Let's Face It: Quantifying the Impact of Nonverbal Communication in FOMC Press Conferences

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FEDERAL RESERVE BANK OF RICHMOND
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Central Bank Communication

"...In the 1920s, the Governor's "eyebrows" famously became one of the Bank's means of communicating. The eyebrows were, in a way, a primitive form of emoji: sterling crisis – sad face.."

Speech by Andrew G. Haldane, 31 March 2017

- Central bank communication can influence expectations and move markets (e.g., Kuttner, 2001, Gurkaynak et al., 2005, Hansen et al., 2018, Cieslak et al., 2019, Coibion et al., 2019, Ehrmann and Talmi, 2020 and many more)
- What about non-verbal communication?

Central Bank Communication: New Framework

- New strand of literature that identifies and captures soft information embedded in central bank communication

- Non-verbal central bank communication:

    - Gorodnichenko, Pham, and Talavera (2021) - quantify Fed Chairs' tone of voice

FOMC Communication: Press Conferences

Since 2011, every other FOMC meeting has been followed by a press conference (every FOMC meeting since 2019):

- Media and investors concentrate their attention only on FOMC meetings with PCs (Boguth, Gregoire, and Martineau (2018))
- Messages communicated during the press conferences form investors expectations (Gomez Cram, and Grotteria (2020))
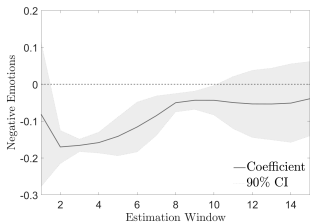
We focus on PCs given their visibility and importance to financial investors; besides being highly important communication tool, also consistent in their structure over time

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Contribution and Results

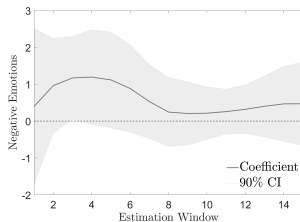- Investors adversely react to Chairs' negative facial expressions exhibited during the press conference

- The impact of Chairs' negative facial expressions on the market is heightened when forward guidance is discussed during the press conference

- The effect of negative facial expressions on the different market measures dissipates within five to ten minutes after being exhibited
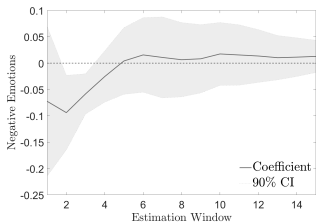
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Results Preview

Panel A: SPY

Panel B: VIX

Panel C: EUR/USD

Panel D: ZN10

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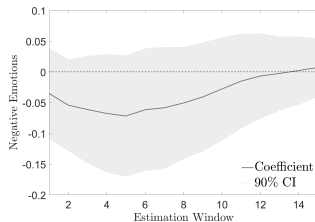
Quantifying Facial Expressions

We decompose each of the 46 PC videos into a set of frames, and use this set of frames as an input data for the Microsoft Azure API:

- For each picture, the predicted scores for each emotion range from 0 to 1
- For each picture, the predicted scores associated add up to 1

We then aggregate these scores to a three minute level

An Example PC Frame
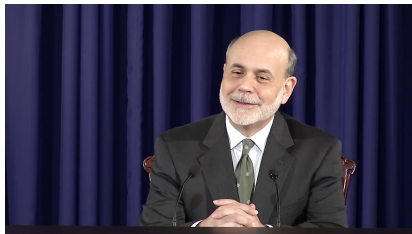
Panel A: Ben Bernanke, March 20th 2013

Emotion	Intensity Score
Anger	0.00
Contempt	0.00
Disgust	0.00
Fear	0.00
Happiness	1.00
Neutral	0.00
Sadness	0.00
Surprise	0.00

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Negative Emotions

Using these intensity scores, we construct our main independent variable called *Negative Emotions*:

$$\text{Negative Emotions}_{i,k} = \frac{(\text{Anger}_{i,k} + \text{Disgust}_{i,k} + \text{Fear}_{i,k})}{(\overline{\text{Anger}_k} + \overline{\text{Disgust}_k} + \overline{\text{Fear}_k})} \quad (1)$$

For example:

- $\text{Anger}_{i,k}$ is the average intensity of anger expressed during a given 3 minute interval i for Chair k
- $\overline{\text{Anger}_k}$ is the average intensity of anger expressed across the sample by Chair k

Research Design

We proxy for changes in market expectations with high-frequency changes in asset volumes and prices (e.g., Nakamura and Steinsson (2018)), and estimate the following specification:

$$\%\Delta Market_{t,me} = \alpha_{fe} + \beta_1 Negative\ Emotions_{t-1} + \beta_k Ctrls_{t-1} + \epsilon_{t,me,fe} \tag{2}$$

- We use t to index minutes, me to index the FOMC meeting, and fe to index either the Chair or FOMC meeting
- We cluster standard errors at the Chair level to account for within Chair correlation of the error terms

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Regression Specification: Variables

Market Instruments ($\%\Delta Market_{t,me}$):

- Percent changes within 3 minute intervals in SPY, VIX, FX, and ZN10 prices and volumes, all measured in basis points.

Negative Emotions ($Negative\ Emotions_{t-1}$):

- Chair's intensity of negative emotions averaged in the prior three minutes, divided by the average intensity of negative emotions across all FOMC meetings presided by that Chair

Controls ($Ctrls_{t-1}$):

- Market conditions, PC tone, MPU, pre-drift variables, FFR change
- Interaction variables (discussion theme, media coverage, fed fund futures)

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Market Reactions and Negative Emotions (Stocks)

Panel A: Stock Market Reaction

	(1) %Δ SPY	(2) %Δ SPY	(3) %Δ SPY	(4) %Δ VIX	(5) %Δ VIX	(6) %Δ VIX
Negative Emotions	-0.459^{***}	-0.493^{***}	-0.499^{***}	3.203	3.330^{*}	3.519^{*}
	(0.000)	(0.000)	(0.000)	(0.106)	(0.083)	(0.088)
Negative Tone	13.557	16.754	21.568	83.497	49.513	-56.846
	(0.577)	(0.522)	(0.543)	(0.542)	(0.770)	(0.852)
Δ FFR	-0.032^{***}	-0.039^{***}		0.224	0.269	
	(0.000)	(0.000)		(0.205)	(0.250)	
SPY Pre Drift	0.023^{***}	0.022^{***}				
	(0.005)	(0.002)				
VIX Pre Drift				0.006	0.005	
				(0.126)	(0.155)	
MPU	-0.488^{***}	0.102		1.568	0.105	
	(0.000)	(0.782)		(0.668)	(0.988)	
Market Conditions	-0.495	0.276		4.928	2.189	
	(0.701)	(0.819)		(0.575)	(0.811)	
Chair FE	No	Yes	No	No	Yes	No
Meeting FE	No	No	Yes	No	No	Yes
N	2,518	2,518	2,518	2,518	2,518	2,518
Adj R^2	0.012	0.017	0.051	0.001	0.001	0.021

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

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Market Reactions and Negative Emotions (FX/Treasury)

Panel B: FX and Treasury Market Reactions

	(1) %Δ EURUSD	(2) %Δ EURUSD	(3) %Δ EURUSD	(4) %Δ ZN10	(5) %Δ ZN10	(6) %Δ ZN10
Negative Emotions	−0.265**	−0.257**	−0.174**	−0.167	−0.158	−0.183
	(0.017)	(0.015)	(0.011)	(0.273)	(0.317)	(0.247)
Negative Tone	−25.115***	−26.585***	−28.034	−3.363	−4.129	−5.748
	(0.010)	(0.004)	(0.114)	(0.713)	(0.632)	(0.463)
Δ FFR	0.008*	0.010***		0.007***	0.008**	
	(0.078)	(0.004)		(0.000)	(0.031)	
EURUSD Pre Drift	0.009***	0.010***				
	(0.001)	(0.000)				
ZN10 Pre Drift				0.020**	0.020**	
				(0.022)	(0.012)	
MPU	0.266**	0.195		0.164	0.048	
	(0.031)	(0.334)		(0.176)	(0.829)	
Market Conditions	0.266	0.132		−0.088	−0.235	
	(0.667)	(0.864)		(0.571)	(0.328)	
Chair FE	No	Yes	No	No	Yes	No
Meeting FE	No	No	Yes	No	No	Yes
N	2,518	2,518	2,518	2,518	2,518	2,518
Adj R^2	0.006	0.006	0.040	0.019	0.020	0.066

$^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

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Media Attention and Press Statement Surprise

To examine whether increased attention exacerbates the reaction of market participants to negative emotions expressed by the Chair, we include two measures of market attention in our analysis:

- We find that increased media attention provides an amplification effect to nonverbal communication for SPY

- We also find that a surprising FOMC announcement has an amplification effect the reaction of market participants to negative emotions

Written Tone and Discussion Theme

We examine the interaction between the negative emotions expressed by the Chair with the tone and topic of the verbal component:

- We find that the adverse effect of Negative Emotions on stock market is diminished if the tone of the conference takes a more negative turn.

- We also find that the adverse effect of Negative Emotions on markets is amplified if forward guidance is discussed during the conference

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Conclusion

When the Fed Chair speaks, the market not only listens, but also watches:

- We find a significant adverse relation between Chairs' expressed negative emotions and reaction of investors, even when controlling for the content of the conference and additional explanatory variables

- Furthermore, we observe that the adverse impact of the Chairs negative emotions on the markets is heightened when forward guidance is discussed during the press conference

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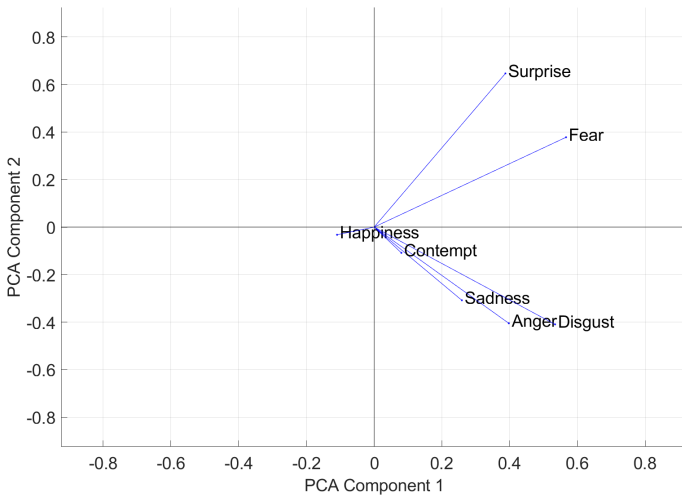000

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The End

Thank You!

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PCA: Negative Emotions

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Negative Emotions and FOMC Meetings

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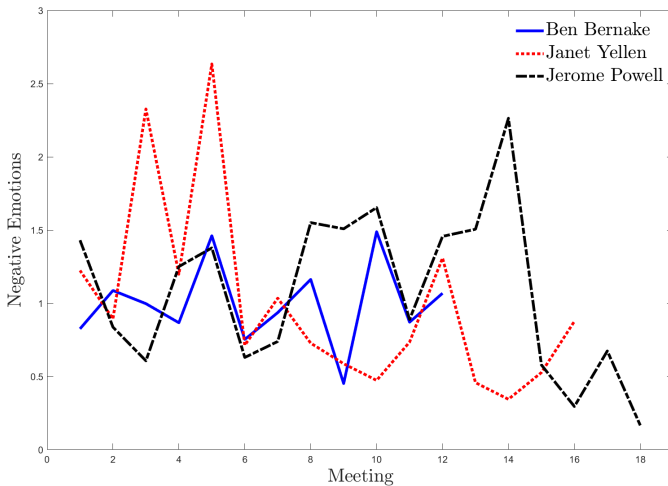
Negative Emotions and Tone
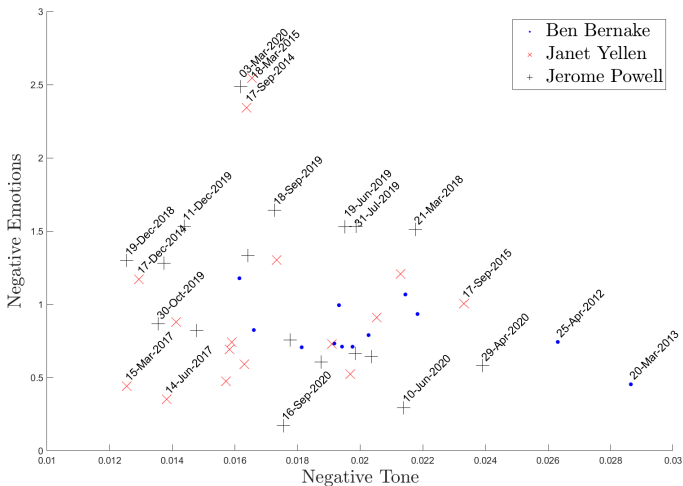
Meeting Attention, Press Statement Surprise and Negative Emotions

Panel A: Media Attention

	(1) %Δ SPY	(2) %Δ VIX	(3) %Δ EURUSD	(4) %Δ ZN10
Negative Emotions	0.881^{**}	-2.706	0.491^{*}	0.043
	(0.012)	(0.602)	(0.075)	(0.733)
Media Coverage * Negative Emotions	-0.088^{***}	0.399	-0.043^{**}	-0.015
	(0.000)	(0.384)	(0.036)	(0.430)
Negative Tone	21.029	-54.415	-28.293^{*}	-5.837
	(0.555)	(0.857)	(0.099)	(0.437)
Meeting FE	Yes	Yes	Yes	Yes
N	2,518	2,518	2,518	2,518
Adj R^2	0.053	0.021	0.041	0.066

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Meeting Attention, Press Statement Surprise and Negative Emotions

Panel B: Press Statement Surprise

	(1) %Δ SPY	(2) %Δ VIX	(3) %Δ EURUSD	(4) %Δ ZN10
Negative Emotions	−0.078	−2.274	−0.200*	−0.285**
	(0.843)	(0.587)	(0.069)	(0.024)
Press Statement Surprise * Negative Emotions	−0.015**	0.201**	0.001	0.004***
	(0.041)	(0.031)	(0.484)	(0.001)
Negative Tone	21.682	−58.417	−28.041	−5.776
	(0.486)	(0.811)	(0.111)	(0.474)
Meeting FE	Yes	Yes	Yes	Yes
N	2,518	2,518	2,518	2,518
Adj R^2	0.057	0.033	0.039	0.068

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Written Tone, Discussion Theme, and Negative Emotions

Panel A: Written Tone

	(1) %Δ SPY	(2) %Δ VIX	(3) %Δ EURUSD	(4) %Δ ZN10
Negative Emotions	-0.789^{***}	7.339^{**}	0.391	0.068
	(0.000)	(0.048)	(0.235)	(0.730)
Negative Tone	8.075	120.891	-1.777	5.944
	(0.841)	(0.688)	(0.756)	(0.181)
Negative Tone * Negative Emotions	15.654^{**}	-206.216	-30.465	-13.565^{***}
	(0.025)	(0.115)	(0.179)	(0.000)
Meeting FE	Yes	Yes	Yes	Yes
N	2,518	2,518	2,518	2,518
Adj R^2	0.051	0.021	0.041	0.067

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

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Written Tone, Discussion Theme, and Negative Emotions

Panel B: Discussion Theme				
	(1) %Δ SPY	(2) %Δ VIX	(3) %Δ EURUSD	(4) %Δ ZN10
Negative Emotions	-0.083	0.735	-0.013	-0.106
	(0.145)	(0.829)	(0.852)	(0.552)
Negative Tone	11.554	33.539	-28.769	-6.517
	(0.750)	(0.903)	(0.129)	(0.457)
Status of Economy	1.343	-8.243	-0.128	0.032
	(0.196)	(0.130)	(0.775)	(0.963)
Status of Economy * Negative Emotions	-0.505	2.916	-0.430	-0.388
	(0.127)	(0.686)	(0.182)	(0.172)
Forward Guidance	0.956	-0.901	0.314	-0.027
	(0.287)	(0.885)	(0.609)	(0.934)
Forward Guidance * Negative Emotions	-1.892^{***}	13.275^{*}	-0.721^{**}	-0.259
	(0.005)	(0.067)	(0.012)	(0.238)
Meeting FE	Yes	Yes	Yes	Yes
N	2,518	2,518	2,518	2,518
Adj R^2	0.057	0.025	0.041	0.067

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$