The Effect of Interest Rate Increases on Consumers' Inflation Expectations: The Roles of Informedness and Compliance

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The randomized control trial is registered at the AER RCT Registry (#AEARCTR-0009172). The views expressed herein are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Cleveland or the Federal Reserve System.

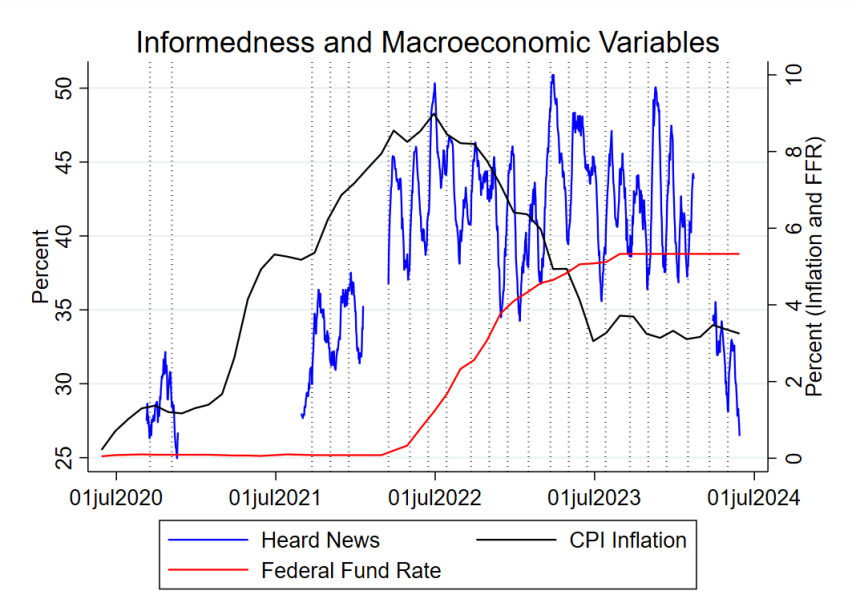
Context

- Monetary policymakers raised the federal funds rate aggressively starting in 2022
  - Marked a change in trajectory from forward guidance at ZLB during COVID recession
  - Key concerns: high inflation and high inflation expectations
- Inflation expectations central to modern macro models, monetary policy transmission mechanism
  - Rising inflation expectations risk becoming self-fulfilling
  - Motivates importance of understanding expectation formation
- Theory: path of higher rates slows demand to lower inflation
- How do monetary policy actions and communications affect inflation expectations?

This Paper

- Our approach: conduct real time randomized controlled trials (RCTs) to give consumers information about changes in the federal funds rate in 2022
- Issues: are survey participants paying attention, both in and out of the survey?
  - With high inflation, people might pay more attention to economic news, so treatments aren't news for some and are already in their information set (Weber et al., 2023)
  - Complex (online) survey and treatments: are all respondents paying the same attention to the content of the survey?
- What we do: measures of ex ante informedness about monetary policy and ex post compliance with the treatment ("swallowing the pill")

More People Are Hearing About Monetary Policy When Inflation is High



Findings

- Weak evidence that increases in the federal funds rate reduce inflation expectations of the average consumer
- But these results are skewed by prior knowledge of monetary policy and noncompliance with the treatments
- Methodologically: propose ways to control for some level of informedness and compliance: both challenging to measure
- Among the uninformed and compliant, treatments have a large negative impact on their medium-term inflation expectations
  - Results consistent with Mackowiak and Wiederholt (2024)
  - No evidence of moving along a Phillips curve on average; direct impact on expectations
  - No difference by gender: informedness and compliance are correlated with demographics

Contributions

- Track households' attention to monetary policy since 2020
- Real time effect of policy announcements in March, May, June, July, and September 2022 meetings (today focus on only July and September)
  - Multi-wave treatments and responses; large N; keeping same baseline treatment
- Propose a simple way to account for ex ante informedness about monetary policy and voluntary ex post compliance with the treatment
  - Implications for heterogeneity analysis
- Show, in a high inflation environment, that consumers seem to understand the basic disinflationary mechanism of monetary policy

Implications

- Additional communication efforts could have had a large effect on relatively informed households
- Effects of real-time communication not directly measurable with this type of exercises
  - Have to make assumptions on reasons for uninformedness or characteristics of informed vs uninformed households
- Null treatment effect doesn't mean null effect of information on actions in real life
- FOMC decisions were communicated and many got informed (Hajdini et al, 2014)
- Assuming a similar reaction between informed and uninformed, communication actions could have affected inflation expectations

Survey Design

- Online Cleveland Fed survey of consumers via Qualtrics of >100 respondents per day
  - N=34,460 total respondents in our sample
- 5 treatment waves beginning in March, May, June, July, & Sept
  - Waves began day after FOMC press release and ran until the Wednesday before the next one
  - Randomly assigned to control and treatment groups
  - 5,000+ consumers per wave
  - In this presentation, focus on July and September
- Little data cleaning
  - Qualtrics ensures they pass RECAPTCHA test
  - Drop respondents with very short (< 6 min.) survey times (N=512)
  - Point expectations winsorized at each treatment period's 2nd and 98th percentiles, Huber robust regressions

Experiment Structure

- We first ask basic demographic information and attention to monetary policy
- We measure prior information on inflation expectations and expectations about other personal macro variables
- We randomly divide the sample into groups and treat with information only some groups
- We measure inflation expectations and expectations about other personal macro variables after the treatment for all

Experiment Design: Prior

Prior inflation expectations questions:

The next few questions are about inflation. Over the next 12 months, do you think that there will be inflation or deflation?

- *Inflation: What do you expect the rate of inflation to be over the next 12 months? Please give your best guess.*
  I expect the rate of inflation to be [ ] percent over the next 12 months.

- Deflation (opposite of inflation): What do you expect the rate of deflation to be over the next 12 months? Please give your best guess.
  I expect the rate of deflation to be [ ] percent over the next 12 months.

Treatments: Baseline

- Treatment 1: basic description of most recent policy action

  "On [date of most recent FOMC press release], the Federal Open Market Committee (FOMC) raised its primary policy interest rate (the federal funds rate) by [fraction] percentage point, to a target range of [lower bound] to [upper bound] percent. The FOMC also said that it would [begin/continue] to reduce the size of its balance sheet."

- Only about policy action
- No information that suggests relationship with inflation
- Andre et al. (2022): Not clear that such a treatment will have an effect on consumers, because of disagreement about the mechanism of MP
  - We complemented this information in some waves to explore potential for stronger effects

Additional information

- We add information to treatment 1, giving a motivation/narrative for the policy action
- **July**:
  "These actions were part of an effort to help bring inflation back down toward its objective."
- **September**:
  "Federal Reserve Chair Jerome Powell said, "The FOMC is strongly resolved to bring inflation down to 2 percent and we will keep at it until the job is done."
- **Placebo** (September)
  "From 2015 to 2021, the population in the United States grew in a range of 3 to 3-1/4 percent."
- **Control**: No information

Experiment Design: Posterior

Posterior inflation expectations question: medium-run expectations:

Over the next 5 years, do you think that there will be inflation or deflation on average?

- *Inflation: What do you expect the average annual rate of inflation to be over the next 5 years? Please give your best guess.*
  I expect the average annual rate of inflation to be [ ] percent per year over the next 5 years.

- *Deflation (opposite of inflation):What do you expect the average annual rate of deflation to be over the next 5 years? Please give your best guess.*
  I expect the average annual rate of deflation to be [ ] percent per year over the next 5 years.

RCT Results

- We focus on average treatment effect:
  - Treatments have effect on posterior announcement ⏩ Table
  - Objective is to see whether information reduces inflation expectations on average
- Baseline empirical specification:

$$\pi_{i,t}^{5y} - \pi_{i,t}^{1y} = \alpha + \beta_j \times I(1 \ \textit{if} \ \textit{treatment} = 1) + \varepsilon_{it}$$

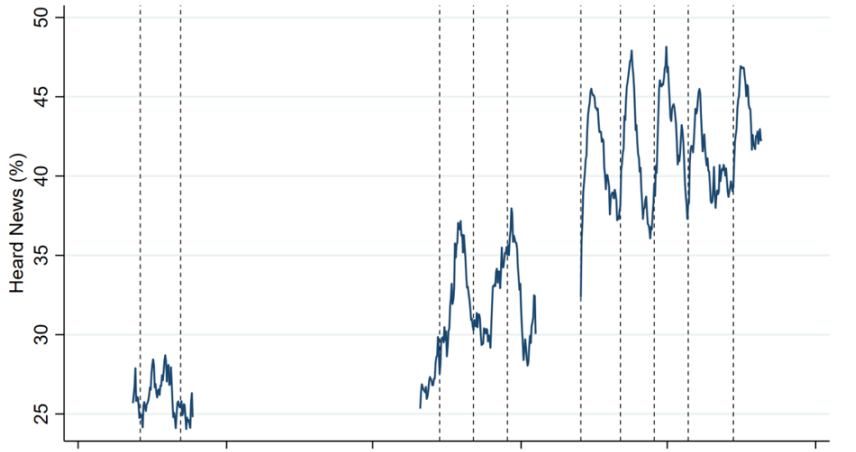
- Huber weights
- We will control by informedness and compliance

Measuring the information set

- Ex ante informedness around monetary policy, voluntary ex post compliance can materially impact the effectiveness of the treatment

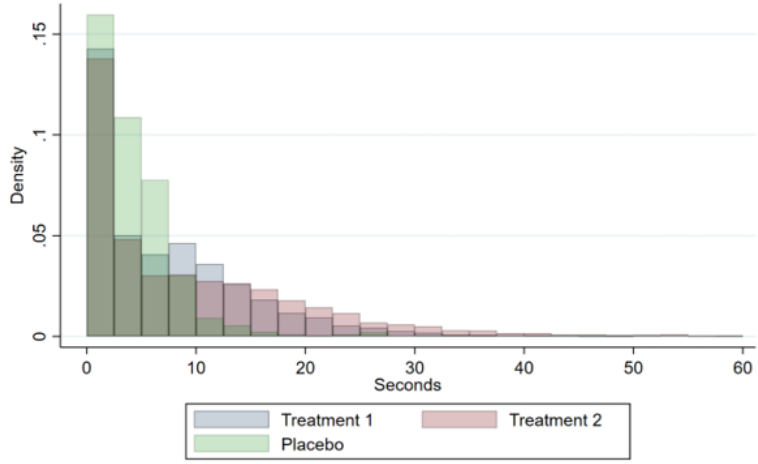
	Compliant	Noncompliant
Uninformed	Get new information and swallow the pill	Get new info. but don't actually process it
Informed	Treatments should not be effective because they do not represent new info.	Results should be essentially random; treatment isn't new info. and isn't read

Informedness Across Time



2-week moving average. Dashed lines indicate FOMC meetings.
Sample ends Oct. 26, 2022.

Distribution of Compliant



Controlling for Compliance

- Only observe compliance within treatment groups (and not the control group), so cannot split sample and preserve randomness
- Two-step procedure to account for compliance, borrowed from applied micro and medical literatures:
  - Within the (pooled) treatment groups, estimate a logit model that uses covariates X to predict compliance. Use this model to obtain propensity scores ($\hat{p}$) for all respondents
  - Obtain compliant average causal effect (CACE) estimates via regression with weights $\hat{p}/(1-\hat{p})$(or the inverse for non-compliant average causal effect, NACE)
- Bootstrap each stage with 100 repetitions (resulting in 10,000 coefficient draws) to account for estimation uncertainty

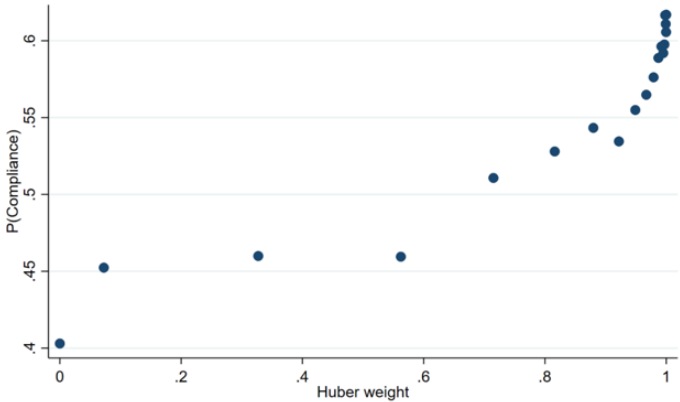
Predicting Compliance

	Full Sample				No News Only			
	Logit Odds Ratio		OLS		Logit Odds Ratio		OLS	
Male	0.78***	(0.05)	-0.05***	(0.01)	0.80***	(0.07)	-0.05***	(0.02)
Nonwhite	0.67***	(0.05)	-0.08***	(0.02)	0.64***	(0.07)	-0.09***	(0.02)
Hispanic	0.63***	(0.07)	-0.09***	(0.02)	0.64***	(0.09)	-0.09***	(0.03)
Primary Shopper	0.89	(0.10)	-0.02	(0.02)	1.09	(0.14)	0.02	(0.02)
Numerical Literacy	1.83***	(0.16)	0.11***	(0.02)	1.50***	(0.17)	0.08***	(0.02)
Heard News	0.94	(0.06)	-0.01	(0.01)				
Age:								
36-50	1.89***	(0.17)	0.13***	(0.02)	2.17***	(0.24)	0.16***	(0.02)
51-65	4.71***	(0.45)	0.35***	(0.02)	4.48***	(0.53)	0.34***	(0.02)
66+	13.38***	(1.56)	0.53***	(0.02)	10.18***	(1.59)	0.49***	(0.03)
Income:	1.89***	(0.17)						
$35,000-$49,999	1.16	(0.11)	0.03	(0.02)	1.23*	(0.13)	0.04*	(0.02)
$50,000-$99,999	0.92	(0.07)	-0.02	(0.02)	0.94	(0.09)	-0.01	(0.02)
More than $100,000	0.77**	(0.08)	-0.05**	(0.02)	0.65***	(0.09)	-0.09***	(0.03)
Education:								
Some college	1.63***	(0.13)	0.10***	(0.02)	1.46***	(0.14)	0.08***	(0.02)
Bachelor's Degree	1.57***	(0.14)	0.09***	(0.02)	1.73***	(0.20)	0.11***	(0.02)
Advanced Degree	1.47***	(0.17)	0.07***	(0.02)	1.83***	(0.30)	0.12***	(0.03)
Political Party:								
Democrat	0.89	(0.07)	-0.02	(0.01)	0.86	(0.08)	-0.03	(0.02)
Republican	1.08	(0.09)	0.02	(0.02)	1.05	(0.11)	0.01	(0.02)
Constant	0.63**	(0.11	0.39***	(0.04)	0.56***	(0.12)	0.37***	(0.04)
Observations	9421		9421		5347		5347	

Standard errors are reported in parentheses. Columns 1 and 3 report results from a logit model predicting compliance as a function of the listed variables as odds ratios, while columns 2 and 4 reports results from OLS regressions of an otherwise identical model.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Predicting Compliance



Results obtained using all respondents across the combined July and September treatment periods.

Post-Treatment minus Pre-Treatment Expectations, By Informedness and Compliance

Heard News =	All All	Compliant & All	 Yes	 No	Non-compliant & All	 Yes	 No
July							
Treatment 1	-1.18***	-1.78***	0.20	-3.20***	-0.92	-1.12	-0.93
	(0.28)	(0.67)	(0.88)	(0.98)	(1.24)	(2.16)	(1.47)
Treatment 2	-0.84***	-2.00***	-1.20	-2.68***	-0.07	0.50	-0.69
	(0.29)	(0.69)	(0.86)	(1.03)	(1.24)	(2.16)	(1.47)
Observations	5996	4674	1994	2680	4284	1833	2451
September							
Treatment 1	-0.35	-1.79**	0.04	-3.34***	0.64	-0.31	2.13
	(0.36)	(0.80)	(1.16)	(1.09)	(1.39)	(2.25)	(1.65)
Treatment 2	-1.59***	-2.57***	-1.17	-3.57***	-0.68	-2.11	-1.72
	(0.36)	(0.81)	(1.20)	(1.10)	(1.41)	(2.21)	(1.80)
Placebo	1.09***	-0.04	0.35	-0.42	-0.99	-4.48*	3.22*
	(0.27)	(0.78)	(1.02)	(1.17)	(1.46)	(2.39)	(1.71)
Observations	5876	4339	1900	2439	3982	1834	2148

Control Rates Information

Post-Treatment minus Pre-Treatment Expectations, By Informedness and Compliance

	All	Compliant &			Non-compliant &		
Heard News =	All	All	Yes	No	All	Yes	No
July							
Treatment 1	-1.18***	-1.78***	0.20	-3.20***	-0.92	-1.12	-0.93
	(0.28)	(0.67)	(0.88)	(0.98)	(1.24)	(2.16)	(1.47)
Treatment 2	-0.84***	-2.00***	-1.20	-2.68***	-0.07	0.50	-0.69
	(0.29)	(0.69)	(0.86)	(1.03)	(1.24)	(2.16)	(1.47)
Observations	5996	4674	1994	2680	4284	1833	2451
September							
Treatment 1	-0.35	-1.79**	0.04	-3.34***	0.64	-0.31	2.13
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Treatment 2	-1.59***	-2.57***	-1.17	-3.57***	-0.68	-2.11	-1.72
	(0.36)	(0.81)	(1.20)	(1.10)	(1.41)	(2.21)	(1.80)
Placebo	1.09***	-0.04	0.35	-0.42	-0.99	-4.48*	3.22*
	(0.27)	(0.78)	(1.02)	(1.17)	(1.46)	(2.39)	(1.71)
Observations	5876	4339	1900	2439	3982	1834	2148

Control Rates Information

Informedness, Compliance, and Gender Differences

Heard News =	All		No News	
Model =	Base	Compliant	Base	Compliant
July				
Treated	-0.95***	-2.63***	-1.72***	-3.44***
	(0.35)	(0.97)	(0.47)	(1.23)
Treated x Male	0.03	1.63	0.42	1.21
	(0.47)	(1.15)	(0.72)	(1.59)
Observations	5995	4674	3498	2680
September				
Treated	-1.55***	1.76*	-2.97***	-2.72**
	(0.46)	(0.93)	(0.68)	(1.17)
Treated x Male	1.04*	-0.89	-2.16**	-1.98
	(0.58)	(1.24)	(0.95)	(1.70)
Observations	5882	4339	3343	2439

Discussion

- Did policy actions in 2022 reduce inflation expectations?
  - Yes, if the informed "swallowed the real-world monetary policy pill" and behaved in a similar fashion to those who received new information and actually read it
  - Cf. Andre et al. (2022) hypothetical questions posed in a low-inflation period
  - Test of external validity: high inflation period, more general awareness of inflation, get a different result—even for people who had not recently heard anything about monetary policy
- 40-50% of people did hear news, meaning that communication could have played an important role in real time
- Heterogeneous treatment effects across demographic groups can potentially be explained by informedness and compliance
  - E.g., gender differential in Coibion, Gorodnichenko, and Weber (2020) could reflect that women pay more attention to the RCT treatment than men

Discussion: Mechanism

- Mechanism through which communications about increases in the policy rate reduce inflation expectations?
  - On average, posteriors for GDP growth and personal income are unaffected by the treatment, even for the uninformed/compliant Table
  - If consumers believe the Phillips curve is flat, they do not expect to be moving along a flat Phillips curve—monetary policy moves inflation expectations directly
    - ⋆ Consistent with work of Hazell et al. (2022)
  - But can't rule out the possibility that consumers believe there is a very steep Phillips curve and hence little cost to disinflation
  - Scope for further work

Conclusion

- We run a multi-wave RCT to test the effect of real-world monetary policy actions from 2022 on consumers' inflation expectations
- Introduce ex ante informedness and ex post compliance to empirical macro RCTs
- For those who were previously unaware and were willing to pay attention, monetary policy communications around interest rate increases reduced medium-term inflation expectations
- Policy communications targeting these groups could yield sizeable impacts

Posterior on Prior x Treatment

	(1) March	(2) May	(3) June	(4) July	(5) Sept	(6) Pooled
Prior	0.96***	0.91***	0.93***	0.65***	0.69***	0.91***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Treatment 1	3.18***	-0.61**	-0.30	0.49**	0.28	2.04***
	(0.24)	(0.22)	(0.23)	(0.20)	(0.25)	(0.10)
Treatment 2	0.14	-0.62***	-0.50**	0.55***	0.45*	-0.46***
	(0.24)	(0.22)	(0.23)	(0.20)	(0.25)	(0.10)
Treatment 3	0.05					2.57***
	(0.23)					(0.20)
Treatment 4	0.01					-0.55***
	(0.24)					(0.20)
Placebo					-1.38***	0.08
					(0.24)	(0.19)
Treatment 1 x Prior	-0.53***	0.05***	-0.01	-0.18***	-0.10***	-0.39***
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Treatment 2 x Prior	-0.04***	0.04**	0.01	-0.11***	-0.20***	0.01
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Treatment 3 x Prior	-0.05***					-0.50***
	(0.01)					(0.02)
Treatment 4 x Prior	-0.07***					-0.02
	(0.02)					(0.01)
Placebo x Prior					0.25***	0.03*
					(0.02)	(0.01)
Observations	7961	5212	4899	5996	5876	29884
Adjusted R2	0.86	0.89	0.89	0.64	0.77	0.83

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Treatment Effects on GDP Expectations Via Propensity Score Weighted Regressions

	Compliant &			Non-Compliant &		
Heard News =	All	Yes	No	All	Yes	No
July						
Treatment 1	-0.04	0.82	-1.02	2.49*	0.44	3.65**
	(0.82)	(1.14)	(1.19)	(1.38)	(2.31)	(1.68)
Treatment 2	0.02	-0.92	0.45	3.50**	5.64**	1.71
	(0.84)	(1.14)	(1.24)	(1.40)	(2.30)	(1.76)
Observations	4674	1994	2680	4284	1833	2451
September						
Treatment 1	0.82	-0.40	1.44	1.24	-0.86	3.43
	(1.07)	(1.45)	(1.52)	(1.57)	(2.40)	(2.21)
Treatment 2	0.46	-2.79*	2.34	1.74	-0.27	3.84*
	(1.09)	(1.52)	(1.53)	(1.51)	(2.33)	(2.04)
Placebo	0.38	-2.11	1.95	0.68	-2.26	3.74
	(1.04)	(1.37)	(1.46)	(1.68)	(2.47)	(2.28)
Observations	4339	1900	2439	3982	1834	2148

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Treatment Effects with Quantitative Prior Interest Rate Change Interaction

	Compliant			Non-compliant		
	(1)	(2)	(3)	(4)	(5)	(6)
Heard News =	All	Yes	No	All	Yes	No
Treatment 1	-2.42**	0.68	-3.08***	-0.25	-3.29	1.31
	(0.99)	(2.09)	(1.12)	(1.28)	(2.56)	(1.43)
Treatment 2	-3.09***	-1.73	-3.29***	-0.65	-4.14	1.09
	(1.05)	(1.87)	(1.23)	(1.32)	(2.82)	(1.43)
Placebo	1.02	3.59	0.51	-1.50	-9.86**	2.51
	(1.47)	(2.82)	(1.69)	(1.83)	(4.08)	(1.86)
Rates Up 1pp	-1.47**	-1.61	-0.93	0.92	-1.32	0.86
	(0.70)	(1.14)	(0.94)	(1.36)	(2.41)	(1.50)
Rates Up x Treatment 1	0.83	-0.76	-0.21	-0.09	3.68	-2.62
	(1.14)	(2.20)	(1.44)	(1.82)	(3.16)	(2.15)
Rates Up x Treatment 2	1.13	0.52	0.44	0.58	4.66	-2.06
	(1.19)	(2.00)	(1.53)	(1.86)	(3.32)	(2.24)
Rates Up x Placebo	-1.71	-3.73	-2.00	1.18	9.30**	-2.56
	(1.71)	(3.00)	(2.19)	(2.46)	(4.67)	(2.82)
Observations	9013	3894	5119	8266	3667	4599

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