How Do Firms Form Their Expectations?

New Survey Evidence

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EXPECTATIONS AND THE CENTRAL BANK

Inflation expectations play a particularly important role for central banks:

- Anchoring of inflation expectations

  Ben Bernanke (2007): "… The extent to which inflation expectations are anchored has first-order implications for the performance of inflation and of the economy more generally."

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- Reducing uncertainty about monetary policy

  Ben Bernanke (2010): “Improving the public's understanding of the central bank's policy strategy reduces economic and financial uncertainty and helps households and firms make more-informed decisions.”

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- Forward-guidance

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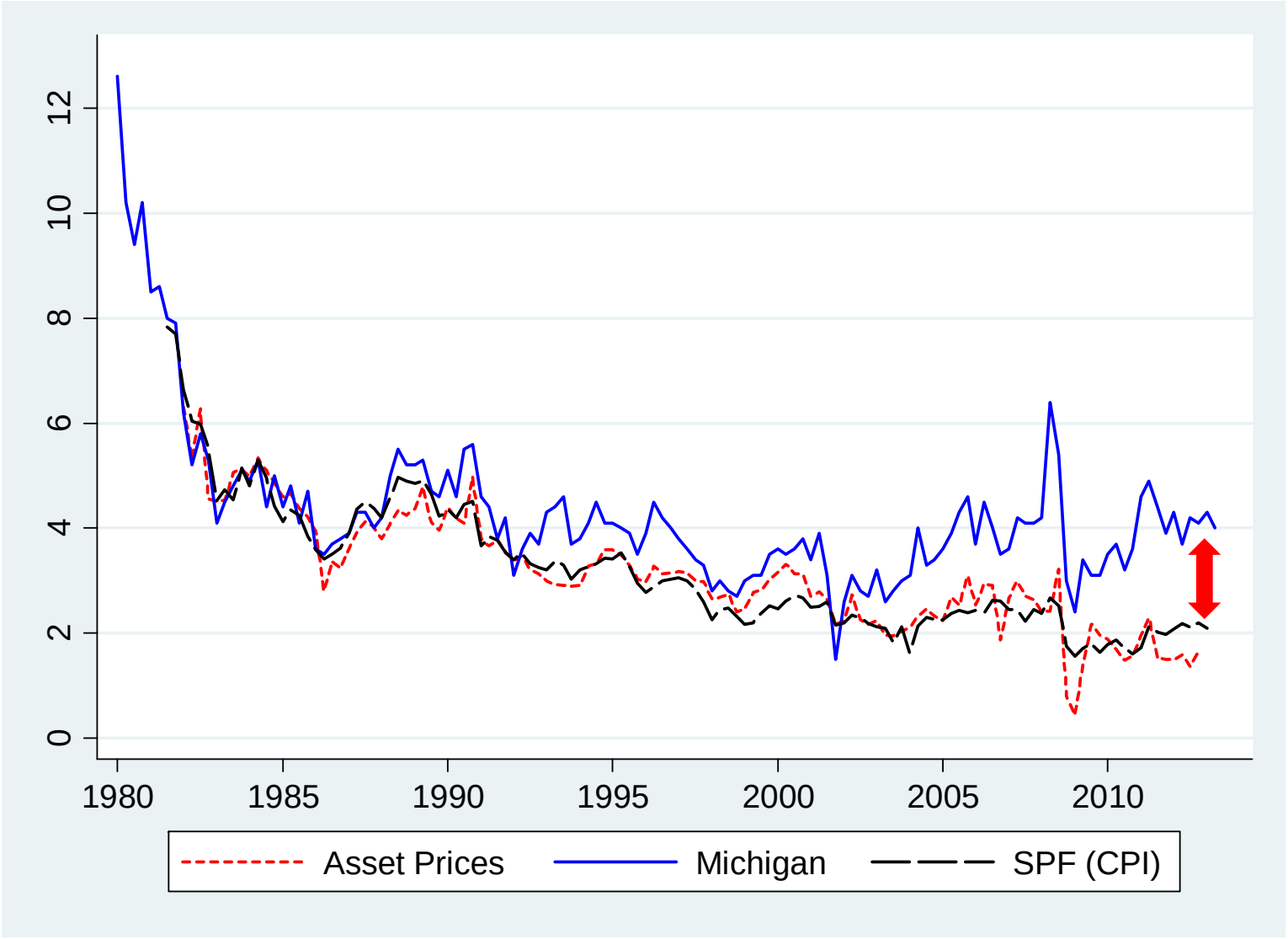
How do economic agents form inflation expectations?

WHOSE EXPECTATIONS DO WE MEASURE?

- Professional forecasters
  - Survey of Professional Forecasters, Blue Chip Economic Indicators
- Central bankers
  - FOMC forecasts are provided in *Monetary Policy Reports* to Congress
- Financial markets
  - Inference based on spreads between nominal and indexed bonds (Cleveland Fed)
- Households
  - Michigan Survey of Consumers
- Firms
  - Livingston Survey (very large firms ≈ prof. forecasters)
  - Conference Board, Ifo (qualitative)

No quantitative survey of firms' expectations!

INFLATION EXPECTATIONS



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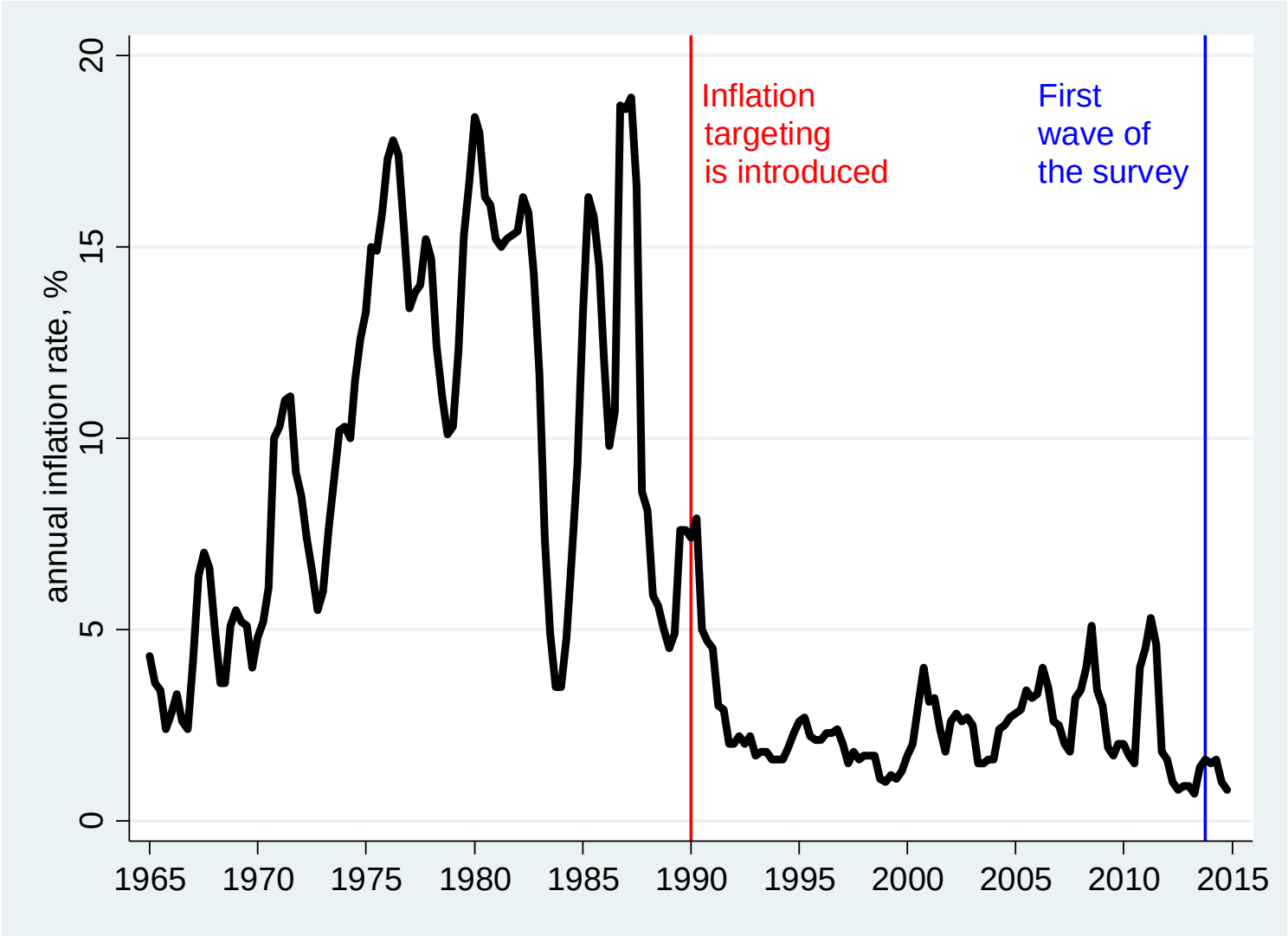
  - How do differences in beliefs about recent conditions affect firms' beliefs about *future* macroeconomic variables?
    Profoundly.
  - How do firms respond to new macroeconomic information?
    In a Bayesian manner.
  - When/how do firms seek out new macroeconomic information and what types of information do they look for?
    In state-dependent fashion focusing on variables which matter most for their economic decisions.

HISTORY OF INFLATION IN NEW ZEALAND



We study a country with a long history of inflation targeting and, hence, presumably anchored inflation expectations.

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  - Main survey: Late Sept 2013 to Early Dec 2013 (3,150 firms)
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Questions about expectations, price setting, market structure

MEASURING (IN)ATTENTION TO MACROECONOMIC CONDITIONS

We ask firms to report "backcasts" or "nowcasts" about macroeconomic variables:

- "*What do think the unemployment rate currently is in New Zealand? Please provide a precise quantitative answer.*"

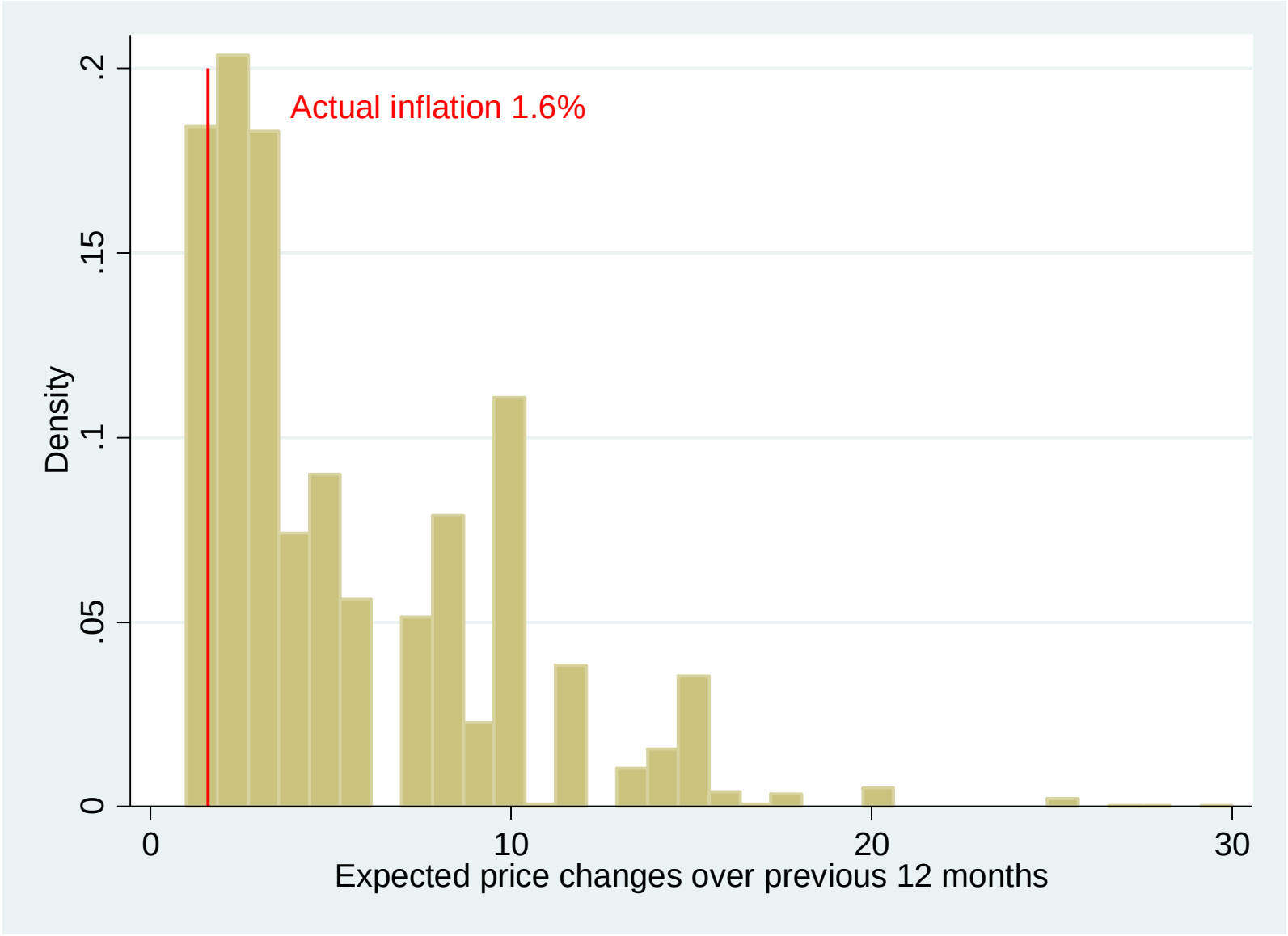
- "*During the last twelve months, by how much do you think prices have changed overall in the economy? Please provide a precise quantitative answer.*"

- Equivalent questions for interest rates, real GDP growth, exchange rate, output gap, and industry-specific inflation rates.

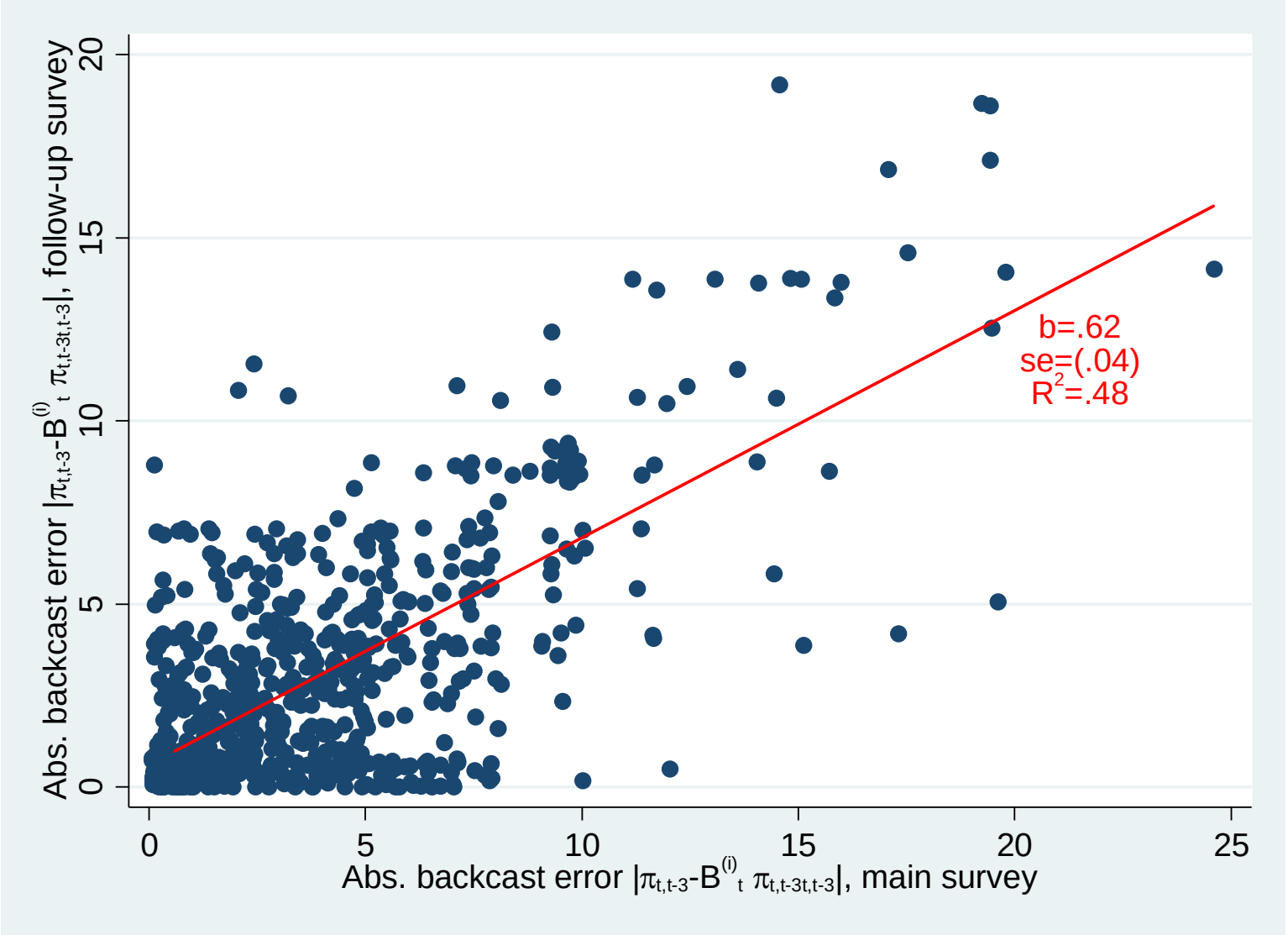
We then construct "backcast errors" as difference between true values and firms' predicted values.

FACT #1: INATTENTION TO RECENT MACROECON. CONDITIONS

During the last 12 months, by how much do you think prices changed overall in the economy?



FACT #2: INATTENTION IS PERSISTENT



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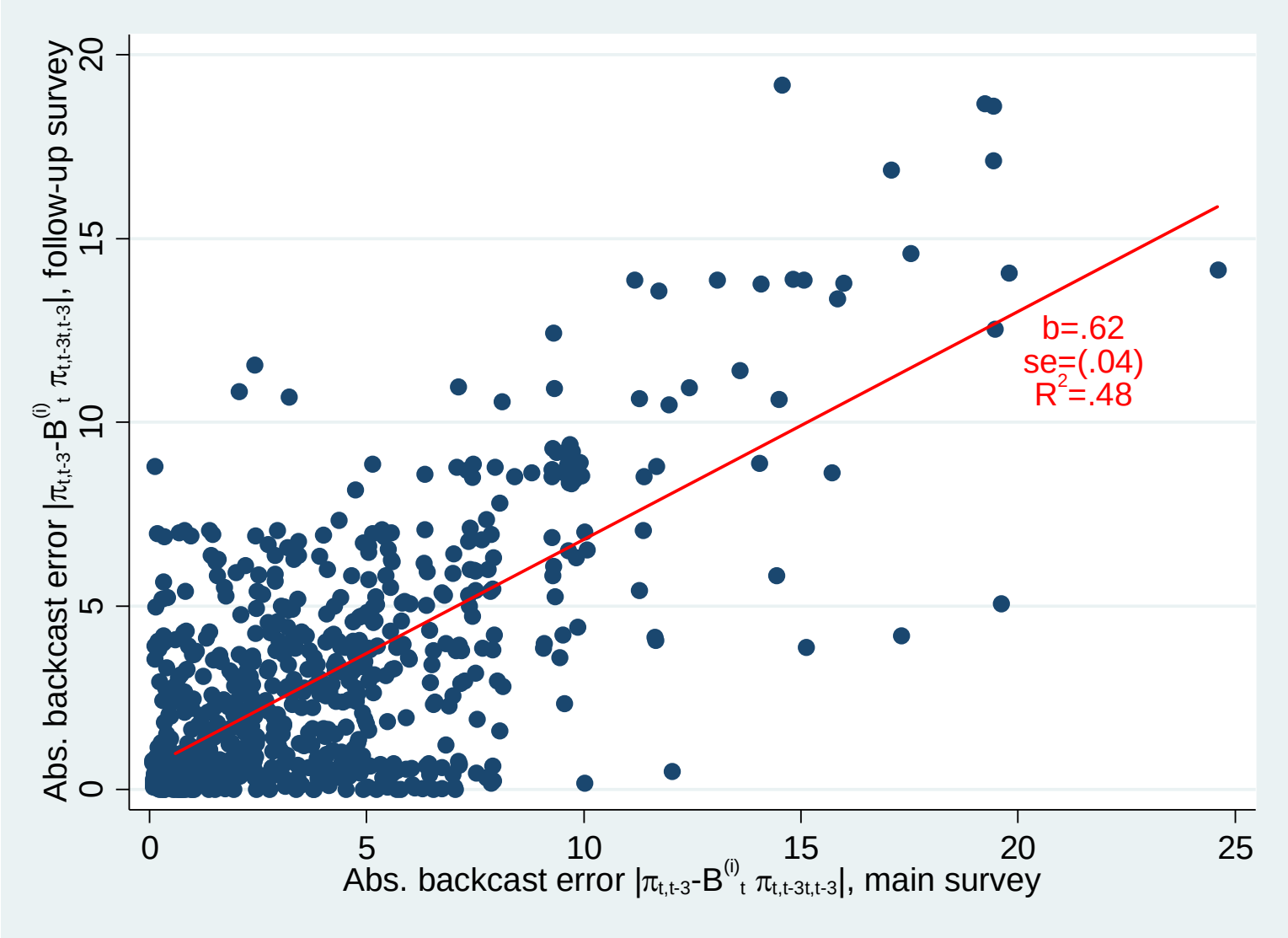

The speed of learning is similar to that found in the U.S. for households and professionals (i.e. slow).

FACT #3: INCENTIVES MATTER FOR QUALITY OF BELIEFS

Slope of the profit function should matter for acquisition of information.

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If this firm was free to change its price (i.e. suppose there was no cost to renegotiating contracts with clients, no costs of reprinting catalogues, etc…) **right now, by how much would it change its price?** Please provide a percentage answer (e.g. "+10%" for a 10% increase in price).

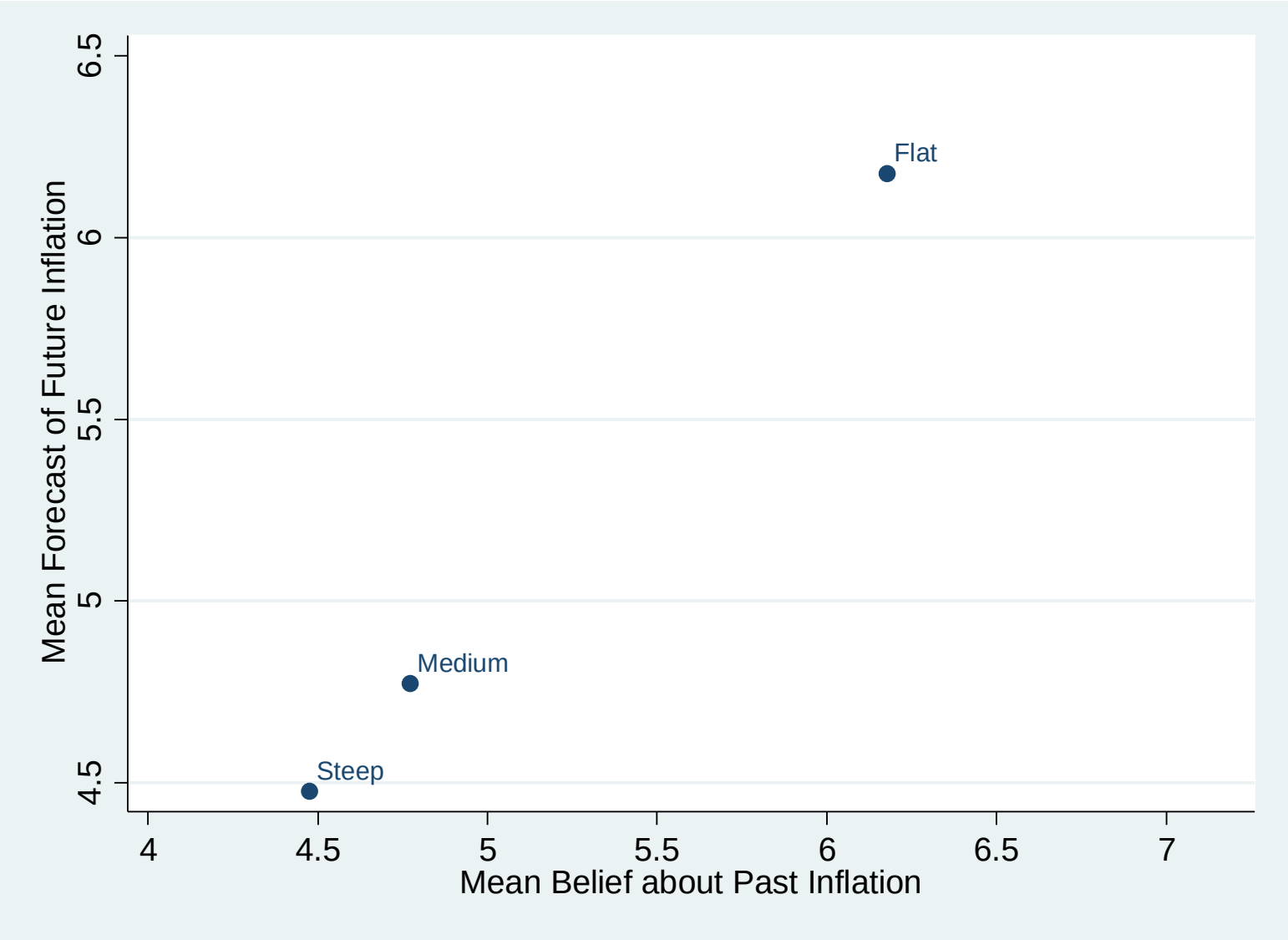
By how much do you think profits would change as a share of revenues? Please provide a numerical answer in percent (e.g. "+10%" if profits are expected to rise by 10% of revenues).

Expected change in price:	**……**	**%**
Expected change in profits:	**……**	**% of revenues**

$$Slope = \left|\frac{\Delta Profit}{\Delta Price}\right|$$

FACT #3: INCENTIVES MATTER FOR QUALITY OF BELIEFS

Firms with steeper profit functions have better forecasts/backcasts.



FACT #4: MACROECONOMIC FORECASTS OF ECONOMIC AGENTS

	Recent data	Central Bank	Professional Forecasters	Households	Firms
Forecasts from 2014Q1					
12-Month Ahead Annual Inflation Rate					
Mean Forecast (actual)	1.5%	1.9%	2.0%	3.6%	5.9%
Std. Dev. of Forecasts			0.3%	1.8%	2.8%

- Huge disagreement across firms
- High inflation expectations

⇒ Poor anchoring of inflation expectations

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12-Month Ahead Unemployment Rate					
Mean Forecast (actual)	6.0%	4.9%	5.3%	n.a.	5.2%
Std. Dev. of Forecasts			0.3%	n.a.	1.2%
12-Month Ahead Annual GDP Growth Rate					
Mean Forecast (actual)	2.3%	3.5%	3.4%	n.a.	3.1%
Std. Dev. of Forecasts			0.5%	n.a.	0.8%
12-Month Change in Interest Rates					
Mean Forecast (actual)	0.6%	1.9%	1.2%	n.a.	1.1%
Std. Dev. of Forecasts			0.3%	n.a.	1.2%

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FACT #5: BELIEFS ABOUT THE PAST ARE CORRELATED WITH BELIEFS ABOUT THE FUTURE

$$F_t^i \pi_{t+12,t} = \alpha + \beta B_t^i \pi_{t,t-12} + \delta_j + \varepsilon_i$$

Variables	Wave #1	Wave #2	Wave #4	Firm FE
	(1)	(2)	(3)	(4)
Inflation rate, aggregate	0.248***	0.065	0.345***	0.322***
	(0.033)	(0.061)	(0.043)	(0.042)
N	3,149	716	1,255	5,126
R^2	0.419	0.396	0.211	0.206

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Unemployment rate		0.337***	0.865***	0.651***
		(0.039)	(0.028)	(0.066)
N		716	1,255	1,973
R^2		0.244	0.821	0.392

Differences in beliefs about recent inflation can go a long way in accounting for differences in beliefs about future inflation.

FACT #6: BAYESIAN LEARNING

- Ask a manager about his/her beliefs about inflation, GDP and UE rate (probability distribution)

Please assign probabilities (from 0-100) **to the following ranges of overall price changes in the economy over the next 12 months for New Zealand:** (Note that the probabilities in the column should sum to 100)

Percentage Price Changes in 12 Months	**Probabilities**	
More than 25%:	**……**	**%**
From 15 to 25%:	**……**	**%**
From 10 to 15%:	**……**	**%**
From 8 to 10%:	**……**	**%**
From 6 to 8%:	**……**	**%**
From 4 to 6%:	**……**	**%**
From 2 to 4%:	**……**	**%**
From 0 to 2%:	**……**	**%**
Less than 0%:	**……**	**%**
Total (the column should sum to 100%):	**100**	**%**

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- Ask a manager about his/her beliefs about inflation, GDP and UE rate (probability distribution)
- Present new information to a subsample of randomly chosen firms
  - Forecast from NZ Survey of Professional Forecasters (2%)
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  - SPF Forecast & CB target
  - Past inflation (1%)
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- Ask firms to report point inflation forecasts

How Do Firms Respond to New Information?

Two theoretical predictions from Bayesian updating after signal s:

- **Revision in beliefs toward the signal:**

$$(p_i - \mu_i) = \frac{\psi_s}{\psi_s + \tau_i}(s - \mu_i) \Rightarrow p_i = \frac{\psi_s}{\psi_s + \tau_i} s + \frac{\tau_i}{\psi_s + \tau_i} \mu_i$$

where p_i is posterior, μ_i is prior, ψ_s is precision of signal, and τ_i is precision of prior beliefs. More precise signals (high ψ_s) should lead to larger average revisions in beliefs.

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- **Firms with greater prior uncertainty revise beliefs more.**

$$\log\left(\frac{p_i - \mu_i}{s - \mu_i}\right) = \log\left(\frac{\psi_s}{\psi_s + \tau_i}\right) \approx -\frac{1}{\psi_s} \times \frac{1}{\sigma_i^2} \Rightarrow \frac{p_i - \mu_i}{s - \mu_i} = c + \beta\sigma_i + error$$

where $\beta > 0$ is decreasing in precision of the signal.

FACT #6: BAYESIAN LEARNING

Information source:	Inflation					
	pool	SPF	CB target	CB target + SPF	π_{t-1}	$\overline{E_{-i}\pi_{t+12}}$
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Dependent variable: posterior p_i						
Prior, μ_i	0.307***					
	(0.031)					
Observations	500					
R-squared	0.375					

$$p_i = \frac{\psi_s}{\psi_s + \tau_i} s + \frac{\tau_i}{\psi_s + \tau_i} \mu_i$$

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Panel A: Dependent variable: posterior p_i						
Prior, μ_i	0.307***	0.352***	0.221***	0.221***	0.275***	0.515***
	(0.031)	(0.075)	(0.062)	(0.064)	(0.051)	(0.047)
Observations	500	100	100	100	100	100
R-squared	0.375	0.319	0.195	0.273	0.347	0.676

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The different sensitivities of forecast revisions to signal suggest that firms view central bank target as most credible information and other firms' forecasts as least credible.

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Panel B. Dependent variable: scaled revision of posterior: $\frac{p_i-\mu_i}{s-\mu_i}$						
Uncertainty, σ_i	0.074***					
	(0.014)					
Observations	448					
R-squared	0.035					

$$\frac{p_i - \mu_i}{s - \mu_i} = c + \beta\sigma_i + error$$

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Panel B. Dependent variable: scaled revision of posterior: $\frac{p_i-\mu_i}{s-\mu_i}$						
Uncertainty, σ_i	0.074***	0.088**	0.016	0.049**	0.083***	0.133***
	(0.014)	(0.040)	(0.036)	(0.024)	(0.026)	(0.028)
Observations	448	86	80	91	93	98
R-squared	0.035	0.024	0.002	0.035	0.051	0.083

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FACT #7: TRACKING INFLATION

Which macroeconomic variables are most important to you in making your business decisions? Please rank the variables below from 1 (most important) to 3 (least important)

a. *Unemployment rate* ...
b. *GDP* ...
c. *Inflation* ...
d. *None of these is important to my decisions*

Which macroeconomic variables do you keep track of? Check each variable that you keep track of.

a. *Unemployment rate* ...
b. *GDP* ...
c. *Inflation* ...
d. *None of these is important to my decisions* ...

FACT #7: TRACKING INFLATION

Importance for business decisions (1=high, 3=low)	Inflation	
	Follow	Do not Follow
	(1)	(2)
1	0.371	0.003
2	0.028	0.104
3	0.011	0.482
Total	0.410	0.590

- 60% of firms report that they do **not** track inflation at all.
- Most firms which report that they track inflation are those who rank it as *most* important for their business decisions.

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3	0.011	0.482
Total	0.410	0.590

Inflation	Follow	Don't Follow
	(1)	(2)
Backcast error	1.151	5.131
Forecast	3.453	5.916
Forecast uncertainty (st. dev.)	1.797	2.131

- 60% of firms report that they do **not** track inflation at all.
- Most firms which report that they track inflation are those who rank it as *most* important for their business decisions.
- Firms which report that they track inflation have much better beliefs about recent and future inflation, as well as more precise beliefs.
- The lack of information about aggregate inflation by many firms seems to reflect a *conscious* choice to ignore inflation because it is not sufficiently important to their business decisions.

FACT #8: STATE-DEPENDENT ACQUISITION OF INFORMATION

Response	**Suppose you hear on TV that the economy is doing poorly. Would it make you more likely to look for more information?**	
Much more likely		
Somewhat more likely		
No change		
Somewhat less likely		
Much less likely		

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Much more likely	**0.453**	
Somewhat more likely	**0.313**	
No change	0.106	
Somewhat less likely	0.073	
Much less likely	0.054	

Firms seek out more information in response to bad economic news: "state-dependence" in information acquisition.

FACT #8: STATE-DEPENDENT ACQUISITION OF INFORMATION

Response	**Suppose you hear on TV that the economy is doing poorly. Would it make you more likely to look for more information?**	**Suppose you hear on TV that the economy is doing well. Would it make you more likely to look for more information?**
Much more likely	**0.453**	0.080
Somewhat more likely	**0.313**	0.214
No change	0.106	0.086
Somewhat less likely	0.073	**0.507**
Much less likely	0.054	0.113

Firms seek out *less* information when economic news are positive: "asymmetries" in information acquisition.

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Theory predicts that the type of information firms should seek out depends in part on the degree of strategic complementarity in price-setting.

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→ firms should prefer public signals observed by other firms

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Suppose that there are two sources of information about the state of the economy. These sources are equally informative/useful, but they can give different signals about the state of the economy (that is, they can disagree). In addition, the first source can be seen by other firms in your industry while the second sources is available only to you. You can see only one source. Which source would you pick?

a. The source that can be seen by other firms

b. The source that can be seen only by you

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→ firms care more what other firms are doing

→ firms should prefer public signals observed by other firms

Suppose that there are two sources of information about the state of the economy. These sources are equally informative/useful, but they can give different signals about the state of the economy (that is, they can disagree). In addition, the first source can be seen by other firms in your industry while the second sources is available only to you. You can see only one source. Which source would you pick?

a. The source that can be seen by other firms

b. The source that can be seen only by you

Suppose a typical firm in your industry cuts its price by 10%. By how much would YOUR sales be affected?

FACT #9: STRATEGIC ACQUISITION OF INFORMATION

Dep. var.: **Information complementarity**	Coef./(s.e.)	N obs	R^2
Regressor: **Price complementarity**	0.290*** (0.023)	1,140	0.177

Information complementarity: dummy variable =1 if a firm picks "The source that can be seen by other firms" and zero otherwise.

Price complementary: measures (in percent, absolute value) by how much sales of a "your" firm fall when a typical firm in your industry cuts its price by 10%. The response is divided by 10.

CONCLUSION

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- This inattention is consistent with rational inattention motives.
- Inattention to recent macroeconomic dynamics is reflected in firms' forecasts.
- Firms systematically respond in Bayesian manner when presented with new information.
- Information acquisition is state-dependent and particularly sensitive to "bad" news.
- Central bankers who want to "manage" inflation expectations are likely to face a much more pronounced communications problem than currently perceived.