

# Speaking of Inflation: The Influence of Fed Speeches on Expectations

Eleonora Granziera (Norges Bank)   Vegard H. Larsen (BI)   Greta Meggiorini (UCI)

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*"I think monetary policy is 98% talk and 2% action, and communication is a big part."*

- Ben Bernanke, former Fed Chair

Central Bank communication essential for policy making:

- Increased demand of transparency from public
- Larger set of tools
- Useful to steer or anchor expectations

# Motivation

Some skepticism about effectiveness of central banks' communication:

*“Central banks will keep trying to communicate with the general public, as they should. But for the most part, they will fail.”*

*“Many economic models presume that central bank communication is aimed at wage-setters, price-setters, consumers, or investors—maybe all of them. But are they listening?”*

- Alan Blinder (2018), former Fed Vice Chair

# Research Question

**Are Agents Listening?**

## Are Agents Listening?

- Are FOMC speeches affecting **inflation expectations**?
  - **Households**: basis for consumption and savings decisions (Coibion, Gorodnichenko, and Weber, 2022)
  - **Professional Forecasters**: used to estimate the slope of the Phillips Curve (Ball and Sandeep, 2018) , to increase the accuracy of empirical forecasting models (Gergely and Odendahl, 2021) and fit of structural models (Del Negro et al., 2015)
  - **Market investors**: affect asset prices, e.g. stock prices and interest rates (Bernanke and Kuttner, 2005)

## Are Agents Listening?

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  - Professional Forecasters: used to estimate the slope of the Phillips Curve (Ball and Sandeep, 2018) , to increase the accuracy of empirical forecasting models (Gergely and Odendahl, 2021) and fit of structural models (Del Negro et al., 2015)
  - Market investors: affect asset prices, e.g. stock prices and interest rates (Bernanke and Kuttner, 2005)
- Why analyze **speeches** rather than minutes or statements?
  - real-time publicly accessible information
  - communication towards outsiders
  - longer time series than statements (January 2000) or SEP (October 2007)
  - different speakers: diversity of opinions (cross-section and time series)

# Contribution and Preview of Results

1. Construct inflationary pressure index from Fed speeches
  - new monthly index based on 4890 speeches from 1995M1 to 2023M4

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2. Estimate impact of index on agents' forecasts
  - households (MSC), professionals (SPF) and market based (MKT)
  - Fed sentiment steers expectations of both experts and non-experts
  - (soft) communication efforts effective after the Great Financial Crisis
  - hh affected more than experts



# Contribution and Preview of Results

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2. Estimate impact of index on agents' forecasts
  - households (MSC), professionals (SPF) and market based (MKT)
  - Fed sentiment steers expectations of both experts and non-experts
  - (soft) communication efforts effective after the Great Financial Crisis
  - hh affected more than experts
3. Additional analyses:
  - Speaker matters: Troika vs Non Troika
  - State Dependence: Recessions vs Expansions
  - Long Run Inflation Expectations
  - Hawkishness of FOMC members

# Related Literature

## **Role of central bank communication**

- Impact on financial market instruments

Gürkaynak et al. (2005), Boukus and Rosenberg (2006), Blinder et al. (2008), Carvalho et al. (2016)

- Information conveyed through language

Lucca and Trebbi (2009), Bholat et al. (2015), Hansen and McMahon (2016), Shiller (2017), Haldane and McMahon (2018), Gardner, Scotti, and Vega (2022) , Shapiro and Wilson (2022)

## **Managing expectations**

Pedemonte (2019), Coibion et al. (2021), Coibion, Gorodnichenko, and Weber (2022), D'Acunto et al. (2022), Kumar, Coibion, Afrouzi, and Gorodnichenko (2015), McMahon and Rholes (2022)

## **Fed speeches**

Neuhierl and Weber (2019), Ehrmann, Tietz, and Visser (2021), Malmendier, Nagel, and Yan (2021), Istrefi, Odendahl, and Sestieri (2021), Ahrens and McMahon (2021) Swanson (2023), Swanson and Bauer (2023)

## **Data: Inflationary Pressure Index and Inflation Forecasts**

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# Constructing Inflationary Pressure Index

- Collect speeches by 7 members of Board of Governors and 12 regional Fed presidents  $\approx$  4890 speeches
- Split all the speeches into sentences
- Identify a sentence as being about inflation if it contains one of the topic keywords (**identifiers**):
  - *inflation*
  - *price*
- Pair each keyword with the closest (**modifier**)  
new dictionary based on economic intuition
- Score each pair based on modifier (+1) additive or (-1) subtractive

# Identifiers and Modifiers: List

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Identifiers	Additive Modifiers (+1)	Subtractive Modifiers (-1)
inflation, price	boost, climb, elevat, escalat, expand, foster, height, high, increas, intensify, jump, persist, pressure, moderate, rise, risk remain, rising, rose, risen, soar, solid, spik, sustain, strong, strength, surg, upward, up, upside risk	below, collapse, damp, deteriorat, declin, diminish, down, drop, eas, fall, low, modest, moderated, muted, plummet, reduction, restrain, retreat, set back, slow, soft, subdued, weak

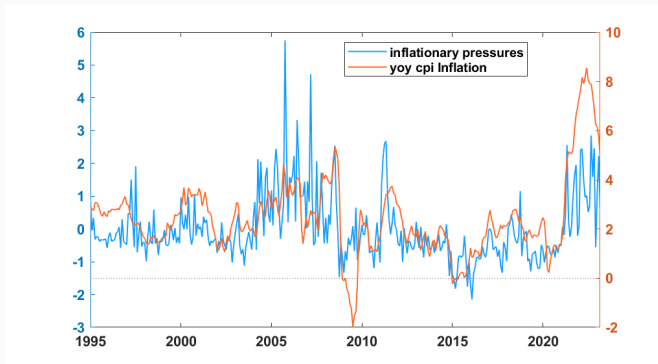
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# Identifiers and Modifiers: Example Sentences

Date	Speaker	Inflation Pressure	Example sentences
2004-10-29	Total	-5	
	R. Ferguson	-5	<i>That should gradually return the economy to full utilization of its resources, while inflation remains subdued.</i>
2005-10-18	Total	94	
	J. Yellen	27	<i>And a key question is whether higher energy prices also will elevate core inflation.</i>
	A. Greenspan	20	<i>Additionally, the longer-term crude price has presumably been driven up by renewed fears of supply disruptions in the middle east and elsewhere.</i>
2015-11-12	Total	-14	
	W. Dudley	-13	<i>It is possible that factors such as very low headline inflation and weak productivity growth are holding down what workers receive in compensation.</i>
	J. Bullard	-4	<i>In that case, policymakers may wish to lower the inflation target to remain more consistent with the actual inflation outcomes.</i>

# Inflationary Pressure Index

- Higher index reflects higher current or future inflationary pressures
- Not an assessment of whether outlook is good or bad (inflation close or far from target)
- Index captures both number of speeches and tone



**Figure 1:** Monthly standardized inflationary pressure index (blue) and year over year monthly cpi all inflation (red), January 1995-April 2023, based on 82,850 sentences.

## Regression results

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# Variable Selection: Controls

$$\text{Model 1: } E_t \pi_{t+h} = \alpha + \beta s_{t-1} + \gamma' X_{t-1} + u_t$$

$$\text{Model 2: } E_t \pi_{t+h} = \alpha + \beta s_{t-1} + \gamma' X_{t-1} + \delta \text{ SEP} + u_t$$

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<b>MSC</b>	PPI by Commodity: Final Demand: Finished Goods
	CPI: Commodities
	PCE: Durable goods
	Manufacturers' Unfilled Orders: Durable Goods

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<b>SPF</b>	Capacity Utilization: Manufacturing
	CPI : All Items Less Food and Energy
	Real Revolving Credit Owned and Securitized

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<b>MKT</b>	CPI: All Items Less Food
	Civilian Labor Force Level
	New Privately-Owned Housing Units Started: Total Units in the Midwest
	New Privately-Owned Housing Units Authorized in Permit-Issuing Places: Total Units in the Midwest

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**Table 1:** Variables  $X_{t-1}$  selected from the LASSO regression of  $E_t \pi_{t+h}$  on  $Z_{t-1}$ , where  $Z_{t-1}$  are the predictors included in the FRED-QD Database for Macroeconomic Research by McCracken and Ng (2016).

# Inflationary Pressure Index and Expectations

	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
<b>MSC</b>						
IPI	0.12***	0.14**	0.07**	0.13**	0.27***	0.22**
SEP		0.22*		-0.14		0.50**
R <sup>2</sup>	0.64	0.71	0.41	0.54	0.73	0.76
<b>SPF</b>						
IPI	0.07***	0.07***	0.05*	0.04	0.12***	0.08***
SEP		0.18***		0.06		0.17**
R <sup>2</sup>	0.80	0.87	0.75	0.64	0.88	0.91
<b>MKT</b>						
IPI	0.09***	0.17***	-0.07*	-0.08	0.17***	0.11*
SEP		0.54***		0.47***		0.64***
R <sup>2</sup>	0.58	0.72	0.29	0.70	0.55	0.73

**Table 2:** Dependent variable: 12 month ahead expectations (median). ‘\*’, ‘\*\*’ and ‘\*\*\*’ indicate significance levels at the 10, 5 and 1 percent. Regressions include controls  $X_{t-1}$  selected from the LASSO regression of  $E_t \pi_{t+h}$  on  $Z_{t-1}$ , with  $Z_{t-1}$  the predictors in the FRED-QD Database by McCracken and Ng (2016). Regressions for the SPF conducted at the quarterly frequency.

# Takeaway

- We find that Fed speeches affect inflation expectations of
  - households
  - professional forecasters
  - markets
- Higher inflationary pressure index implies that agents' have higher inflation expectations
- Households affected more than experts
- Even after controlling for
  - “quantitative” information provided by the Fed in the projections
  - Lagged CPI, among other macro variables
- Both soft and quantitative information more effective starting from the Great Financial Crisis

Baseline results are robust to:

- using **mean** forecast rather than median forecast
- taking out **index outliers** (5% of the sample)
- using **principal components** instead of LASSO
- including **lags** of the inflation pressure and controls
- using **forecast revisions** instead of forecasts
- alternative household expectations **NY Fed SCE**
- excluding identifiers/modifiers

# Additional Results

- speaker matters

Troika more effective than regional presidents

- state dependence

households and markets more affected in bad times

- long run expectations

affected but to a lesser extent

- percentile types

agents at the top of the distribution are more affected by the index

# Hawkishness Index

Are inflation expectations affected by the degree of hawkishness? Construct a naive hawkishness indicator based on FOMC speeches

- By speaker: count the number of times the speaker says inflation, prices and unemployment
- Hawkishness by speaker:  $(\#inflation + \#cost)/(\# unemployment)$
- By date, daily: sum hawkishness of speakers giving speech on that date
- Dummy: hawkish FED if daily hawkishness index greater than real time mean

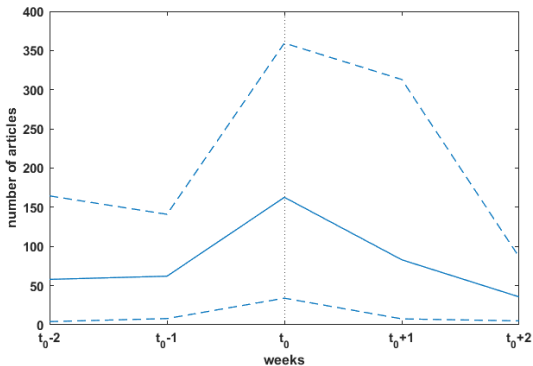
Interact hawkishness indicator with sentiment

# Inflationary Pressure Index and Hawkishness

	MSC		SPF		MKT	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
IPI	0.12***	0.09	0.15***	0.14***	0.16***	0.15**
Hawk*IPI	-0.00	0.27**	-0.14***	-0.12***	-0.14***	0.10
SEP		0.24*		0.15***		0.54***
R <sup>2</sup>	0.64	0.73	0.82	0.89	0.58	0.72
Observations	339	85	114	80	339	85
Tuning Parameter	0.005	0.005	0.01	0.01	0.003	0.003

**Table 3:** Dependent variable: 12 month ahead expectations (median). ‘\*’, ‘\*\*’ and ‘\*\*\*’ indicate significance levels at the 10, 5 and 1 percent. Regressions include controls  $X_{t-1}$  selected from the LASSO regression of  $E_t\pi_{t+h}$  on  $Z_{t-1}$ , with  $Z_{t-1}$  the predictors in the FRED-QD Database by McCracken and Ng (2016). Regressions for the SPF conducted at the quarterly frequency.

# Media Coverage of FOMC Speeches



**Figure 2:** Average number of articles from US newspapers covering FOMC speeches by all members, excluding Chair and NY-FED president, January 1st to April 10th 2023.  $t_0$  is the week in which the speeches are given. Source: Factiva



# Conclusion

- We construct a Fed inflation pressure index
  - identify the “soft” information in Fed communication
- Economic agents are listening
  - Fed communication reaches both experts and non-experts
  - speeches affect inflation expectations
  - quantitative information (SEP) is also useful
- Communication strategies have improved over time
  - larger effectiveness after the Great Financial Crisis
- Heterogeneity across forecasting “type”
  - households respond more
  - agents expecting inflation higher than median are more affected by inflation pressure index

# Implications

- Lessons for policy-makers
  - switch to transparency pays off: expectations are now affected by Fed communication
  - central banks can rely on speeches as well as SEP to
  - speaker matters
- Communication has stronger effects in bad times compared to good times
- Are expectations affected in the intended way?

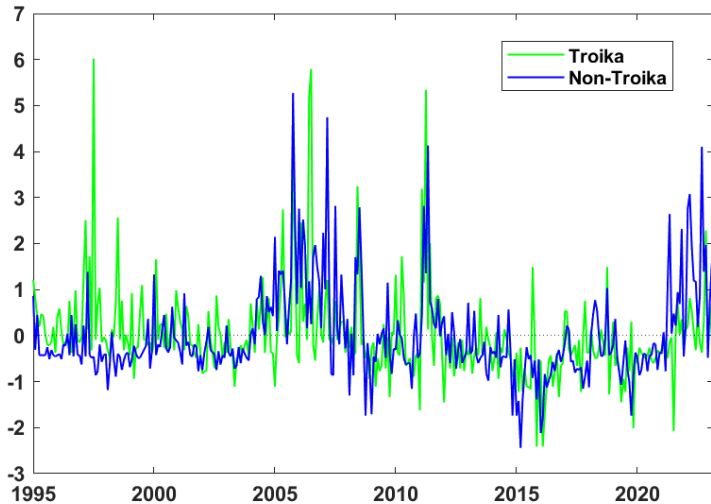
Thank you

# Are some speakers more influential than others?

Build different inflation pressure index by speaker:

- Troika (Chair+Vice Chair+NY Fed President) versus non-Troika (regional presidents)
- Troika considered the most important figures in the Fed System

# Troika versus Non Troika: indexes



**Figure 3:** Inflationary pressure index for Troika (Chair+Vice Chair+NY Fed President) and Non-Troika (all other speakers). The contemporaneous correlation between indices is 0.34.

# Troika vs. Non-Troika

$$\text{Model 1: } E_t \pi_{t+h} = \alpha + \beta_1 s_{t-1}^{\text{troika}} + \beta_2 s_{t-1}^{\text{non-troika}} + \gamma' X_{t-1} + u_t$$

$$\text{Model 2: } E_t \pi_{t+h} = \alpha + \beta_1 s_{t-1}^{\text{troika}} + \beta_2 s_{t-1}^{\text{non-troika}} + \gamma' X_{t-1} + \delta \text{ SEP} + u_t$$

	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	<b>MSC</b>					
Troika IPI	0.03	0.03	0.02	0.02	0.07*	0.09
Presidents IPI	0.10***	0.08	0.07**	0.15*	0.17***	0.05
SEP		0.25*		-0.16		0.63**
R <sup>2</sup>	0.63	0.70	0.42	0.50	0.71	0.74
	<b>SPF</b>					
Troika IPI	0.05**	0.04*	0.04	0.08	0.05*	0.04*
Non-Troika IPI	0.04*	0.05**	0.02	-0.00	0.08***	0.04
SEP		0.16***		0.03		0.18**
R-Squared	0.80	0.87	0.74	0.62	0.88	0.91
	<b>MKT</b>					
Troika IPI	0.11***	0.10***	0.03	-0.01	0.09**	0.07*
Presidents IPI	0.03	0.07	-0.09**	-0.25**	0.11**	0.06
SEP		0.55***		0.37**		0.66***
R <sup>2</sup>	0.59	0.74	0.30	0.77	0.55	0.74

Are the effects different in [different phases of the business cycle](#)?

We look at:

- NBER recession dates
- CBO output gap  
positive vs negative
- Output growth  
year over year growth rate of real GDP below or above 3% average

# State dependence

	NBER		CBO Output Gap		Output Growth	
	Recession	Expansion	Negative	Positive	Below Average	Above Average
				<b>MSC</b>		
IPI	0.56**	0.11***	0.19***	-0.00	0.17**	-0.01
R <sup>2</sup>	0.57	0.74	0.66	0.66	0.55	0.86
				<b>SPF</b>		
IPI	0.12	0.06***	0.12***	0.05	0.06**	0.09**
R-Squared	0.81	0.81	0.83	0.36	0.83	0.69
				<b>MKT</b>		
IPI	0.57***	0.07**	0.12**	-0.01	0.15***	-0.05
R <sup>2</sup>	0.74	0.55	0.53	0.28	0.59	0.47

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Are long-run forecasts affected by Fed inflation pressure?

We use data from:

Michigan Survey of Consumers: 5 year ahead inflation

Survey of Professional Forecasters: 10 year ahead CPI

Market based: 5 year ahead

# Long Run Forecasts: MSC

	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	<b>MSC</b>					
IPI	0.02*	0.03	-0.01	0.02	0.05***	0.06**
SEP		0.02		0.13		-0.09*
R <sup>2</sup>	0.41	0.52	0.22	0.12	0.57	0.66
	<b>SPF</b>					
IPI	0.04***	0.05***	0.02	0.02*	0.10***	0.06**
SEP		0.11***		0.02		0.12***
R-Squared	0.70	0.64	0.88	0.80	0.51	0.60
	<b>MKT</b>					
IPI	0.03	0.13**	-0.12***	0.03	0.10***	0.05
SEP		-0.03		0.47***		0.14**
R <sup>2</sup>	0.60	0.61	0.28	0.75	0.58	0.67

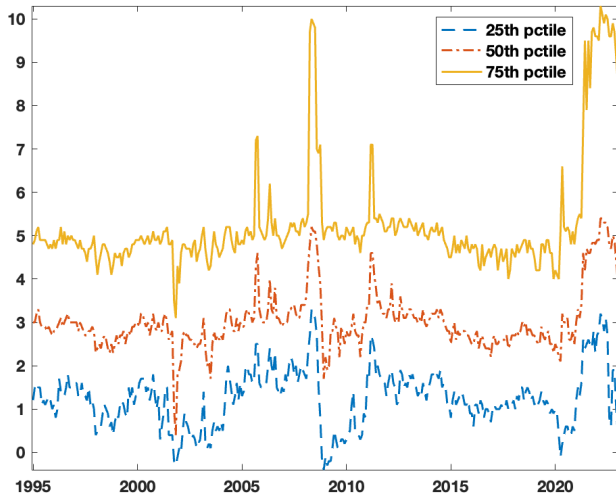
# Percentiles analysis

Are some agents more affected than others?

→ analysis by respondent type:

- types are those in specific percentiles of the time  $t$  survey forecast distribution
  - follows Bianchi, Ludvigson and Ma (2022)
- does not assume types are invariant over time, not about optimistic vs pessimistic

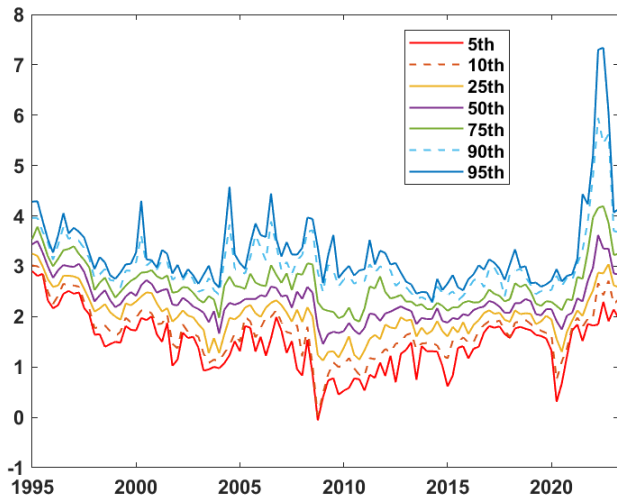
# Percentile Types: MSC



# Percentile Types: MSC

Pctile		1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
25th	IPI	0.17***	0.21***	0.17***	0.33***	0.15**	0.14
	SEP		0.23		-0.07		0.67**
	R <sup>2</sup>	0.42	0.47	0.51	0.66	0.41	0.46
50th	IPI	0.12***	0.14**	0.07**	0.13**	0.27***	0.22**
	SEP		0.22*		-0.14		0.50**
	R <sup>2</sup>	0.64	0.71	0.41	0.54	0.73	0.76
75th	IPI	0.09*	0.08	0.01	0.09*	0.45***	0.24
	SEP		0.54*		-0.23**		0.98*
	R <sup>2</sup>	0.69	0.70	0.36	0.64	0.76	0.73
	Observations	339	85	155	24	184	61

## Percentile Types: SPF



# Percentile Types: SPF

Pctile		1995:Q1-2023:Q2		1995:Q1-2007:Q4		2008:Q1-2023:Q2	
10th							
	Inflation Pressure	0.03	0.01	-0.02	0.02	0.19**	-0.10
	SEP		0.03		0.54***		0.53***
25th							
	Inflation Pressure	0.04*	0.04**	-0.01	0.02	0.11***	0.01
	SEP		0.12**		0.47***		0.28***
75th							
	Inflation Pressure	0.06**	0.07***	0.00	0.04	0.13***	0.08**
	SEP		0.21***		0.39***		0.26***
90th							
	Inflation Pressure	0.14***	0.14***	0.11**	0.15***	0.21***	0.18**
	SEP		0.13		0.32***		0.28

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# Robustness: Mean

## Michigan Consumer Survey

	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
IPI	0.13***	0.16*	-0.00	0.21**	0.38***	0.30**
SEP		0.46**		0.04		0.94**
R <sup>2</sup>	0.72	0.73	0.55	0.58	0.78	0.78

## Survey of Professional Forecasters

	1995:Q1-2023:Q2		1995:Q1-2007:Q4		2008:Q1-2023:Q2	
IPI	0.07***	0.07***	0.03	0.05	0.13***	0.08**
SEP		0.20***		0.15		0.22***
R-Squared	0.80	0.88	0.70	0.66	0.88	0.90
Observations	114	80	52	23	62	57
Tuning Parameter	0.01	0.01	0.01	0.01	0.01	0.01



# Robustness: Outliers

Michigan Consumer Survey						
	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
IPI	0.13***	0.13**	0.06*	0.12*	0.33***	0.26***
SEP		0.43***		-0.13		0.51*
R <sup>2</sup>	0.53	0.63	0.45	0.54	0.69	0.74
Survey of Professional Forecasters						
	1995:Q1-2023:Q2		1995:Q1-2007:Q4		2008:Q1-2023:Q2	
IPI	0.09***	0.12***	0.07*	0.11**	0.14***	0.11***
SEP		0.18***		0.06		0.18**
R-Squared	0.81	0.89	0.76	0.72	0.89	0.91
Observations	108	75	49	20	59	54
Market based						
	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
IPI	0.13***	0.12	0.11**	0.10*	0.37***	0.32**
SEP		0.24*		-0.15		0.45*
R <sup>2</sup>	0.59	0.64	0.39	0.52	0.70	0.71
% Outliers	5	5	5	5	5	5

# Robustness: Principal Components

Michigan Consumer Survey						
	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
IPI	0.13***	0.13**	0.06*	0.12*	0.33***	0.26***
SEP		0.43***		-0.13		0.51*
R <sup>2</sup>	0.53	0.63	0.45	0.54	0.69	0.74

Survey of Professional Forecasters						
	1995:Q1-2023:Q2		1995:Q1-2007:Q4		2008:Q1-2023:Q2	
IPI	0.07**	0.07***	-0.11**	-0.01	0.16***	0.06*
SEP		0.44***		0.31**		0.50***
R <sup>2</sup>	0.50	0.80	0.41	0.47	0.69	0.86

Market based						
	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
IPI	0.06*	0.16***	-0.07**	-0.23***	0.13***	0.08
SEP		0.44***		0.21		0.74***
R <sup>2</sup>	0.48	0.62	0.53	0.71	0.54	0.74

# Robustness: Additional Lags

Michigan Consumer Survey						
	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
IPI	0.11***	0.13**	0.06*	0.15*	0.23***	0.20**
SEP		0.05*		0.07		0.06**
R <sup>2</sup>	0.64	0.71	0.44	0.47	0.73	0.75

Survey of Professional Forecasters						
	1995:Q1-2023:Q2		1995:Q1-2007:Q4		2008:Q1-2023:Q2	
IPI	0.07***	0.07***	0.03	0.05*	0.12***	0.08***
SEP		0.19***		0.06		0.18**
R-Squared	0.80	0.87	0.75	0.67	0.88	0.90
Observations	113	80	51	23	61	56

Market based						
	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
IPI	0.05	0.10**	-0.07*	-0.08	0.11**	0.07
SEP		0.12**		0.04**		0.06**
R <sup>2</sup>	0.59	0.77	0.30	0.63	0.58	0.77

# Robustness: Revisions

	Michigan Consumer Survey					
	1995:m1-2023:m4		1995:m1-2007:m12		2008:m1-2023:m4	
$\Delta$ IPI	0.00	0.01	-0.02	–	0.05	0.05
$\Delta$ SEP		0.17		–		-0.07*
R <sup>2</sup>	0.02	0.03	0.02	–	0.02	0.04
Observations	338	49	154	–	184	181

	Survey of Professional Forecasters					
	1995:Q1-2023:Q2		1995:Q1-2007:Q4		2008:Q1-2023:Q2	
$\Delta$ Inflation Pressure	0.05***	0.05***	0.01	–	0.10***	0.10***
$\Delta$ SEP		0.09		–		0.08
R-Squared	0.20	0.20	0.10	–	0.38	0.38
Observations	113	113	51	–	61	61
Tuning Parameter	0.01	0.01	0.01	–	0.01	0.01

# Robustness: New York Fed SCE

	One Year Ahead		Three Years Ahead	
	Model 1	Model 2	Model 1	Model 2
Inflation Pressure	0.26***	0.29**	0.07***	0.12**
SEP		0.15		-0.03
R-Squared	0.91	0.93	0.81	0.77
Observations	119	39	119	39
Tuning Parameter	0.01	0.01	0.01	0.01

# Are expectations accurate?

Sample	MSC			SPF		
	25th	50th	75th	25th	50th	75th
<b>1995-2023</b>	2.18	1.79	3.18	1.69	1.63	1.60
<b>1995-2007</b>	1.81	1.02	2.39	0.96	0.89	0.91
<b>2008-2023</b>	2.47	2.26	3.76	2.08	2.03	2.00

**Table 4:** Root Mean Squared Error (RMSE) for CPI all items inflation from the MSC and SPF.

# Methodology

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# Regression Model

$$E_t \pi_{t+h} = \alpha + \beta \underbrace{s_{t-1}}_{\text{MSC, SPF or MKT}} + \gamma' \underbrace{X_{t-1}}_{\text{controls selected with LASSO}} + u_t$$

## Timing:

- $s_{t-1}$  is the inflationary pressure index of previous month (MSC, MKT) or of the first month of the quarter (SPF)

## Controls:

- $X_{t-1}$  selected through LASSO among  $\approx 120$  macro-financial variables from FRED data set by McCracken and Ng (2016)
- FOMC projections from SEP

## Rationale: Belloni and Chernozhukov (2013)

- smaller bias compared to one step LASSO regression even when OLS post-LASSO model is misspecified



# Regression Model

Identification of causal effect:

- Issue if some confounding variable is affecting both expectations at time  $t$  and the IPI
- LASSO: control for relevant macro-financial variables but in a parsimonious way

Further exercises:

- PCA analysis
- Reverse analysis: regress sentiment on expectations
- Revisions of forecasts

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