster et. al. 99)

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- **This Paper:** Direct empirical test of strategic incentives in survey of prof forecst
- **Model:** develop strategic diversification game in forecast reporting
  - It can explain the documented *overreaction* to new information
  - But it also implies *underreaction* to new public information
- **Empirics:** find *underreaction* to *lagged* survey consensus forecast
  - Consistent with our strategic diversification model of "stand out from the crowd"
  - Not consistent with several behavioral models
  - No evidence of either under- or over- reaction in the Fed's Greenbook forecasts

Recover honest beliefs

- We document **strategic incentives** in forecast reporting
  - survey $\neq$ true expectation
- We estimate structurally the model to recover the underlying honest beliefs
  1. The honest **belief rigidity** is 20-30% higher than posted one
  2. The honest **belief dispersion** is 30-100% lower than the posted one

Literature

- Test RE hypothesis: evidence for behavioral biases

  Fuhrer 18, Bordalo et al 20, Broer and Kohlhas 23

  - Apparent behavioral bias can be ascribed to *strategic incentives* in forecast reporting

- Test FI hypothesis: document beliefs rigidity

  Muth 61, Coibion & Gorodnishenko 12, 15, Crowe 10, Woodford 02, Goldstein 21

  - Highlight bias in existing rigidity estimates from strategic incentives & correct them

- Forecasters' strategic incentives

  Laster et al 99, Ottaviani & Sorensen 06, Marinovic et al 13

  - Provide (i) novel supporting evidence, (ii) novel framework with public information, (iii) structural estimation on survey data

SPF DATA

- Data from the Survey of Professional Forecasters (SPF) collected by the Federal Bank Reserve of Philadelphia
- Quarterly panel of forecasts on macroeconomic and financial variables at different horizons
- For actual values, we use first-release data
- Transform variables in annualized growth rate

Simple Conceptual framework

- Forecasters try to forecast some unobservable fundamental x_t at horizon h
- Information sets can include components with idiosyncratic and common noise
  - Private signal: $s_t^i = x_{t+h} + \eta_t^i, \qquad \eta_t^i \sim N(0, \tau^{-1})$
  - Public signal: $g_t = x_{t+h} + e_t, \qquad e_t \sim N(0, \nu^{-1})$
- We assume forecast $\tilde{E}_t^i[x_{t+h}]$ at time t about horizon h follows

$$\tilde{E}_t^i[x_{t+h}] = \tilde{E}_{t-1}^i[x_{t+h}] + G_1(g_t - \tilde{E}_{t-1}^i[x_{t+h}]) + G_2(s_t^i - \tilde{E}_{t-1}^i[x_{t+h}])$$

- This setup embeds RE and many behavioral models as special cases
  - Coefficients G_1 and G_2 arbitrary, not necessarily "optimal"
  - Total weight on new information $G = G_1 + G_2$ (stickiness $1 - G$)

Motivation: overreaction to new information

- According to RE, individual forecast errors should be unpredictable
- BGMS (2020) run the regression

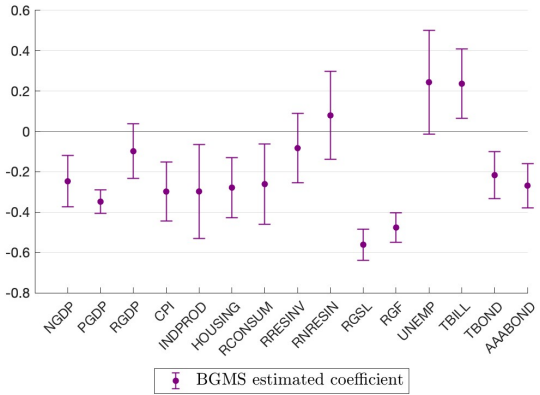
$$\underbrace{x_{t+h} - \tilde{E}_t^i(x_{t+h})}_{fe_{t+h,t}^i} = \alpha + \beta_{BGMS}(\underbrace{\tilde{E}_t^i(x_{t+h}) - \tilde{E}_{t-1}(x_{t+h})}_{fr_{t+h,t}^i}) + err_t^i$$

- Under RE, $\beta_{BGMS} = 0$
- They find $\beta_{BGMS} < 0$: **overreaction** to *new* information
  - After a good news ($fr > 0$) forecast too optimistic ($fe = \underbrace{x}_{\uparrow} - \underbrace{f(x)}_{\uparrow\uparrow} < 0$)

$\Rightarrow G_1 + G_2 \equiv G > G^{RE}$

Motivation: overreaction to new information

$$fe^i_{t+h,t} = \alpha + \beta_1 fr^i_{t+h,t} + err^i_t$$



Notes: Panel regression with individual fe. Standard errors are corrected for heteroskedasticity and autocorrelation as in Vogelsang (2012). Confidence intervals reported at 10% significance level.

Static strategic diversification game

- In the spirit of Morris and Shin (2002), forecasters face the objective

$$\max_{\widetilde{E}_t^{(i)}[x_{t+h}]} \mathbb{E}\left[-(\widetilde{E}_t^{(i)}[x_{t+h}] - x_{t+h})^2 + \lambda(\widetilde{E}_t^{(i)}[x_{t+h}] - \overline{E}_t[x_{t+h}])^2 \middle| g_t, s_t^{(i)}\right]$$

observing signals

$$\begin{aligned} g_t &= x_{t+h} + e_t, & e_t &\sim N(0, \nu^{-1}) \\ s_t^{(i)} &= x_{t+h} + \eta_t^{(i)}, & \eta_t^{(i)} &\sim N(0, \tau^{-1}) \end{aligned}$$

  - $\lambda = 0$: agents submit their honest beliefs
  - $0 > \lambda > 1$: agents wants to stand out from the crowd (winner-take-all game)

Honest and posted beliefs

- For analytical solution, assume x_t is iid with mean μ. Their honest posterior is

$$\mathbb{E}_t^{(i)}[x_{t+h}] = \mu + G_1^{RE}(g_t - \mu) + G_2^{RE}(s_t^{(i)} - \mu)$$

- While the posted forecast equals

$$E_t^{(i)}[x_{t+h}] = \mu + G_1(g_t - \mu) + G_2(s_t^{(i)} - \mu)$$

- Consistent with existing evidence
  - $G_1 + G_2 > G_1^{RE} + G_2^{RE}$: **overweight** *new* information (BGMS 2020)

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- Consistent with existing evidence
  - $G_1 + G_2 > G_1^{RE} + G_2^{RE}$: overweight new information (BGMS 2020)
  - $G_1 + G_2 < 1$: consensus belief **stickiness** (CG 2015, Goldstein 2021)

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- While the posted forecast equals

$$E_t^{(i)}[x_{t+h}] = \mu + G_1(g_t - \mu) + G_2(s_t^{(i)} - \mu)$$

- New key implications
  - $G_1 = \frac{(1-\lambda)G_1^{RE}}{(1-\lambda)+\lambda G_2^{RE}} < G_1^{RE}$: **underweight** new *public* information

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  - $G_1 = \frac{(1-\lambda)G_1^{RE}}{(1-\lambda)+\lambda G_2^{RE}} < G_1^{RE}$: underweight new public information
  - $G_2 = \frac{G_2^{RE}}{(1-\lambda)+\lambda G_2^{RE}} > G_2^{RE}$: **overweight** new *private* information

Honest and posted beliefs

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- While the posted forecast equals

$$E_t^{(i)}[x_{t+h}] = \mu + G_1(g_t - \mu) + G_2(s_t^{(i)} - \mu)$$

- New key implications
  - $G_1 = \frac{(1-\lambda)G_1^{RE}}{(1-\lambda)+\lambda G_2^{RE}} < G_1^{RE}$: underweight new public information
  - $G_2 = \frac{G_2^{RE}}{(1-\lambda)+\lambda G_2^{RE}} > G_2^{RE}$: overweight new private information
  - Consensus forecast *more accurate* than true beliefs

$$Var(x_{t+h} - \overline{E}_t(x_{t+h})) < Var(x_{t+h} - \overline{\mathbb{E}}_t(x_{t+h}))$$

Taking the model to the data

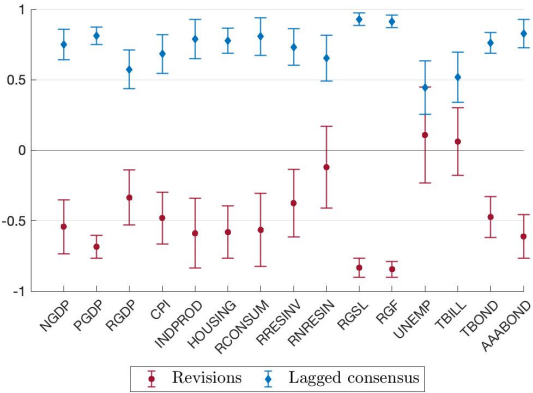
- Now we differentiate between reaction to *public* and *private* info
  - Public signal: **lagged consensus forecast**
  - Use surprise component: $pi_t^i \equiv \bar{\tilde{E}}_{t-1}[x_{t+h}] - \tilde{E}_{t-1}^i[x_{t+h}]$
- We run the following regression

$$fe_{t+h,t}^i = \alpha + \beta_1 fr_{t+h,t}^i + \beta_2 pi_{t+h,t}^i + err_t^i$$

- Under RE & truthful reporting: $\beta_1 = 0$, $\beta_2 = 0$. We find
  - $\beta_1 < 0$: **overreaction** to new *private* information
  - $\beta_2 > 0$: **underreaction** to new *public* information

Taking the model to the data

$$fe^i_{t+h,t} = \alpha + \beta_1 fr^i_{t+h,t} + \beta_2 pi^i_{t+h,t} + err^i_t$$



Notes: Panel regression with individual fe. Standard errors are corrected for heteroskedasticity and autocorrelation as in Vogelsang (2012). Confidence intervals reported at 10% significance level.

Alternative interpretations

- We find **overreaction** to new *private info*, but **under-reaction** to new *public info*
- Consistent with our model of **strategic diversification**
  - Forecasters are rational but do not truthfully reveal their beliefs to surveys
  - Overweight private signals to stand out from the crowd (winner-take-all game)
- *Not* consistent with behavioral models of overreaction to all new information
  - Diagnostic expectations, extrapolative beliefs, ...
- But could be consistent with **behavioral overconfidence** (Daniel et al 98; Broer & Kohlas 18)
  - Forecasters are behavioral biased
  - Overweight private signals because wrongly perceived them as more accurate

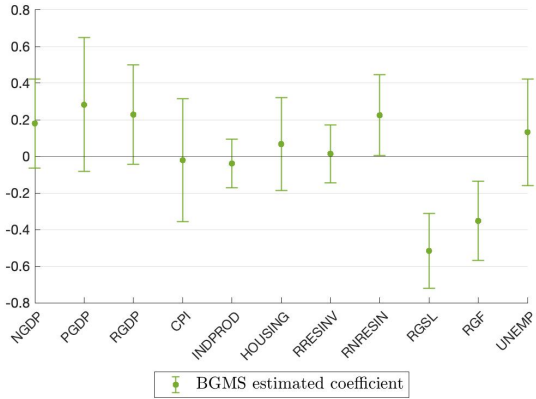
TEST 1: COMPARISON WITH CENTRAL BANK FORECASTS

- Compare SPF with frecasts not intended for the public: **Fed Board Greenbook**
  - Made available to public with 5 years lag, less subject to strategic incentives
  - We consider last forecast of each quarter of 11 variables also included in SPF
- We find **no over or under-reaction** to new information

$\Rightarrow$ Biases absent in survey less affected by strategic incentives

No over-reaction to new information

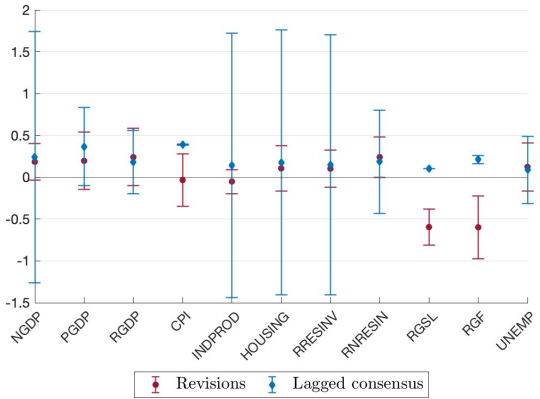
$$fe^i_{t+h,t} = \alpha + \beta_1 fr^i_{t+h,t} + err^i_t$$



Notes: Bars reports the 90% confidence interval for the estimated coefficients. Standard errors are robust to heteroskedasticity and Newey-West with the automatic bandwidth selection procedure of Newey and West (1994).

No over or under-reaction to private and public info

$$fe^i_{t+h,t} = \alpha + \beta_1 fr^i_{t+h,t} + \beta_2 pi^i_{t+h,t} + err^i_t$$



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Test 2: Compare different public signals

- Compare underreaction to two different public signals:
  1. **Lagged consensus:** $pi^i_{1,t} \equiv \bar{\bar{E}}_{t-1}[x_{t+h}] - \tilde{E}^i_{t-1}[x_{t+h}]$
  2. **Lagged actual:** $pi^i_{2,t} \equiv x_{t-1} - \tilde{E}^i_{t-1}[x_{t-1}]$
- We include both in the regression

$$fe^i_{t+h,t} = \alpha + \beta_1 fr^i_{t+h,t} + \beta_2 pi^i_{1,t} + \beta_3 pi^i_{2,t} + err^i_t$$

- We find $\beta_2 > \beta_3$: larger under-reaction to signal about other forecasters' beliefs
- Intuitively consistent with strategic diversification

Test 2: Compare different public signals

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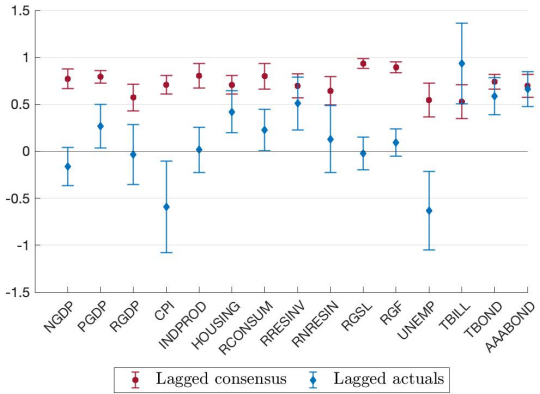

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QUANTITATIVE MODEL

Dynamic model

- **Fundamental:** unobservable, AR(1)

$$x_t = \rho x_{t-1} + u_t, \qquad u_t \sim N(0, \xi^{-1})$$

- **Information:** private signal and public signal

$$g_t = x_t + e_t, \qquad e_t \sim N(0, \nu^{-1})$$
$$s_t^i = x_t + \eta_t^i, \qquad \eta_t^i \sim N(0, \tau^{-1})$$

- **Global game**

$$\hat{x}_{t,t}^i = \frac{1}{1-\lambda} E_t^i[x_t] - \frac{\lambda}{1-\lambda} E_t^i[\bar{\hat{x}}_{t,t}]$$

$\Rightarrow$ Individual posted forecast update similar to Kalman Filter recursion

$$\hat{x}_{t,t}^i = \hat{x}_{t,t-1}^i + G_1(g_t - \hat{x}_{t,t-1}^i) + G_2(s_t^i - \hat{x}_{t,t-1}^i)$$

- With $G_1 < G_1^{RE}$ and $G_2 > G_2^{RE}$

Structural estimation

- For each series we estimate
  - Fundamental parameters (ρ, ξ) from actual data
  - Signal noises (ν, τ) and strategic incentive (λ) with GMM
- Target moments:
  1. Mean FE dispersion
  2. Estimated posted gain G
  3. Estimated overraction to private information
- Very good match of untargeted moments

Estimated parameters

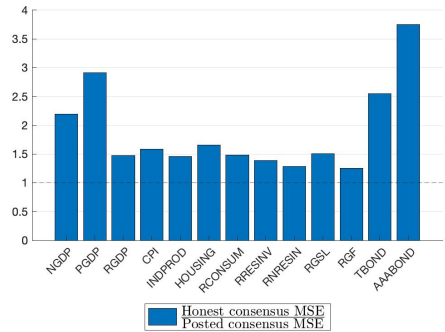
Posted and honest consensus forecast MSE

- Information rigidity is **higher** than the raw estimate

$$G_{true} \approx 0.4 < G_{posted} \approx 0.5$$

  - The reported consensus forecast is **more accurate** than true avg expectations
  - True consensus forecast MSE 30-100% **larger** than *posted* one

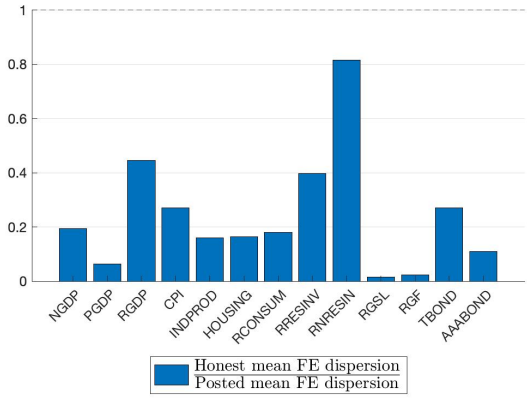
Estimated gain



Posted and honest FE dispersion

- True beliefs dispersion **lower** than raw estimate
  - True mean FE dispersion 80% **lower** than *posted* one

Estimated dispersion



Conclusion

- We provide new evidence consistent with **strategic diversification** in professional forecasters surveys
  - Survey expectations $\neq$ honest beliefs
  - Explain the biases documented by existing literature
- Estimate structurally a forecasting model of strategic incentives
  - We recover honest beliefs
  - Honest **stickiness** 20% higher and **dispersion** 80% lower than posted ones

Thank you!

Appendix

Summary statistics

	Consensus					Individual		
	Errors			Revisions		Forecast dispersion	Nonrev share	Pr(< 80% revise same direction)
	Mean	SD	SE	Mean	SD			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nominal GDP	-0.26	1.69	0.19	-0.14	0.68	1.00	0.02	0.80
GDP price index inflation	-0.28	0.58	0.08	-0.08	0.25	0.49	0.07	0.85
Real GDP	-0.26	1.64	0.19	-0.16	0.58	0.78	0.02	0.74
Consumer Price Index	-0.08	1.04	0.15	-0.11	0.68	0.54	0.06	0.66
Industrial production	-0.83	3.94	0.46	-0.49	1.19	1.57	0.01	0.72
Housing Start	-3.36	17.79	2.20	-2.31	5.93	8.34	0.00	0.68
Real Consumption	0.32	1.10	0.15	-0.06	0.41	0.61	0.03	0.78
Real residential investment	-0.46	8.32	1.19	-0.61	2.33	4.37	0.04	0.87
Real nonresidential investment	0.20	5.60	0.79	-0.22	1.71	2.31	0.03	0.74
Real state and local government consumption	0.04	2.96	0.38	0.14	1.10	2.09	0.07	0.91
Real federal government consumption	0.02	1.10	0.15	-0.05	0.33	0.98	0.11	0.93
Unemployment rate	0.01	0.68	0.08	0.05	0.32	0.30	0.18	0.66
Three-month Treasury rate	-0.51	1.14	0.16	-0.19	0.51	0.43	0.15	0.59
Ten-year Treasury rate	-0.48	0.73	0.11	-0.12	0.36	0.37	0.11	0.55
AAA Corporate Rate Bond	-0.46	0.82	0.11	-0.11	0.38	0.49	0.09	0.66

Fact 2: novel strategy to estimate stickiness

Variable	G_{CG} (1)	SE (2)	G (3)	SE (4)	Difference (5)	SE (6)	p-value (7)
Nominal GDP	0.66	0.13	0.53	0.02	0.13	0.13	0.17
GDP price index inflation	0.77	0.13	0.49	0.03	0.28	0.13	0.02
Real GDP	0.60	0.07	0.56	0.03	0.04	0.08	0.29
Consumer Price Index	0.82	0.17	0.49	0.02	0.33	0.17	0.03
Industrial production	0.83	0.38	0.50	0.03	0.33	0.38	0.19
Housing Start	0.72	0.13	0.49	0.03	0.24	0.13	0.04
Real Consumption	0.76	0.19	0.49	0.03	0.28	0.20	0.08
Real residential investment	0.45	0.07	0.41	0.03	0.04	0.07	0.30
Real nonresidential investment	0.45	0.04	0.48	0.02	-0.02	0.05	0.69
Real state and local government consumption	1.30	0.32	0.43	0.04	0.87	0.32	0.00
Real federal government consumption	0.61	0.12	0.47	0.04	0.15	0.13	0.13
Unemployment rate	0.57	0.05	0.49	0.02	0.08	0.05	0.06
Three-month Treasury rate	0.62	0.07	0.55	0.02	0.07	0.07	0.16
Ten-year Treasury rate	1.01	0.09	0.51	0.02	0.50	0.09	0.00
AAA Corporate Rate Bond	1.03	0.18	0.54	0.02	0.49	0.18	0.00

Notes: Columns (1)-(2) reports the implied gain from CG regressions. Columns (3)-(4) replicate the gain estimate from Goldstein regression. Columns (5)-(8) reports the difference between column (1) and (3), its standard error and the probability of rejecting the null of column (5) lower or equal to zero.

Fact 2: novel strategy to estimate stickiness

	2 quarters horizon			
	β	SE	p-value	Median
Variable	(1)	(2)	(3)	(4)
Nominal GDP	0.61	0.01	0.00	0.62
GDP price index inflation	0.63	0.02	0.00	0.68
Real GDP	0.63	0.02	0.00	0.62
Consumer Price Index	0.70	0.02	0.00	0.71
Industrial production	0.59	0.02	0.00	0.63
Housing Start	0.53	0.02	0.00	0.56
Real Consumption	0.63	0.03	0.00	0.62
Real residential investment	0.56	0.02	0.00	0.64
Real nonresidential investment	0.61	0.03	0.00	0.61
Real state and local government consumption	0.60	0.05	0.00	0.56
Real federal government consumption	0.62	0.03	0.00	0.62
Unemployment rate	0.56	0.02	0.00	0.62
Three-month Treasury rate	0.63	0.03	0.00	0.67
Ten-year Treasury rate	0.60	0.02	0.00	0.63
AAA Corporate Rate Bond	0.61	0.02	0.00	0.62

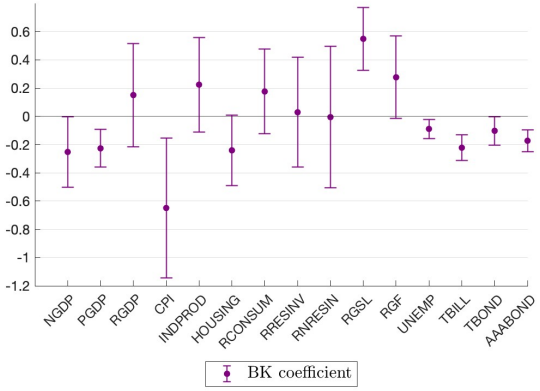
Notes: Columns 1-3: panel with individual and time fixed effects; column 4: median of individual demeaned regressions. Standard errors are corrected for heteroskedasticity and autocorrelation as in Vogelsang (2012).

BK overreaction to public signal

- Broer and Khohlas (2019) regress FE on public signal by itself

$$fe^i_{t+h,t} = \alpha + \beta_{BK} g_t + err^i_t$$

- They find $\beta_{BK} \gtrless 0$: **mixed** reaction to new public information



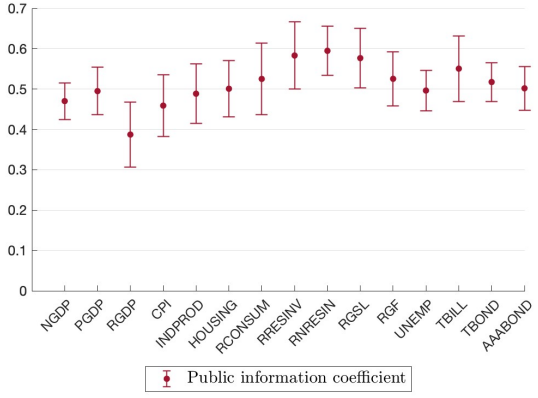
Our correction to BK

- We run the same regression but isolating the surprise component:

$$fe^i_{t+h,t} = \alpha + \beta pi^i_{t+h,t} + err^i_t, \qquad pi^i_t \equiv g_t - \tilde{E}^i_{t-1}[x_{t+h}]$$

- We find $\beta > 0$: **underreaction** to new public information

back



Extension: heterogeneous priors

- The benchmark strategic diversification model **does not match** the "univariate" underreaction to public information

$$fe^i_{t+h,t} = \alpha + \beta pi^i_{t+h,t} + err^i_t, \qquad \beta_{model} = 0$$

- Underweight public signal relative to private signal, not to prior
  - $\lambda > 0$ leads to underweight public info relative to private info
  - But both prior and new public signals are public
- In order to match this fact, allow for **heterogeneous priors** (Morris, 1995; Patton and Timmermann, 2010)
  - Now priors partially private: underweight new public info wrt priors
  - For some calibration still get overreaction to new info $\beta_{BGMS} < 0$
- We abstract from this in dynamic model

Survey anonymity

- We use the SPF, which is collected by the Fed anonymously
- However *"According to industry experts, forecasters often seem to submit to the anonymous surveys the same forecasts they have already prepared for public"* (Marinovic et al, 2013). Two reasons:
  1. Cost in compiling new forecasts
  2. Their strategic behavior could be uncovered by the editor of the anonymous survey
- Two observations supporting this claim:
  1. Anonymous SPF forecasts are very similar to non-anonymous Blue Chip ones (BGMS, 2020)
  2. The ECB asked it directly to their SPF panelists: "When responding to the SPF, what forecast do you provide?"
     - In 2013: 18% "new forecasts", 82% "latest available"
     - In 2008 below 10%.

Back

Target moments

	Mean Dispersion		C		β_1	
Variable	Data (1)	Model (2)	Data (3)	Model (4)	Data (5)	Model (6)
Nominal GDP	1.49	1.49	0.53	0.53	-0.54	-0.54
GDP price index inflation	0.33	0.33	0.49	0.49	-0.68	-0.68
Real GDP	0.92	0.92	0.56	0.56	-0.34	-0.34
Consumer Price Index	0.31	0.31	0.49	0.49	-0.48	-0.48
Industrial production	3.71	3.71	0.50	0.50	-0.59	-0.59
Housing Start	110.04	110.04	0.49	0.49	-0.58	-0.58
Real Consumption	0.51	0.51	0.49	0.49	-0.56	-0.56
Real residential investment	27.03	27.03	0.41	0.41	-0.37	-0.37
Real nonresidential investment	7.38	7.38	0.48	0.48	-0.12	-0.12
Real state and local government consumption	1.41	1.41	0.47	0.47	-0.84	-0.84
Real federal government consumption	6.40	6.40	0.43	0.43	-0.83	-0.83
Ten-year Treasury rate	0.17	0.17	0.51	0.51	-0.47	-0.47
AAA Corporate Rate Bond	0.34	0.34	0.54	0.54	-0.61	-0.61

Untargeted moments

	c_{CG}		β_{BGMS}		β_2	
Variable	Data (1)	Model (2)	Data (3)	Model (4)	Data (5)	Model (6)
Nominal GDP	0.66	0.71	-0.25	-0.31	0.75	0.21
GDP price index inflation	0.77	0.67	-0.35	-0.44	0.81	0.31
Real GDP	0.61	0.75	-0.10	-0.15	0.57	0.13
Consumer Price Index	0.82	0.73	-0.30	-0.24	0.67	0.16
Industrial production	0.83	0.82	-0.30	-0.22	0.79	0.26
Housing Start	0.72	0.76	-0.28	-0.28	0.78	0.23
Real Consumption	0.76	0.80	-0.26	-0.23	0.80	0.23
Real residential investment	0.45	0.72	-0.08	-0.17	0.73	0.11
Real nonresidential investment	0.45	0.52	0.08	-0.10	0.65	0.01
Real state and local government consumption	0.61	0.85	-0.48	-0.41	0.91	0.45
Real federal government consumption	1.30	0.89	-0.56	-0.35	0.93	0.37
Ten-year Treasury rate	1.01	0.59	-0.22	-0.38	0.76	0.09
AAA Corporate Rate Bond	1.03	0.62	-0.27	-0.48	0.83	0.18

Posted and honest gain

	Gain			Consensus MSE		
Variable	Posted (1)	Honest (2)	Ratio (3)	Posted (4)	Honest (5)	Ratio (6)
Nominal GDP	0.53	0.40	0.76	0.49	1.07	2.19
GDP price index inflation	0.49	0.32	0.66	0.05	0.14	2.92
Real GDP	0.56	0.49	0.88	0.78	1.14	1.47
Consumer Price Index	0.49	0.40	0.82	0.23	0.36	1.58
Industrial production	0.50	0.44	0.87	3.51	5.11	1.46
Housing Start	0.49	0.40	0.82	69.95	115.75	1.65
Real Consumption	0.49	0.42	0.86	0.46	0.68	1.49
Real residential investment	0.41	0.36	0.87	29.60	40.95	1.38
Real nonresidential investment	0.48	0.43	0.90	4.12	5.30	1.29
Real state and local government consumption	0.47	0.40	0.86	0.54	0.81	1.51
Real federal government consumption	0.43	0.39	0.90	5.96	7.49	1.26
Ten-year Treasury rate	0.51	0.33	0.64	0.04	0.11	2.55
AAA Corporate Rate Bond	0.54	0.29	0.54	0.04	0.14	3.75

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Posted and honest dispersion

	Dispersion		
Variable	Posted (1)	Honest (2)	Ratio (3)
Nominal GDP	1.49	0.29	0.19
GDP price index inflation	0.33	0.02	0.06
Real GDP	0.92	0.41	0.44
Consumer Price Index	0.31	0.08	0.27
Industrial production	3.71	0.60	0.16
Housing Start	110.04	18.10	0.16
Real Consumption	0.51	0.09	0.18
Real residential investment	27.03	10.76	0.40
Real nonresidential investment	7.38	6.01	0.82
Real state and local government consumption	1.41	0.02	0.02
Real federal government consumption	6.40	0.14	0.02
Ten-year Treasury rate	0.17	0.05	0.27
AAA Corporate Rate Bond	0.34	0.04	0.11

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Estimated parameters

Variable	ρ (1)	$\sqrt{\frac{\xi}{\nu}}$ (2)	$\sqrt{\frac{\xi}{\tau}}$ (3)	λ (4)
Nominal GDP	0.93	1.48	1.70	0.74
GDP price index inflation	0.93	1.60	2.13	0.88
Real GDP	0.80	1.30	1.36	0.47
Consumer Price Index	0.78	1.38	1.60	0.61
Industrial production	0.85	1.28	1.86	0.68
Housing Start	0.85	1.38	1.81	0.70
Real Consumption	0.87	1.33	1.84	0.67
Real residential investment	0.89	1.56	1.74	0.49
Real nonresidential investment	0.89	2.37	1.28	0.25
Real state and local government consumption	0.89	1.32	2.79	0.90
Real federal government consumption	0.80	1.29	2.90	0.87
Ten-year Treasury rate	0.83	1.81	1.56	0.72
AAA Corporate Rate Bond	0.85	1.76	1.82	0.87

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Public information in forecasts

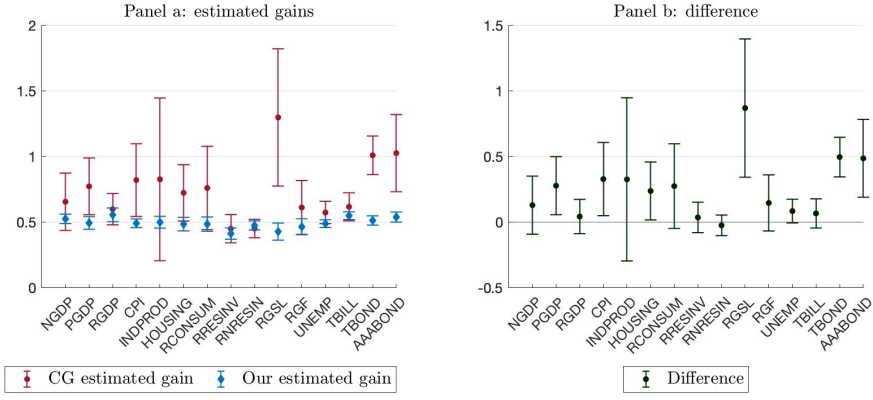
- We provide evidence on the importance of public information in survey forecasts
- We compare

(1) **CG 2015**'s estimate of new info weight G
  - Regress consensus forecast error on forecast revisions
  - *Biased* by public information: $\hat{G}_{CG} > G$

(2) **Goldstein 2021**'s estimate of new info weight G
  - Regress forecast revision dispersion on prior dispersion
  - *Robust* to public information: $\hat{G}_{Goldstein} = G$

- The difference is informative about importance of public information in forecast

Public information in forecasts



Notes: Panel regression with individual fe. Standard errors are corrected for heteroskedasticity and autocorrelation as in Vogelsang (2012). Confidence intervals reported at 10% significance level.