The Market Impact of Fed Communications: The Role of the Press Conference*

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Abstract

We document a shift in the market impact of the press conference given by the Federal Reserve Chair at the close of FOMC meetings. Using intraday trading data, we find that market volatility is more than three times higher during press conferences given by current Chair Jerome Powell than during press conferences by predecessors Janet Yellen and Ben Bernanke. Press conferences since the start of Covid-19 are largely responsible for the heightened market volatility during Chair Powell's conferences. During this period, we find that the market tends to move in the opposite direction during the press conferences compared to its movement following the FOMC statement publication. In contrast, press conferences by Chairs Bernanke and Yellen tended to reinforce the market's initial reaction to the information released in the FOMC statement. Text analysis of the Q&A portions of Powell's press conferences suggests that his choice of language correlates with these market movements. We find that Fed communications during the recent period have been less effective in reducing forward-looking interest rate uncertainty.

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Financial markets react sharply and instantaneously to communications from the Federal Reserve (Fed) (Fleming and Remolona, 1999). New evidence suggests that investors learn not just about the nominal short-run interest rate, which is set by the Federal Open Market Committee (FOMC), but also change their views about long-run macroeconomic conditions in response to Fed communications (Hillenbrand, 2022). Consequently, the Fed has become increasingly transparent over time about both the information it has about the economy as well as its views about the forward path of monetary policy (Nelson, 2021).

Starting in April 2011, Chair Bernanke redoubled this commitment to transparency by holding a press conference after the release of the FOMC statement. In this inaugural conference, he stated his intention was to "[...] reflect the consensus of the Committee, while taking note of the diversity of views as appropriate." Since its introduction, the press conference has become a highly-anticipated part of the Fed's communications with the public. Recent events highlight the impact that the press conference can have on markets: during five FOMC press conferences in 2022, the S&P 500 lost or gained over 1 percent—$300 billion—in value.

In this paper, we document a significant departure in the nature of market reactions to recent conferences under the tenure of Chair Jerome Powell. While Fed press conferences have been associated with heightened market volatility since their inception (De Pooter 2021, Gómez-Cram and Grotteria 2022), we document a sharp increase in market volatility during Chair Powell's conferences. Squared returns on market indices over Chair Powell's press conferences are three times higher on average than during press conference by Chairs Bernanke and Yellen. This heightened volatility does not appear to be due to higher baseline uncertainty or more volatility around Fed communications at large. We find that market volatility following the FOMC statement release and during a placebo time interval the week prior to the press conference are similar across all chairs. Meetings taking place since the start of the Covid-19 pandemic (i.e., since March 2020) are largely responsible for the heightened market volatility during press conferences during Chair Powell's tenure.

In addition to heightened market volatility, we find that recent press conferences under Chair Powell's tenure have been more likely to reverse initial market reactions to the FOMC statement. While press conferences given by former Chairs Bernanke and Yellen tended to reinforce the FOMC statement, generating a positive correlation between the initial market reaction to the FOMC statement and the market reaction to their press conferences (as previously documented by Gómez-Cram and Grotteria 2022), Chair Powell's press conferences tend to trigger *opposite* moves in the market. That is, during Chair Powell's press conferences, the initial reaction of both equity and Treasury markets to the FOMC statement is often reversed. These market reversals are concentrated during press conferences since the beginning of Covid-19, suggesting that the shift in the market impact of Fed communications under Chair Powell may signal a difference in strategy

during a period of macro uncertainty.

Following Rosa (2013), we interpret an increase in asset market volatility in response to the press conference as evidence that it is providing market-relevant information that was not already summarized in the joint statement. To further explore this hypothesis, we analyze text from the Q&A portion of two of Chair Powell's most recent conferences. By manually matching moments of the press conference with movements in two-year Treasury yields, we find a number of examples where Chair Powell's answers to reporters' questions appear to move markets. We also supplement this manual analysis with a computation approach. We start by building a corpus of words used in FOMC statements and assigning a "positive" or "negative" value to each word using the market reaction to FOMC statements containing those words. Note that these data have no overlap with the Q&A portion of the Chair's press conference. We find that Chair Powell's language during Q&A often shifts toward more accommodative or more hawk-ish language, which aligns with the market reactions to his press conferences. We validate our approach by applying the same text analysis technique to a much-watched speech made by Chair Powell at the Brookings Institution on November 30, 2022, and find that the market rally during that speech was accompanied by more accommodative language used by Chair Powell during the event Q&A.

Our analysis suggests that the press conference has taken on a more central role in Fed communications since the start of the Covid-19 pandemic. This shift in the role of the press conference may be meant to serve many different goals. We discuss explanations ranging from making space for nimble Fed policy to Chair Powell using the press conference to get out ahead of other FOMC members to manage dissent (thereby disciplining the communications "arms race" documented by Vissing-Jorgensen 2019). Ultimately, we evaluate this shift in communication strategy along one dimension—namely, its effectiveness in reducing uncertainty about the path of future interest rates. Following Sinha (2015) and Cremers et al. (2021), we use implied volatility from at-the-money options on short- and long-term Treasury futures as a proxy for interest rate uncertainty and study how this measure of interest rate uncertainty changes around FOMC press conferences. We find that recent FOMC press conferences have been less effective in reducing uncertainty on both short- and long-term interest rates. While this is by no means a comprehensive assessment of the success of this shift in communication, our analysis cautions that elevating the role of press conference communications may be at odds with the Federal Reserve's goal of increasing the predictability of monetary policy.

Related literature. Our analysis relates to a vast literature that uses high-frequency data to document the effect of Fed actions on financial markets, including Kuttner (2001), Cochrane and Piazzesi (2002), Gürkaynak et al. (2005), Bernanke and Kuttner (2005), Hanson and Stein (2015), Gertler and Karadi (2015), Nakamura and Steinsson (2018), Cieslak and Schrimpf (2019),

Miranda-Agrippino and Ricco (2021), and Hillenbrand (2022), among many others. One important finding in this literature is that Fed communications can impact markets beyond changes in the target rate alone. For example, Gürkaynak et al. (2005) show that markets react immediately to monetary policy announcements even when there is no change in the actual policy itself. Nakamura and Steinsson (2018) and Hillenbrand (2022) stress that communications in FOMC statements or in the summary of economic projections can have important effects on market expectations. Recent work directly studies the nature of these Fed communications, for instance by measuring the length, complexity, and sentiment of the FOMC statement (e.g., Hernández-Murillo and Shell 2014, Acosta and Meade 2015, Hansen and McMahon 2016, Josselyn and Meade 2017, Ehrmann and Talmi 2020, Gáti and Handlan 2022), or even by measuring changes in speaking tone (Gorodnichenko et al. 2021) or facial expression (Curti and Kazinnik 2021).

Most closely related to our analysis of Fed press conferences are De Pooter (2021), Gómez-Cram and Grotteria (2022), and Parle (2022). In a FEDS Note, De Pooter (2021) finds that average absolute returns in the stock and bond markets are higher during Fed press conferences than during non-event windows, consistent with the release of market-relevant information during these press conferences. He documents that the language used by Fed Chairs during the press conference scores lower on a complexity index than language used in the FOMC statement and speculates that the clarity in press conference language may contribute to their impact on markets.[1] We build on De Pooter (2021) by documenting a shift in the market impact of Fed press conferences over time, documenting the increased frequency of market reversals during press conferences since the onset of Covid-19, and attempting to understand the affect of this shift on forward-looking uncertainty.

Gómez-Cram and Grotteria (2022) document a positive correlation between market reactions to FOMC statements and to the subsequent press conference and, by aligning press conference transcripts to high-frequency financial data, attribute this positive correlation to moments when the Fed Chair discusses the new policy statement. Their sample of FOMC days ends in January 2020. We also find a positive correlation between market reactions to the FOMC statement and to the press conference before 2020, reaffirming Gómez-Cram and Grotteria (2022). But, importantly, we find that this pattern reverses in the period since Covid-19.

Parle (2022) also studies the role of central bank press conferences, but in the context of press conferences given by the European Central Bank (ECB). Using natural language processing techniques, he finds that the market reacts to additional information shared by the ECB during its press conferences are separate from the initial information shared in its monetary policy decision statement. Our evidence that language used by the Fed Chair during press conferences affects markets beyond the FOMC statement resonates with his findings.

[1] He also shows that Chair Powell tends to use significantly less complex language during press conferences than his predecessors and shows how topics discussed during the press conference Q&A have evolved over time.

Finally, as part of our analysis, we discuss whether the shift in the role of the press conference is a beneficial one. Here, we relate to a large literature that considers the goals and effectiveness of monetary policy communication, surveyed by Blinder et al. (2008) and Coenen et al. (2017). Particularly relevant are Ehrmann and Fratzscher (2007), who question whether communicating the diversity of committee member views enhances the predictability of monetary policy; Stein and Sunderam (2018), who consider how gradualism in monetary policy communication affects market reactions; andVissing-Jorgensen (2019), who studies the costs and benefits of the "communications arms race" among monetary policy makers.

1 Data

We collect information on press conferences given at the close of Federal Open Market Committee (FOMC) meetings starting in April 2011 when Chair Ben Bernanke first instituted the practice. Our sample ends with the press conference on December 14, 2022. For each press conference, we record the time at which the FOMC statement was released, the time at which the Chair's press conference started, and—using videos on the Federal Reserve website—the duration of the press conference.[2] We exclude three unscheduled and emergency press conferences from our analysis: the March 4, 2014 unscheduled conference call under Chair Yellen and the Covid-19 related press conferences on March 3 and March 15, 2020 under Chair Powell.

To measure market reactions, we collect tick-by-tick data NYSE Trade and Quote (TAQ) database on two exchange-traded funds (ETFs) that track the S&P 500 and Dow Jones Industrial indices (SPY and DIA, provided by SPDR). For most analyses, we collapse this data at the minute level, by taking the median mid price for each ticker in each minute.

We also collect data on intra-day movements in the yield curve using Bloomberg indices.[3] Since intraday data on these indices starts in 2013, we limit our analysis of movements in Treasury yields to start with Chair Yellen's tenure (i.e., March 2014–Present). Data from these Bloomberg indices aligns closely with daily Treasury yield data from Gürkaynak et al. (2007) (updated weekly at `https://www.federalreserve.gov/data/nominal-yield-curve.htm`). From January 2011 to December 2022, the correlation of daily two-year Treasury and ten-year Treasury yields from Bloomberg indices with two- and ten-year par yields from Gürkaynak et al. (2007) is over 0.999.

Finally, we use daily measures of thirty-day implied volatility on at-the-money Treasury options, from Bloomberg's LIVE calculation engine. This data source is an alternative to implied volatility measures constructed by the CBOE, which were discontinued in May 2020. Neverthe-

[2]These dates and times are available from the Federal Reserve website at `https://www.federalreserve.gov/monetarypolicy/fomcpresconf20220727.htm`.

[3]We use the `USGG` indices from Bloomberg (e.g., the `USGG2YR` index for intraday data on two-year yields).

less, the two measures are closely correlated: from January 2011 to May 2020, the correlation of daily 30-day implied volatility on at-the-money 10-year Treasury options from Bloomberg's LIVE calculation engine and from the CBOE is 0.95.

2 Empirical Analysis

In this section, we present our main empirical results. First, we document heightened market volatility during Fed press conferences—consistent with the release of market-relevant information during these conferences—and, in particular, an increase in press conference volatility during Chair Powell's tenure. Second, we show a pattern of reversals during recent conferences and link market movements during these reversals to the language used in press conference Q&A. Finally, we explore how measures of forward-looking uncertainty on short- and long-term Treasury yields react to recent press conferences.

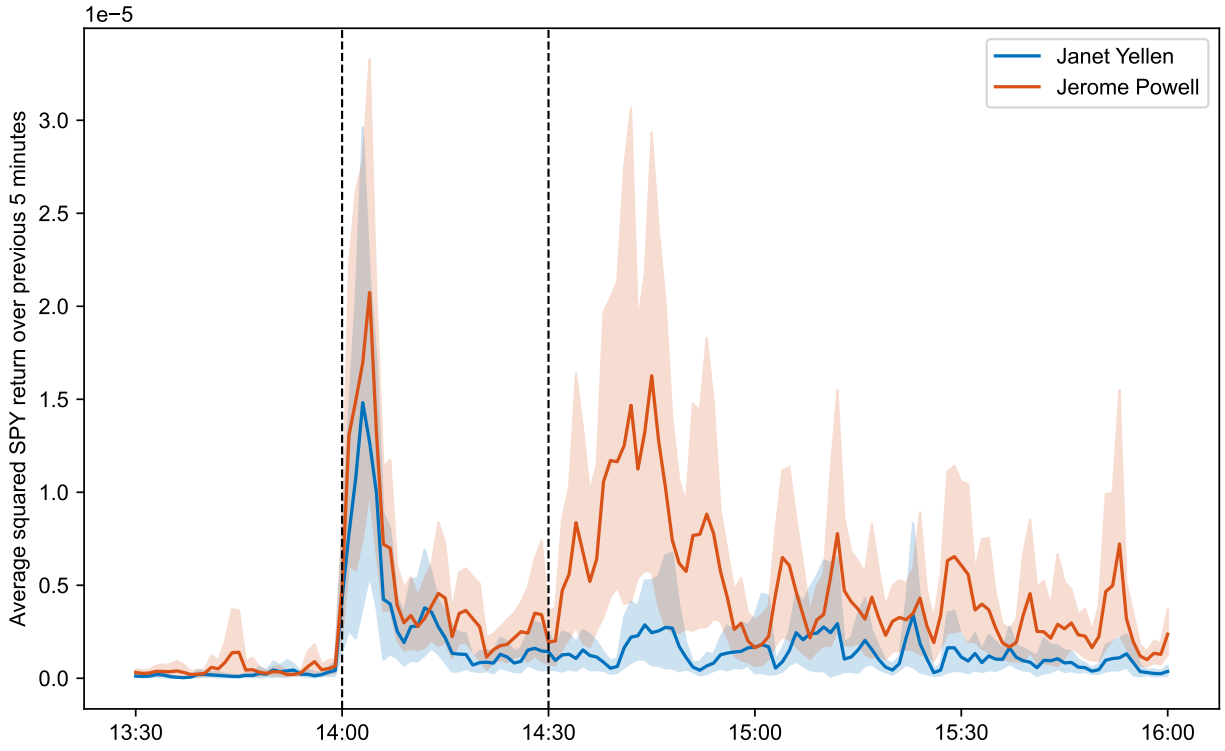
2.1 Market Volatility during Fed Press Conferences

We start by plotting market volatility, measured by squared returns on the S&P 500 over five-minute increments, over the course of the FOMC statement release and press conference on FOMC press conference days in Figure 1. (Figure 1 includes only conferences since 2013 under Chairs Yellen and Powell, since the timing of statement releases and press conferences sometimes differed under Chair Bernanke.) As documented by previous work (e.g., Gürkaynak et al. 2005, Rosa 2013), the release of the FOMC statement at 2:00pm is marked by a sharp rise in volatility as markets incorporate the information in the FOMC statement. We observe a subsequent rise in market volatility after the start of the FOMC press conference at 2:30pm. While volatility during the press conference is high relative to the period before the FOMC statement release for both Chairs Yellen and Powell, Figure 1 shows that the heightened volatility during press conferences is especially pronounced for Chair Powell.

To explore the heightened volatility during Fed press conferences, we construct a measure of market volatility during three event windows: (1) from one minute before the press conference to the end of the press conference, (2) for a thirty minute window starting one minute before the FOMC statement release,[4] and (3) for the identical window as the press conference but the prior week prior to the conference, which we refer to as the "placebo conference." Our baseline measure

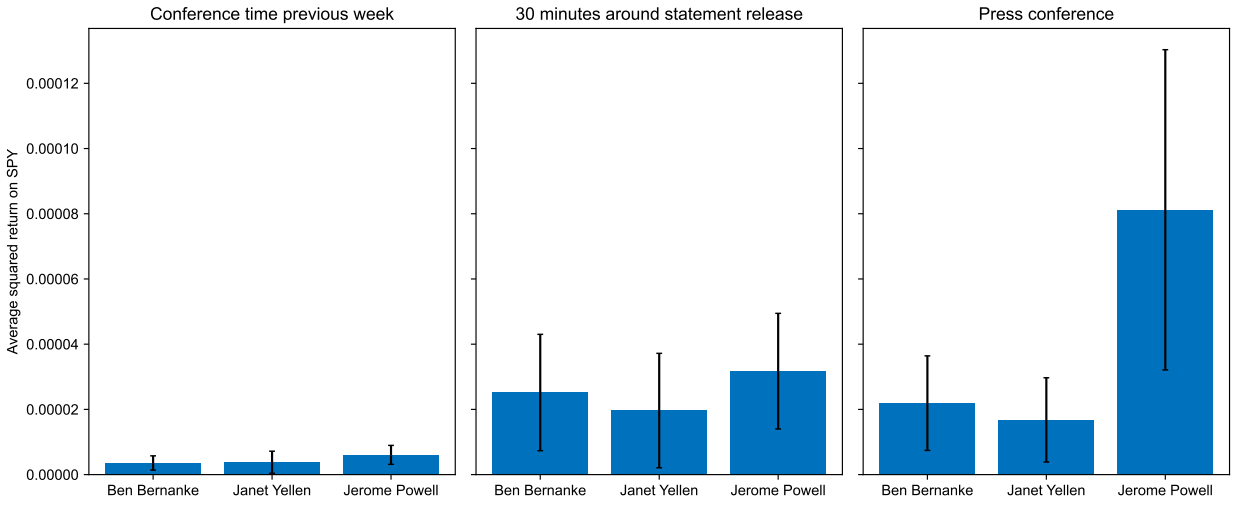
[4]For four of Chair Bernanke's conferences, the FOMC statement was released just fifteen minutes prior to the press conference. The FOMC statement release windows and press conference windows overlap for these four events in our baseline analysis. In Appendix Table A4, we repeat our analyses instead using 15 minute windows after the FOMC statement release, so that the two windows are always non-overlapping. The results are very similar.

Figure 1: Market volatility on FOMC press conference days.



Note: The figure shows average squared returns of the S&P 500 index (proxied by the SPY ETF) over five-minute periods from 1:30 PM to 4:00 PM on FOMC press conference days. Dashed lines indicate the FOMC statement release time (2:00 PM) and the press conference start time (2:30 PM). Each line plots the average of squared returns for the previous five minutes across all press conferences given by the chair. The shaded area is a bootstrapped 95 percent confidence interval.

Figure 2: Market volatility for placebo conference, FOMC statement release, and press conference under three chairs, measured using average squared returns.



Note: The figure shows average squared returns of the S&P 500 index (proxied by the SPY ETF) during press conferences given by Chair Powell, Chair Yellen, and Chair Bernanke. We measure returns from the minute before the press conference starts to the minute it ends. We exclude emergency and unscheduled conferences: the March 4, 2014 unscheduled conference call under Chair Yellen and the emergency Covid-19 related press conferences given by Chair Powell on March 3, 2020 and March 15, 2020.

of market volatility is squared returns of the S&P 500 (proxied using the SPY ETF) over the event window.

Figure 2 compares market volatility for the placebo conference, FOMC statement release, and the press conference for Chairs Ben Bernanke, Janet Yellen, and Jerome Powell. Two patterns stand out. First, average market volatility during the window around the FOMC statement release and during the press conference are both significantly higher than market volatility during the placebo period. This observation conforms with previous work by De Pooter (2021) and Gómez-Cram and Grotteria (2022), who also document heightened market volatility during Fed press conferences. Second, there is a striking increase in market volatility during Chair Powell's press conferences compared to press conferences given by his predecessors. Squared market returns during Chair Powell's press conferences are three times greater on average than squared returns during press conferences by Ben Bernanke and Janet Yellen. In contrast, squared market returns during the placebo period and in the 30 minutes following the FOMC statement release are similar across all three chairs.

A regression analysis in Appendix Table A1 confirms these visual observations: market volatility during Chair Powell's conferences is significantly higher than his predecessors, while there is no statistically significant difference in volatility during the placebo period or following the FOMC

statement release. Results from the Dow Jones Industrial index, shown in Appendix Figure A2 and Table A2, are also similar: market volatility during Chair Powell's press conferences is just over three times higher than under his predecessors.

As an alternate measure of market volatility, we use squared returns measured in five-minute increments over the event window. (For the FOMC statement, we simply use the market return for a five minute window starting one minute before the FOMC statement release.) This measure has two advantages: it captures market swings that take place over the course of the press conference, and it compares the market impact of the FOMC statement and press conference in comparable units of time. Figure A1 shows how this measure of market volatility compares across the three chairs. Under this measure, a five-minute increment during the press conference is less informative, on average, than the five minutes following the FOMC statement release. Again, market volatility during Chair Powell's press conferences stand out from his predecessors'.

One explanation for the heightened market volatility during Chair Powell's conferences could be the more volatile macro environment under his tenure, which includes the pandemic response and subsequent resurgence of inflation. However, there is little evidence of a difference in volatility across the three chairs during the placebo window, suggesting the heightened volatility during Chair Powell's press conferences is not an artifact of higher baseline market volatility. Similarly, there is no significant difference in market volatility in the minutes surrounding the FOMC statement release across the three chairs, suggesting that heightened volatility during Chair Powell's press conferences is not the result of more surprising interest rate policy.[5]

Given the similarity in market volatility during the placebo window and following the FOMC statement release across the three chairs, the data instead lead us to interpret the heightened market volatility during Chair Powell's press conferences as evidence of a change in the role of the press conference. As discussed by Rosa (2013), realized market volatility can serve as an indicator for the release of market-relevant information. Thus, under this interpretation, the heightened market volatility during Chair Powell's press conferences suggests that these conferences have become a more important mode for the Fed (or Chair Powell) to affect market expectations.

We define the *relative market impact of the Fed press conference* as the ratio of market volatility during the press conference as compared to the thirty minutes following the FOMC statement

[5]In Appendix Table A6, we compare market volatility following the release of other macro news announcements under Chair Powell's tenure to volatility following those announcements' release under Chairs Bernanke and Yellen. For most releases—including the release of FOMC minutes—we also do not find a significant difference during Chair Powell's tenure. However, we do find heightened market volatility under Chair Powell's tenure for the release of the CPI and the JOLTS Job Openings Report, consistent with the increased importance of inflation and labor market tightness in the aftermath of the Covid-19 pandemic.

release. That is,

$$\text{Relative Market Impact of Press Conference}(t) = \frac{\text{Volatility during Press Conference}(t)}{\text{Volatility after FOMC Statement Release}(t)},$$

where Volatility during Press Conference(t) is measured as the variance of S&P 500 returns in five-minute increments during the press conference, and Volatility after FOMC Statement Release(t) is measured as the variance of S&P 500 returns in five-minute increments for the thirty minutes following the FOMC statement release. This measure captures the importance of the press conference in moving market expectations relative to the FOMC statement release, for each FOMC date.

Figure 3 plots the average relative market impact of the press conference for Chairs Bernanke, Yellen, and Powell. The average level for Chair Powell is about 75 percent higher than for Chair Bernanke and double that of Chair Yellen. Appendix Table A5 shows that the heightened market impact of the press conference under Chair Powell is statistically significant. This evidence suggests that a shift in the importance of the press conference, relative to the FOMC statement, in affecting market expectations under Chair Powell's tenure.[6]

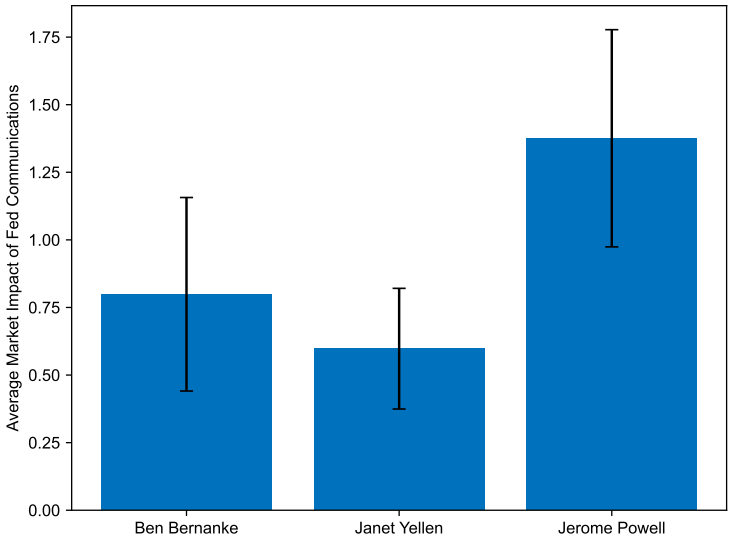
Break at the onset of Covid-19. Why has the press conference gained additional importance under Chair Powell? One explanation is that different Federal Reserve Chairs bring different styles and preferences to the job. For example, Gáti and Handlan (2022) document changes in the pattern of FOMC statement communications around the introduction of new Chairs, consistent with Chairs having distinct communication styles. In the case of Chair Powell specifically, De Pooter (2021) shows that Chair Powell tends to use simpler language (measured using the Flesch-Kincaid Readability index) during his press conferences than his predecessors.

Our analysis suggests, however, that the heightened market volatility during Chair Powell's press conferences is largely attributable to conferences given since the start of the Covid-19 pandemic. Figure 4 splits the plot of market volatility on the day of FOMC press conferences (shown above in Figure 1) for conferences held before the pandemic ("Pre-Covid") and once it began ("Post-Covid").[7] By splitting Chair Powell's conferences by the onset of the pandemic, we immediately note that it is the post-Covid conferences that cause significantly more volatility in the market.

[6]To further explore the relationship between market reactions to FOMC statement releases and press conferences at the same FOMC meeting, Appendix Figure A7 plots the magnitude and volatility of the market reaction to the FOMC statement release against the magnitude and volatility of the market reaction to the press conference. There is a mild positive association between the magnitudes and volatilies of the market reactions. However, conditional on a certain market reaction to the FOMC statement release, both the size and volatility of the market reaction during the press conference given by Chair Powell appears to be larger than under the other chairs.

[7]Please note that by post-Covid, we refer to the conferences that followed after the onset of the pandemic. "Post-Covid" does not imply anything about when the pandemic ended.

Figure 3: Relative market impact of press conference: Comparison across chairs.

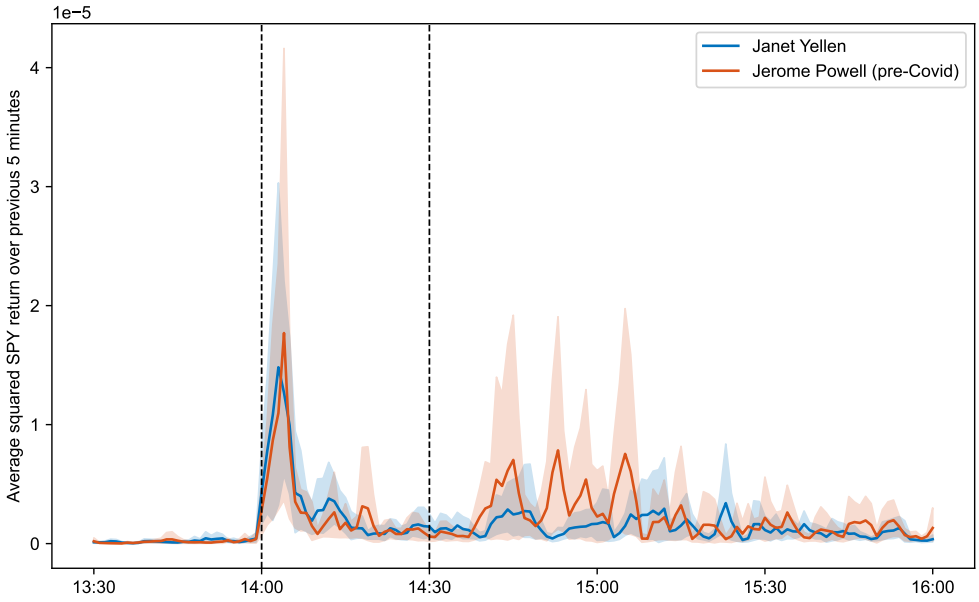


Note: The figure shows the average market impact of the press conference by Federal Reserve Chair. The relative market impact of the press conference for each FOMC press conference date t is calculated as

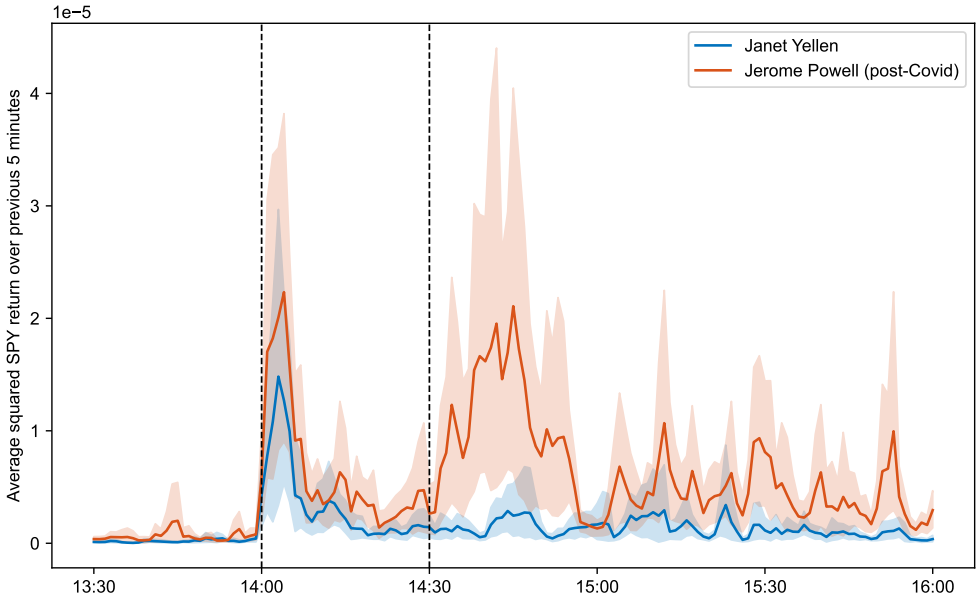
$$\text{Relative Market Impact of Press Conference}(t) = \frac{\text{Volatility during Press Conference}(t)}{\text{Volatility after FOMC Statement Release}(t)},$$

where volatility is measured using the variance of returns in five-minute increments. This figure uses returns on the S&P 500 index (proxied by the SPY ETF) for market returns. We exclude emergency and unscheduled conferences: the March 4, 2014 unscheduled conference call under Chair Yellen and the emergency Covid-19 related press conferences given by Chair Powell on March 3, 2020 and March 15, 2020.

Figure 4: Market volatility on FOMC press conference days.



(a) Pre-Covid (before March 2020).



(b) Post-Covid (after March 2020).

Note: The figure shows average squared returns of the S&P 500 index (proxied by the SPY ETF) over five-minute periods from 1:30 PM to 4:00 PM on FOMC press conference days. Dashed lines indicate the FOMC statement release time (2:00 PM) and the press conference start time (2:30 PM). Each line plots the average of squared returns for the previous five minutes across all press conferences given by the chair. The shaded area is a bootstrapped 95 percent confidence interval.

Appendix Table A3 tests for heightened market volatility during press conferences given by Chair Powell pre- and post-Covid. We find that market volatility during Chair Powell's pre-Covid press conferences is not statistically significant from his predecessors. However, market volatility during his post-Covid conferences is six to nine times greater than during other conferences. In Appendix Figure A6 and Table A5, we also show that the increase in the relative market impact of the press conference under Chair Powell's tenure is entirely driven by press conferences given after the start of Covid-19.

Since heightened market volatility is a feature of Chair Powell's post-Covid conferences, but not all his conferences, we are led to conclude that this change is not the result of a simple difference in stylistic preferences across chairs. Rather, we interpret this evidence as suggesting that the press conference has played a more important role in shaping market expectations recently either due to an intentional shift on the part of Chair Powell during the Covid-19 pandemic or due to a shift in the nature of how markets react to Fed communications during the post-Covid period.[8]

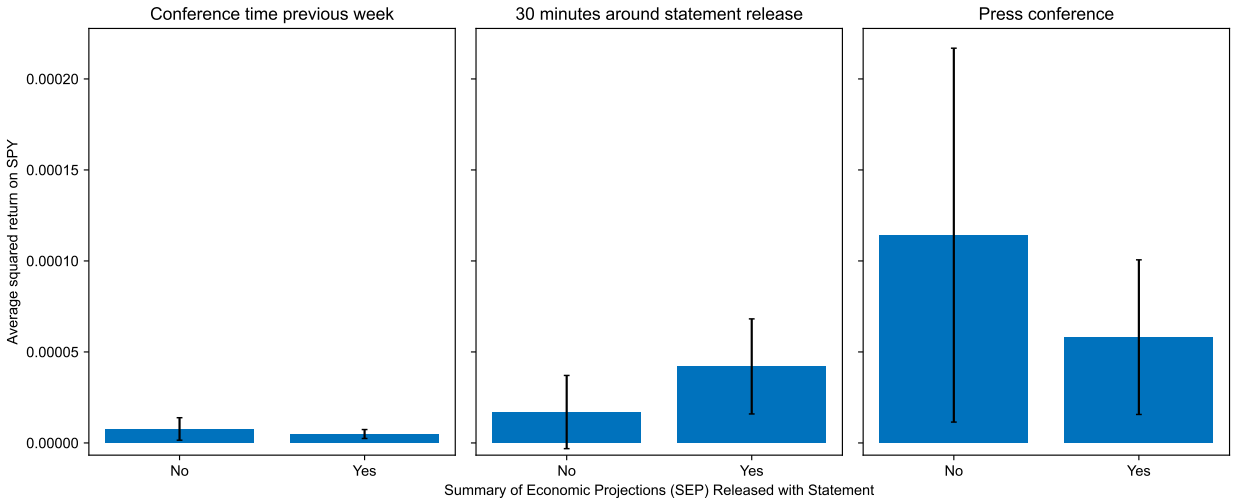
Interaction with release of Summary of Economic Projections. How does the market reaction to the Chair's press conference interact with the depth of communication by the FOMC? One possibility is that the press conference serves as a substitute for other Fed communication. For example, when the FOMC is unable to share precise guidance with the market through its statement or other communications, market participants may rely more heavily on the press conference to understand the FOMC's plans. A salient way in which the FOMC communicates future plans with the market is the Summary of Economic Projections (SEP), which includes FOMC participants' projections for GDP growth, the unemployment rate, inflation, and the appropriate Federal Funds rate over the coming years. The SEP is currently released four times a year (i.e., every other meeting). However, after markets fell over 2 percent during the press conference on January 26, 2022, economist Jón Steinsson proposed that the FOMC release a SEP every meeting, since "[the FOMC's] tools to communicate clearly with markets at 'off' meetings like this one are sub-par."[9]

In Figure 5, we compare market volatility following the FOMC statement release and during Chair Powell's press conference on dates where a SEP was or was not released. Directionally, the results support the hypothesis that the press conference performs as a substitute for the SEP: the average market reaction to the FOMC statement release is higher on dates when an SEP is released at the same time than on dates where no SEP is released, and conversely market volatility during the press conference is lower on dates when an SEP is released than not. This evidence suggests

[8]One hypothesis for what is driving the difference in market reactions to the Chair's press conferences is that Chair Powell is addressing topics that go beyond the statement. In Appendix A15, we calculate a measure of textual similarity–cosine similarity, previously used by Acosta and Meade (2015)–between the meeting minutes and the press conference Q&A (panel (a)) and the FOMC statement and the Q&A (panel (b)). We find that the average cosine similarity drops sharply at the start of Chair Powell's tenure.

[9]See `https://twitter.com/JonSteinsson/status/1486468435064156163`.

Figure 5: Market volatility for placebo conference, FOMC statement release, and press conference under Chair Powell, separated by dates with Summary of Economic Projections (SEP) release.



Note: Average squared returns of the S&P 500 (proxied by the SPY ETF) during press conferences given by Chair Powell. We measure returns from the minute before the press conference starts to the minute it ends.

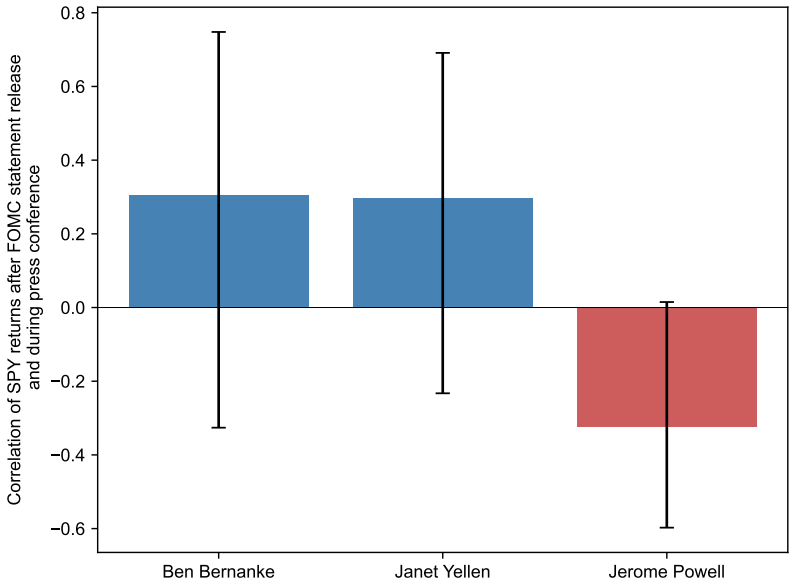
that releasing an SEP may indeed moderate the attention given to the Chair's press conference and perhaps allay market volatility. While a comparison of magnitudes supports this interpretation, we caution that the differences in market volatility across SEP and no-SEP days is not statistically significant, perhaps due to the small number of observations.

2.2 Reversals

Heightened market volatility during Chair Powell's press conferences suggests that the market may look to his press conferences for information not revealed in the FOMC statement. One explanation is that communication from Chair Powell during his press conferences may in fact signal departures from the thought process expressed by the rest of the FOMC in the released statement.

Figure 6 provides evidence for this hypothesis by plotting the correlation of market returns following the FOMC statement with market returns during the press conference for each chair. During press conferences given by Chair Powell, the market has on average tended to move the *opposite* direction as it initially moved in response to the FOMC statement release. This is in contrast to former Chairs Bernanke and Yellen, whose press conferences tended to reinforce the market's initial reaction to the FOMC statement release. (Our evidence on the positive correlation between market reactions to the press conference and to the FOMC statement release is confirmed by Gómez-Cram and Grotteria 2022, who document this positive correlation for press conferences given before January 2020.) In Appendix Figure A8, we show that the negative correlation under

Figure 6: Correlation of market reaction to FOMC statement release with market reaction to press conference.



Note: Correlation of S&P 500 returns after statement release and during press conference for each chair. A positive correlation means that the S&P 500 tended to move in the same direction after the statement release and during the press conference given by the chair. Error bars indicate 95 percent confidence interval.

Chair Powell is driven by conferences held after March 2020.

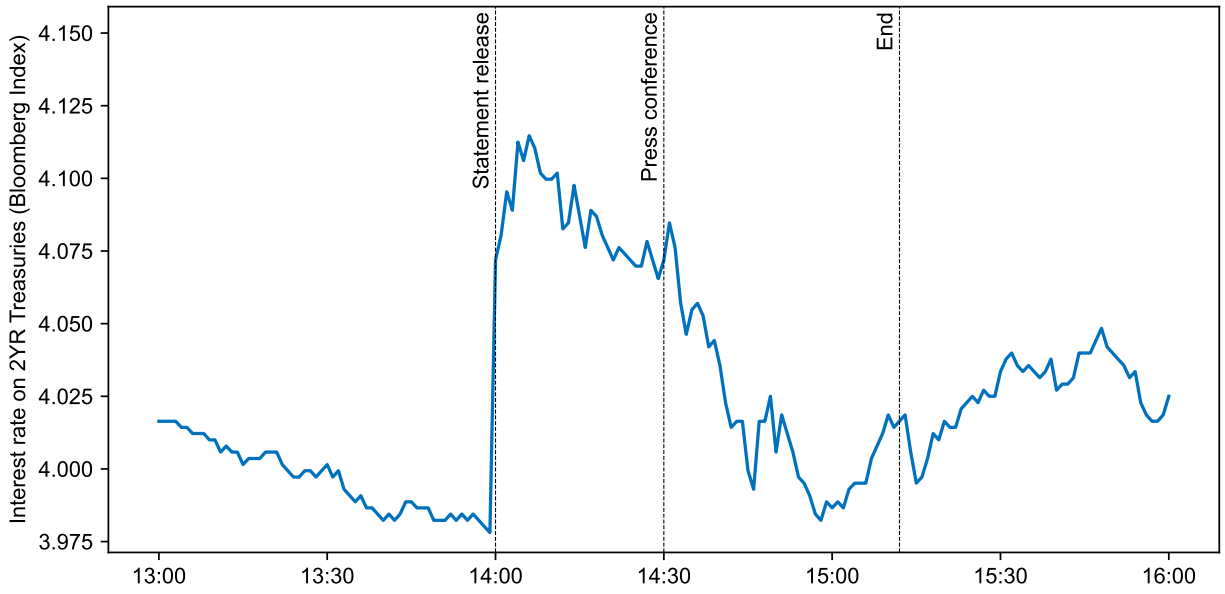
Two recent conferences are taken as case studies in Figure 7. On September 21, 2022, the FOMC released a statement "moving [its] policy stance purposefully to a level that will be sufficiently restrictive to return inflation to 2 percent." The interest rate on two-year Treasuries rose nearly 10 basis points, from shy of 4 percent to about 4.08 percent, at the time of the FOMC statement release. Yet, during Chair Powell's Q&A, markets buoyed—at the end of the press conference, the interest rate on two-year Treasuries had nearly fallen to its level before the statement release.

Similarly, on November 2, equity markets rose in the thirty minutes after the FOMC released its statement suggesting it would "take into account the cumulative tightening of monetary policy [and] the lags with which monetary policy affects economic activity and inflation." Yet, markets fell nearly 2 percent during the forty-five minute conference that followed. The Wall Street Journal interpreted the Q&A from Chair Powell as signaling his subtle departure from other committee members who have "hinted" that the long and variable lags associated with monetary policy should give the Fed pause about its hawkish hikes.[10]

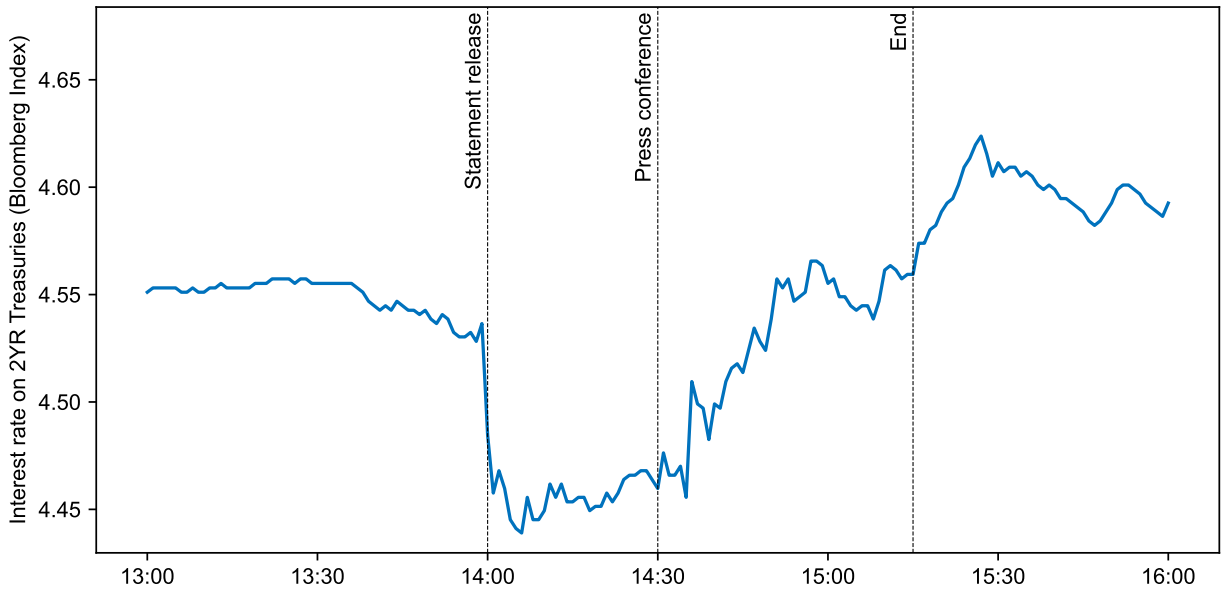
The broader pattern across events is that the market has been more likely to walk back its

[10]https://www.wsj.com/articles/jerome-powell-to-markets-the-destination-matters-not-the-journey-11667427735

Figure 7: Recent examples of market reversals during Chair Powell's conferences.



(a) September 21, 2022.



(b) November 2, 2022.

Note: Both panels plot intraday data on the yield of two-year Treasuries from Bloomberg (USGG2YR).

initial reaction to FOMC statement during Chair Powell's press conferences. Figure 8 shows how yields on two-year Treasuries change over the course of FOMC press conference days. The plotted lines are differences in yields from the initial level of two-year Treasury yields at 1:50 PM. In the upper panel, which compares press conference days during which the FOMC statement release was accompanied by a one basis point rise in two-year Treasury yields, a sharp difference emerges for the lines for Chairs Yellen and Powell. Under Chair Yellen, two-year Treasury yields tend to continue rising during the press conference after their initial reaction to the FOMC statement. By the close of trading, two-year Treasury yields are on average significantly different from the level they started at before the FOMC statement release. In contrast, under Chair Powell, the two-year Treasury yield reverts somewhat during the press conference, so that the level of yields by the end of the press conference is no longer statistically different from the yield before the FOMC statement release.

Appendix Figure A13 extends the picture by looking at two-year Treasury yields one, two, and three full days after the FOMC press conference. Under Chair Yellen, yields remain close to the level that they moved to after the FOMC statement release. In contrast, changes in yields under Chair Powell are not significantly different from zero and have very wide dispersion.

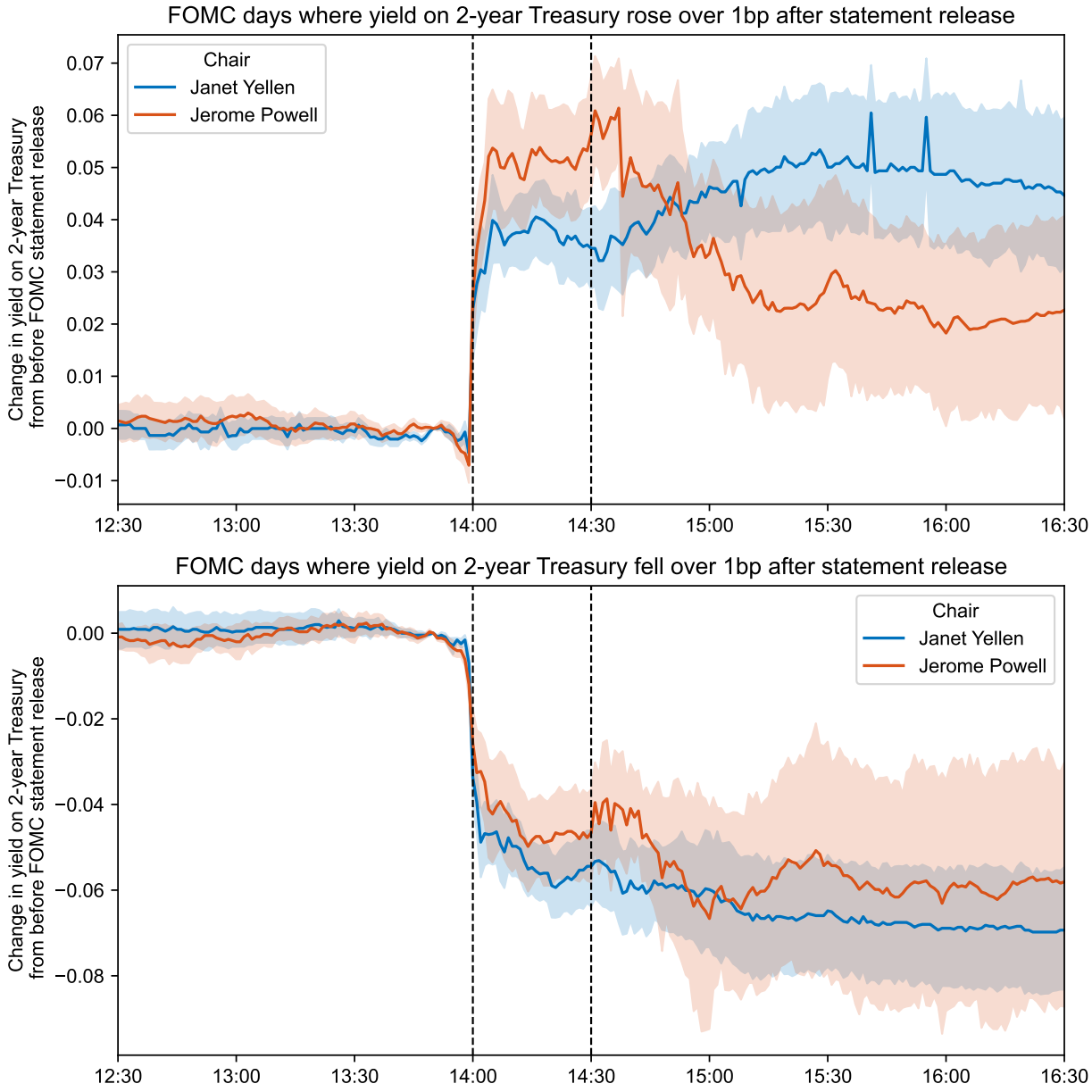
In the Appendix, we show that this negative correlation between the market reaction to the FOMC statement release and to the press conference extends to the Dow Jones Industrial index and to yields on two-, five- and ten-year Treasuries (see Figures A10 and A11). A similar pattern also emerges for market expectations of near term (two-year) inflation rates, though the relationship is noisier for longer-term (five- and ten-year) breakeven inflation rates.

2.2.1 Text analysis

One explanation for these market reversals is that the market has been over-reactive to recent FOMC statements. Overreaction is a common feature of financial markets, leading to eventual reversals, and recent research suggests that overreaction increases when investors anticipate a more extreme distribution of potential outcomes (Bordalo et al. 2020, Kwon and Tang 2020). In this subsection, we analyze the text of the Q&A portions of Chair Powell's most recent conferences. This text analysis suggests that the market reversals are linked to language used by Chair Powell, rather than being artifacts of initial overreaction to the FOMC statement.

We start by manually inspecting transcripts from Chair Powell's September 2022 and November 2022 press conferences alongside minute-by-minute data on Treasury yields. Table A7 and Table A8 present quotes from the Q&A portion of each conference. For example, we see that the reversal and fall in Treasury yields during Chair Powell's September 21, 2022 press conference was accompanied by him saying that it may be "appropriate to slow the pace of rate hikes" and mentioning positive developments in commodity prices and wages. The reversal and rise in Treasury

Figure 8: Path of two-year Treasury yields on FOMC press conference days, split by conferences where two-year yields increased/decreased over 1 basis point following FOMC statement release.



Note: The figure shows the average change in the yield of two-year Treasuries relative to 1:50 PM on the day of the FOMC press conference. Dashed lines indicate the FOMC statement release time (2:00 PM) and the press conference start time (2:30 PM). The upper panel contains six conferences under Chair Yellen (Mar 2014, Jun 2014, Sep 2014, Dec 2016, Jun 2017, Sep 2017) and ten under Chair Powell (Jun 2018, Jul 2019, Sep 2019, Oct 2019, Jun 2021, Dec 2021, Mar 2022, Jun 2022, Sep 2022, Dec 2022). The lower panel contains nine conferences under Chair Yellen (Dec 2014, Mar 2015, Jun 2015, Sep 2015, Mar 2016, Jun 2016, Sep 2016, Mar 2017, Dec 2017) and seven under Chair Powell (Jan 2019, Mar 2019, Jun 2019, Dec 2019, Mar 2021, May 2022, Nov 2022). The shaded area is a bootstrapped standard error (68 percent confidence interval).

Table 1: Covariance of words in FOMC statements with market reaction.

Strong negative covariance	Strong positive covariance
Increases, Implications, Issued, Raise, Addition, Higher, Hardship, Upward, Ukraine, Gains, Attainment, Impede, Pandemic, Emerge, Assessing, Assessments, Overall, Job, Reducing, Wide, Causing, Human, Tremendous, Supply, Adjust, Invasion, Pressures, Russia, Size, Demand, Achieve, Strongly, Roughly, Prepared, Longer, Events	Improved, Time, Recovery, Pace, Maintain, Improvement, Sector, Housing, Dual, Continues, Developments, Pose, Existing, Maintaining, Lower, Help, Currently, Determining, Closely, Decides, Approach, Context, Gradually, Stable, Accommodative, Least, Accommodating, Reaffirmed, Support, Current, Slow, Consistent, Toward, Levels

yields during Chair Powell's November 2, 2022 press conference followed him telling participants, "it is premature to be thinking about pausing," and repeatedly saying "We have a ways to go."

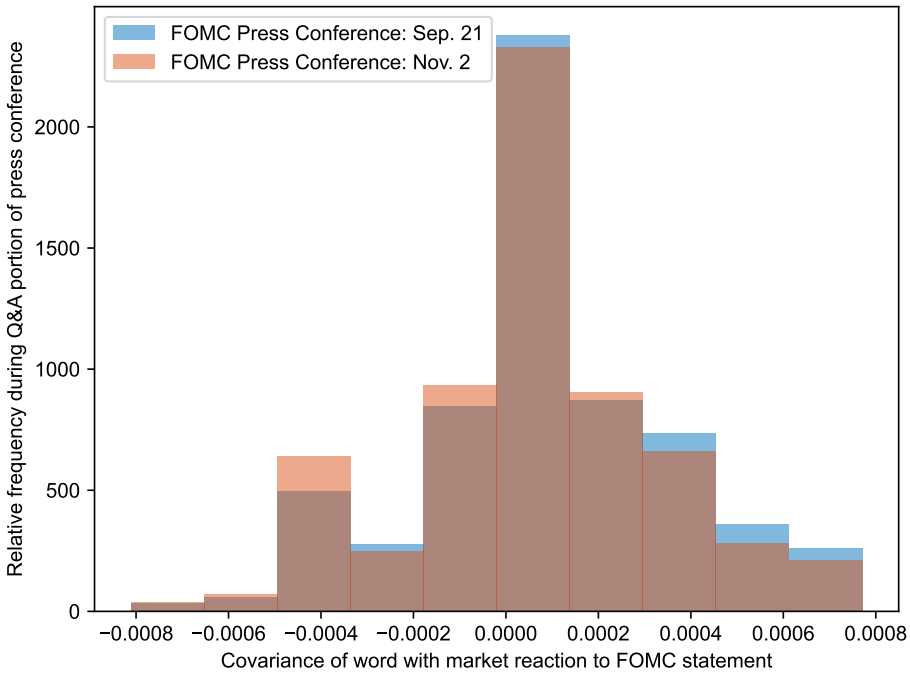
We supplement this manual analysis with a computational analysis of the text from the Q&A portion of Chair Powell's conferences. To do so, we start by building a corpus of words used in FOMC statements and assigning a "positive" or "negative" value to each word using the market reaction to FOMC statements containing those words. Note that, since FOMC statements and market reactions to those statements are used to build the corpus, these data have no overlap with the Q&A portion of the Chair's press conference. We compute the valence of a word as

$$\text{Valence}(w) = Cov(1\{\text{FOMC statement } i \text{ contains } w\}, \text{Market Reaction to FOMC statement } i).$$

We use the same set of sixty-two FOMC meeting dates that we use in our main analysis to construct these valence measures. Accordingly, words with high valences are ones that are most often associated with strong positive market reactions to the FOMC statement, while words with negative valences are ones that are most often associated with strong negative market reactions. Table 1 lists words with strong negative and strong positive valences. Words like "assessing," "pressures," and "raise" are associated with negative market reactions, while words like "improved," "stable," "accommodative," and "slow" are associated with positive market reactions.

We then investigate Chair Powell's use of those words during the Q&A portions of his press conferences on September 21 and November 2, 2022. Figure 9 shows that Chair Powell's press Q&A on November 2, when markets fell during his press conference, shifted to a more negative set of words on average than his previous Q&A on September 21, which had buoyed markets. This finding suggests that Chair Powell's language is correlated with the market reactions during his press conferences, which have tended to reverse course from initial market reactions to the FOMC statements.

Figure 9: Histogram of valences for words used during Chair Powell's Q&A.



Note: The x-axis plots the valence of each word (i.e., covariance of whether a word appears in an FOMC statement with the S&P 500 reaction to that FOMC statement release). Words in the left-most buckets are most strongly associated with negative market reactions, while words in right-most buckets are most strongly associated with positive market reactions. The bars plot the relative frequency of words with each valence during the Q&A portion of two of Chair Powell's most recent press conferences.

Case study: Brookings Speech on November 30. While our focus till now has been on press conferences given at the close of FOMC meetings, Cieslak et al. (2019) and Vissing-Jorgensen (2019) emphasize that there are occasions on which the Federal Reserve Chair and other FOMC officials are able to influence market expectations outside of these press conferences. Chair Powell's recent speech at the Brookings Institution is one such example.[11] We validate our text analysis procedure developed above using press conferences by applying it to the Brookings Institution speech on November 30.

Intraday changes in Treasury yields and S&P 500 prices on November 30, 2022 are plotted in Figure 10. Chair Powell's Brookings speech on that day led to a sharp decline in Treasury yields and a 2 percent rally in market prices. Part of the decline in yields appeared to happen instantly at the time of Powell's speech, but a substantial portion unfolded over the course of the Q&A. By the end of the event, two-year Treasury yields fell by 10 basis points and yields on 10-year Treasuries about 7 basis points.

We use the same text analysis technique to understand what changes in Chair Powell's language triggered the market reaction. Figure 11 shows the results. As discussed above, Chair Powell's language shifted to words much more frequently associated with negative market reactions during the November 2 press Q&A. In comparison to that Q&A, Chair Powell's speech at Brookings was moderately on the less negative, but on the whole made use of more neutral language. However, during the Brookings Q&A, Chair Powell's speech shifted to much more accommodative language. This suggests that the continued decline in yields over the course of his Brookings Q&A was linked to the language Chair Powell employed at the event.

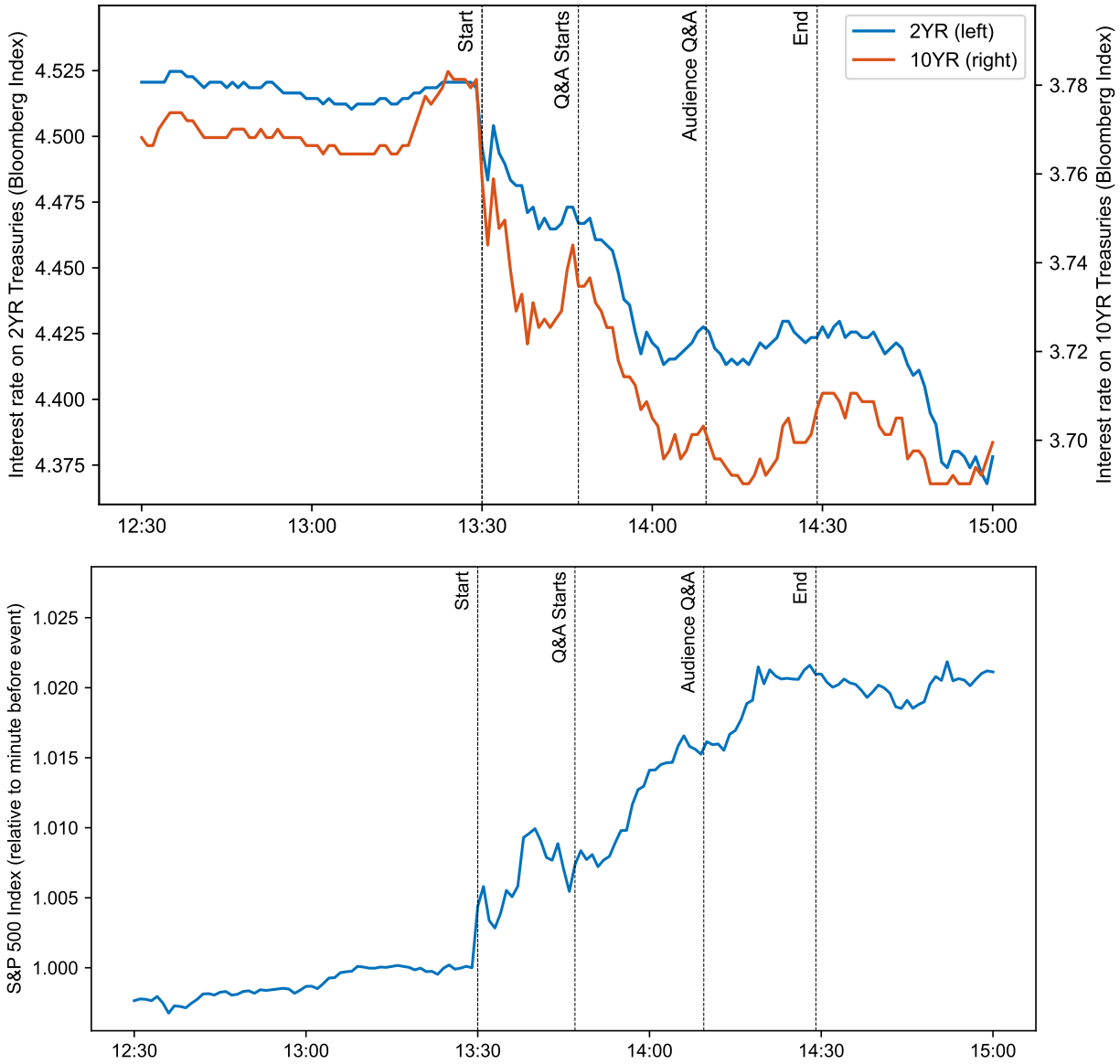
2.3 Effects on forward-looking volatility

So far, we have documented two new patterns about Chair Powell's press conferences during the post-Covid period: they tend to be associated with heightened market volatility and often lead to reversals in market expectations following the FOMC statement release. A natural question is whether this shift in the importance of the press conference is a beneficial one.

One view on the role of Fed communications is expressed by Alan Blinder (1998): "By making itself more predictable to markets, the central bank makes market reactions to monetary policy more predictable to itself. And that makes it possible to do a better job of managing the economy." In our final empirical analysis, we adopt this notion of the goal of Fed communications—that these communications should increase the predictability of future monetary policy to markets—and provide a partial assessment of how the shift in the press conference role has fared along this dimension. At the end of this section, we stress that this metric is a necessarily incomplete

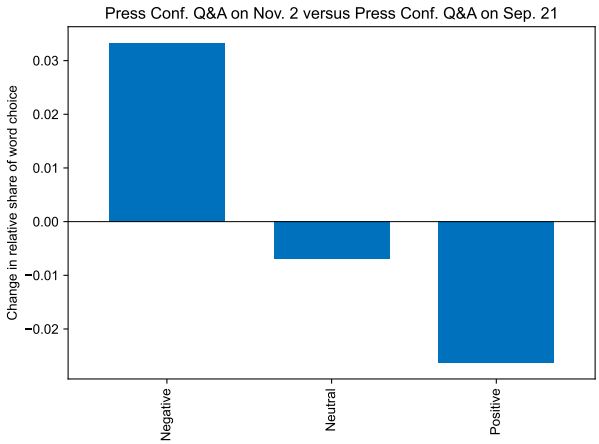
[11] Chair Powell gave this speech after we had conducted most of the analyses for this paper, allowing this speech to to be an "out-of-sample" datapoint that supports our hypothesis.

Figure 10: Market reaction to Brookings speech and Q&A on November 30, 2022.

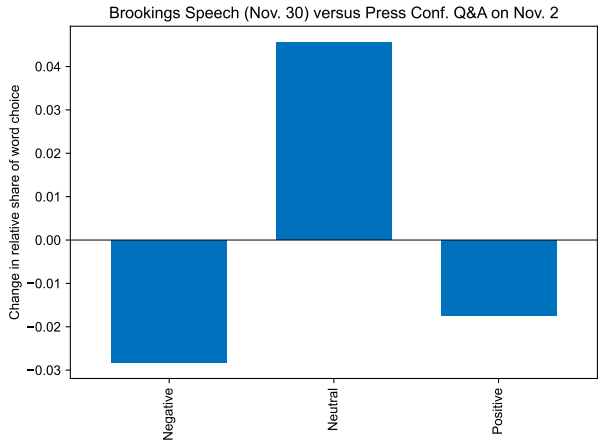


Note: The top panel plots intraday data on the yield of two- and ten-year Treasuries from Bloomberg (USGG2YR and USGG10YR), and the bottom panel plots intraday data on the S&P 500 index. We used the Brookings event transcript to identify the event timestamps.

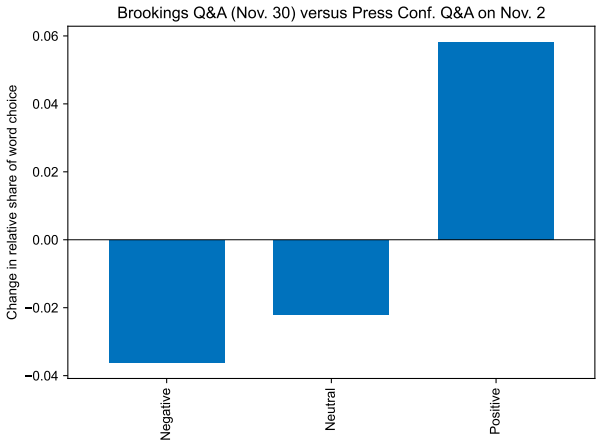
Figure 11: Change in valence of words used across events.



(a) Change from Sep. 21 Q&A to Nov. 2 Q&A.



(b) Change from Nov. 2 Q&A to Brookings Speech.



(c) Change from Nov. 2 Q&A to Brookings Q&A.

Note: Words from FOMC statements are split into three equally sized groups of lowest, middle, and highest covariance with S&P 500 reactions to FOMC statement releases containing those words. The bars plot differences in relative shares of words from each group during each event.

description of the goal of Fed communications and discuss a few alternative ways of understanding the changing role of the press conference.

We use end-of-day implied volatility from 30-day at-the-money options on futures of short- and long-term Treasuries as a measure of uncertainty about the path of future interest rates. Our use of this measure of interest rate uncertainty draws on Sinha (2015) and Cremers et al. (2021), among others. Sinha (2015) shows that investor beliefs, as captured by prices on two- and ten-year Treasury options, respond to forward guidance issued by the FOMC, and Cremers et al. (2021) show that implied volatility of at-the-money options on futures of five-year Treasury notes (which they call "yield implied volatility" or YIV) is a good proxy for interest rate uncertainty and that it predicts both the growth and volatility of a number of macroeconomic variables beyond other measures like the term spread, credit spread, and VIX.

In Appendix Figure A14, we plot the time series of implied volatility on five-year Treasuries. From January 2011 to January 2023, the average 30-day implied volatility on five-year Treasuries is 3.0%, but the series shows considerable variation over the terms of each Chair. For example, implied volatilities averaged 5.4% in 2022, while they averaged between 3.1% from 2014–2017. The periods when implied volatility are lowest are in 2012, when the federal funds rate was at the zero lower bound and the FOMC indicated that rates would remain low until late 2014, and in the summer of 2020, when the federal funds rate was again brought to the zero lower bound.

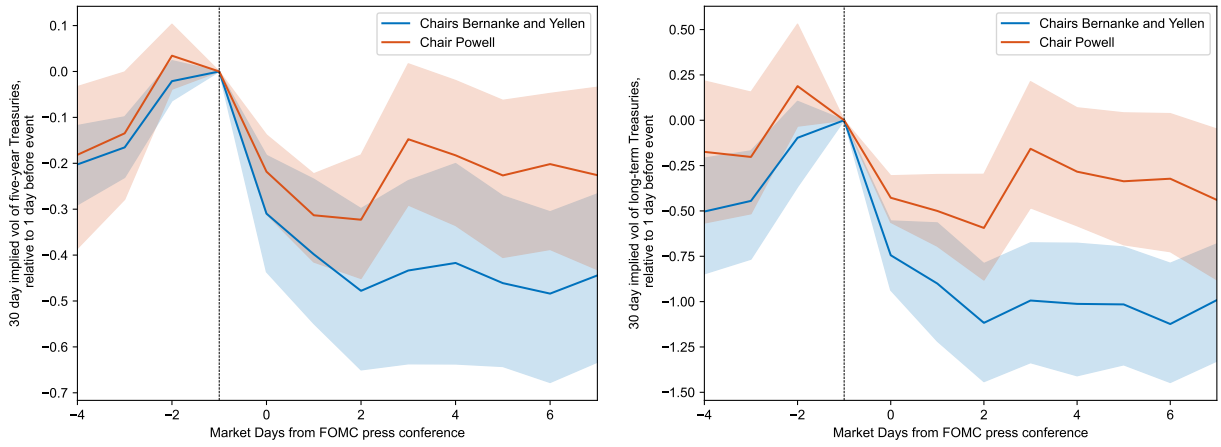
Figure 12 plots changes in implied volatility on short-term (five-year) and long-term (approximately twenty-year) Treasuries from four market days before FOMC press conferences to seven days after FOMC press conferences. The implied volatilities are plotted relative to their value one day before the FOMC press conference. The first observation apparent in Figure 12 is that implied volatility on both short- and long-term Treasuries tends to drop on the day of the FOMC press conference. Intuitively, uncertainty about the Fed's actions on the target range are resolved on the day of the FOMC statement release and press conference, leading to a decline in volatility. However, this decline in volatility is slightly less pronounced under Chair Powell's tenure, especially for long-term Treasuries.

We estimate the following differences-in-differences specification,

$$(\text{ImpliedVol}_{t+h} - \text{ImpliedVol}_{t-1}) = \beta_h + \gamma_h \times \text{Powell}_t + \varepsilon_{t,h}$$

for $h \in \{-4,-3,...,6,7\}$, where ImpliedVol_{t+h} is the implied volatility at market close h days after the FOMC press conference date (t), β_h are fixed effects by lag h, Powell_t is an indicator for whether Chair Powell gave the press conference at date t, and γ_h are coefficients on the interactions for lag h with the indicator Powell_t. We estimate this specification for all scheduled conferences across Chairs Bernanke, Yellen, and Powell.

Figure 12: Effect of FOMC press conference days on 30 day implied volatility of short- and long-term Treasuries.



(a) Five-year Treasuries.

(b) Long-term (≈20 year) Treasuries.

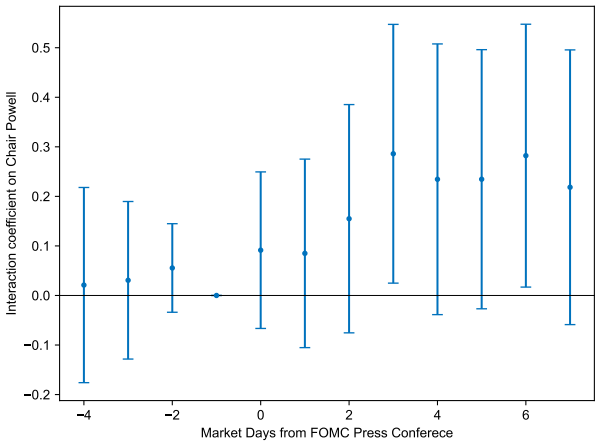
Note: Thirty-day implied volatility of at-the-money options for five-year and long-term Treasuries are from Bloomberg's LIVE calculation engine. Shaded bands indicate bootstrapped 95 percent confidence intervals.

Figure 13 shows the results. Chair Powell's tenure is associated with a mild increase in implied volatility on five- and twenty-year Treasuries following the FOMC press conference, as well as a mild increase in the VIX (i.e., implied 30-day volatility on the S&P 500) for one to five days following the FOMC press conference. These results suggest that Fed communications on FOMC press conference days under Chair Powell have been less successful at alleviating market uncertainty about the path of future interest rates.

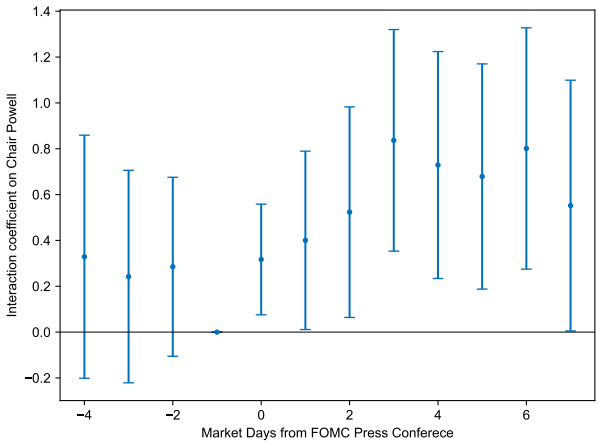
Of course, reducing market uncertainty may not be the only goal of the Federal Reserve or of Chair Powell in particular. Let us briefly describe two alternative goals that could explain the patterns that we document in our analysis above. A first possibility is that Chair Powell has strategically used the press conference to highlight departures in his own thinking from the FOMC, thereby softly committing the FOMC to a future path of decisions that he thinks is most likely to succeed. Previous studies by Meade (2005) and Gerlach-Kristen and Meade (2010) document strategies that previous Fed Chairs have used to manage dissent within the FOMC committee. During a time of contentious decision-making—and when many FOMC members make their own speeches apart from FOMC communications—the press conference may offer the Chair an opportunity to emphasize his own views and get out ahead of other committee members.

A second possibility is that, when economic conditions are changing rapidly, perhaps the goal of Fed communications should not be to reduce uncertainty, but instead of make space for more nimble actions on the part of the FOMC. As Stein (2014) posits, a Fed that has "developed a reputation for worrying less about the immediate bond-market effects of its actions [....may] be

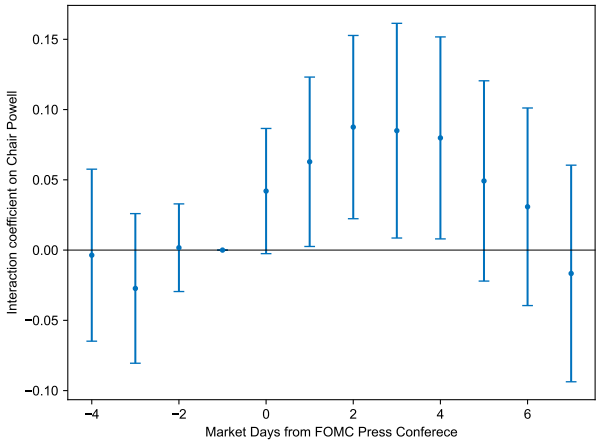
Figure 13: Difference-in-diferences estimates of the impact of Chair Powell's conferences on implied volatility.



(a) Five-year Treasuries.



(b) Long-term (≈20 year) Treasuries.



(c) VIX (CBOE).

Note: Thirty-day implied volatility of at-the-money options for five-year and long-term Treasuries are from Bloomberg's LIVE calculation engine. Standard errors clustered by meeting date, and error bars indicate 95 percent confidence intervals.

able to adjust more nimbly when it needed to." In other words, when the FOMC is learning about the state of the economy at a rapid clip, it may be useful for Fed communications to depart from a gradualist communication strategy, at the cost of greater market volatility.

3 Conclusion

We document a change in market reactions to press conferences under Chair Powell's tenure compared to those under his predecessors. Compared to Chairs Bernanke and Yellen, Chair Powell has been more likely to elicit large market reactions, often in the opposite direction of initial reactions to the FOMC statement. Text analysis suggests that these reactions are the result of Chair Powell's communications—his tendency to shift toward more accommodative or hawkish language. Outside of the FOMC press conferences, there is evidence that Chair Powell's communications at other events have a similar effect on the market. We interpret these results as suggesting a more important role for the press conference among Fed communications, especially during the post-Covid period. Evidence from implied volatility on short- and long-term Treasuries suggests that this shift in strategy has been less successful at allaying uncertainty about the path of future interest rates, though it may serve other goals, such as managing dissent within the FOMC or making space for the FOMC to pursue changes in policy more nimbly.

The Federal Reserve's communication strategy has evolved over time—the introduction of the press conference by Chair Bernanke and the doubling of annual press conferences held by Chair Powell being just two examples—and the patterns we document signal yet another shift in how the Federal Reserve communicates with the market. This change is attended by some costs: the FOMC statement no longer appears to be the "final word" on the path of monetary policy to markets, and there has been weaker resolution of uncertainty about the path of future interest rates. On the other hand, as the U.S. economy faces its highest inflation rates and the steepest set of interest rate hikes in decades, perhaps extraordinary times call for such a shift.

References

Acosta, M. and E. E. Meade (2015). Hanging on every word: Semantic analysis of the fomc's post-meeting statement. Technical Report 2015-09-30, Board of Governors of the Federal Reserve System.

Bernanke, B. S. and K. N. Kuttner (2005). What explains the stock market's reaction to federal reserve policy? *The Journal of Finance 60*(3), 1221–1257.

Blinder, A. S. (1998). *Central Banking in Theory and Practice*. Cambridge MA: MIT Press.

Blinder, A. S., M. Ehrmann, M. Fratzscher, J. D. Haan, and D.-J. Jansen (2008). Central bank communication and monetary policy: A survey of theory and evidence. *Journal of Economic Literature 46*(4), 910–945.

Bordalo, P., N. Gennaioli, R. LaPorta, and A. Shleifer (2020). Belief overreaction and stock market puzzles. Technical Report 27283, National Bureau of Economic Research.

Cieslak, A., A. Morse, and A. Vissing-Jorgensen (2019). Stock returns over the fomc cycle. *The Journal of Finance 74*(5), 2201–2248.

Cieslak, A. and A. Schrimpf (2019). Non-monetary news in central bank communication. *Journal of International Economics 118*, 293–315.

Cochrane, J. H. and M. Piazzesi (2002). The fed and interest rates: A high-frequency identification. *American Economic Review 92*(2), 90–95.

Coenen, G., M. Ehrmann, G. Gaballo, P. Hoffman, A. Nakov, S. Nardelli, E. Persson, and G. Strasser (2017). Communication of monetary policy in unconventional times. Technical Report 578, CFS Working Paper.

Cremers, M., M. Fleckenstein, and P. Gandhi (2021). Treasury yield implied volatility and real activity. *Journal of Financial Economics 140*(2), 412–435.

Curti, F. and S. Kazinnik (2021). Let's face it: Quantifying the impact of nonverbal communication in fomc press conferences. Technical Report 3782239, SSRN.

De Pooter, M. (2021). *Questions and Answers: The Information Content of the Post-FOMC Meeting Press Conference*.

Ehrmann, M. and M. Fratzscher (2007). Communication by central bank committee members: different strategies, same effectiveness? *Journal of Money, Credit and Banking 39*(2-3), 509–541.

Ehrmann, M. and J. Talmi (2020). Starting from a blank page? semantic similarity in central bank communication and market volatility. *Journal of Monetary Economics 111*, 48–62.

Fleming, M. J. and E. M. Remolona (1999). Price formation and liquidity in the u.s. treasury market: The response to public information. *The Journal of Finance 54*(5), 1901–1915.

Gáti, L. and A. Handlan (2022). Monetary communication rules. Working paper.

Gerlach-Kristen, P. and E. E. Meade (2010). Is there a limit on fomc dissents? evidence from the greenspan era. American University Working Paper.

Gertler, M. and P. Karadi (2015). Monetary policy surprises, credit costs, and economic activity. *American Economic Journal: Macroeconomics 7*(1), 44–76.

Gómez-Cram, R. and M. Grotteria (2022). Real-time price discovery via verbal communication: Method and application to fedspeak. *Journal of Financial Economics 143*(3), 993–1025.

Gorodnichenko, Y., T. Pham, and O. Talavera (2021). The voice of monetary policy. Technical Report 28592, National Bureau of Economic Research.

Gürkaynak, R. S., B. P. Sack, and E. T. Swanson (2005). Do actions speak louder than words? the response of asset prices to monetary policy actions and statements. *International Journal of Central Banking 1*(1), 55–93.

Gürkaynak, R. S., B. P. Sack, and J. H. Wright (2007). The us treasury yield curve: 1961 to the present. *Journal of Monetary Economics 54*(8), 2291–2304.

Hansen, S. and M. McMahon (2016). Shocking language: Understanding the macroeconomic effects of central bank communication. *Journal of International Economics 99*, 114–133.

Hanson, S. G. and J. C. Stein (2015). Monetary policy and long-term real rates. *Journal of Financial Economics 115*(3), 429–448.

Hernández-Murillo, R. and H. Shell (2014). The rising complexity of the fomc statement. *Economic Synopses 23*.

Hillenbrand, S. (2022). The fed and the secular decline in interest rates.

Josselyn, M. and E. E. Meade (2017). The fomc meeting minutes: An update on counting words. Technical Report 2017-08-03, FEDS Notes.

Kuttner, K. N. (2001). Monetary policy surprises and interest rates: Evidence from the fed funds futures market. *Journal of Monetary Economics 47*(3), 523–544.

Kwon, S. Y. and J. Tang (2020). Extreme events and overreaction to news. Technical Report 3724420, SSRN.

Meade, E. E. (2005). The fomc: preferences, voting, and consensus. *Federal Reserve Bank of St. Louis Review 87*.

Miranda-Agrippino, S. and G. Ricco (2021). The transmission of monetary policy shocks. *American Economic Journal: Macroeconomics 13*(3), 74–107.

Nakamura, E. and J. Steinsson (2018). High-frequency identification of monetary non-neutrality: the information effect. *The Quarterly Journal of Economics 133*(3), 1283–1330.

Nelson, E. (2021). The emergence of forward guidance as a monetary policy tool. *Finance and Economics Discussion Series*.

Parle, C. (2022). The financial market impact of ecb monetary policy press conferences — a text based approach. *European Journal of Political Economy 74*, 102230.

Rosa, C. (2013). The financial market effect of fomc minutes. *FRBNY Economic Policy Review*.

Sinha, A. (2015). Fomc forward guidance and investor beliefs. *American Economic Review 105*(5), 656–661.

Stein, J. C. (2014, May 6). Challenges for monetary policy communication. Remarks at the Money Marketeers of New York University.

Stein, J. C. and A. Sunderam (2018). The fed, the bond market, and gradualism in monetary policy. *The Journal of Finance 73*(3).

Vissing-Jorgensen, A. (2019). Central banking with many voices: The communications arms race. Conference proceedings, Annual Conference of the Central Bank of Chile.

Appendix A Additional Figures and Tables

Table A1: Differential market volatility during Chair Powell's press conferences, using returns on S&P 500 index.

	Squared market returns over event			*Sq. market returns over 5-min increments*		
	Press conference	FOMC statement	Previous week	Press conference	FOMC statement	Previous week
	(1)	(2)	(3)	(4)	(5)	(6)
Powell	0.622**	0.097	0.024	0.045**	0.053	0.002*
	(0.256)	(0.111)	(0.018)	(0.016)	(0.073)	(0.001)
Constant	0.190**	0.220**	0.037**	0.014**	0.119**	0.003**
	(0.049)	(0.063)	(0.011)	(0.003)	(0.048)	(0.001)
N	62	62	62	62	62	62
R^2	0.08	0.01	0.03	0.10	0.01	0.04

Note: The variable Powell is an indicator set to one for press conferences under Chair Powell's tenure and zero otherwise. Squared market returns expressed in units of percent squared. Robust standard errors in parentheses.

Table A2: Differential market volatility during Chair Powell's press conferences, using returns on Dow Jones Industrial index.

	Squared market returns over event			*Sq. market returns over 5-min increments*		
	Press conference	FOMC statement	Previous week	Press conference	FOMC statement	Previous week
	(1)	(2)	(3)	(4)	(5)	(6)
Powell	0.426**	0.041	0.021	0.032**	0.013	0.003**
	(0.174)	(0.099)	(0.017)	(0.012)	(0.069)	(0.001)
Constant	0.155**	0.203**	0.033**	0.013**	0.123**	0.003**
	(0.042)	(0.072)	(0.011)	(0.003)	(0.055)	(0.001)
N	62	62	62	62	62	62
R^2	0.08	0.00	0.03	0.09	0.00	0.06

Note: The variable Powell is an indicator set to one for press conferences under Chair Powell's tenure and zero otherwise. Squared market returns expressed in units of percent squared. Robust standard errors in parentheses.

Table A3: Differential market volatility during Chair Powell's press conferences before and after the start of Covid-19, using returns on S&P 500 index.

	Squared market returns over event			*Sq. market returns over 5-min increments*		
	Press conference	FOMC statement	Previous week	Press conference	FOMC statement	Previous week
	(1)	(2)	(3)	(4)	(5)	(6)
Powell Pre-Covid	0.111	-0.036	-0.004	0.015	-0.009	0.001
	(0.219)	(0.094)	(0.017)	(0.015)	(0.075)	(0.002)
Powell Post-Covid	0.901**	0.170	0.039	0.062**	0.087	0.003*
	(0.362)	(0.148)	(0.024)	(0.023)	(0.092)	(0.002)
Constant	0.190**	0.220**	0.037**	0.014**	0.119**	0.003**
	(0.049)	(0.064)	(0.011)	(0.003)	(0.048)	(0.001)
N	62	62	62	62	62	62
R^2	0.14	0.04	0.07	0.16	0.02	0.07

Note: The variable Powell is an indicator set to one for press conferences under Chair Powell's tenure and zero otherwise. Squared market returns expressed in units of percent squared. Robust standard errors in parentheses.

Table A4: Robustness using 15 minute window after FOMC statement release.

	Squared market returns over event	
	S&P 500	Dow Jones Industrial
	FOMC statement	FOMC statement
	(1)	(2)
Powell	0.128	0.057
	(0.109)	(0.101)
Constant	0.153**	0.159**
	(0.058)	(0.070)
N	62	62
R^2	0.02	0.01

Note: The variable Powell is an indicator set to one for FOMC meetings under Chair Powell's tenure and zero otherwise. Squared market returns expressed in units of percent squared. Robust standard errors in parentheses.

Table A5: Differential market impact of Fed communications under Chair Powell.

	Relative Market Impact of Press Conference			
	S&P 500		Dow Jones Industrial	
	(1)	(2)	(3)	(4)
Powell	0.692**		0.770**	
	(0.229)		(0.260)	
Powell Pre-Covid		0.394		0.378
		(0.300)		(0.315)
Powell Post-Covid		0.855**		0.983**
		(0.292)		(0.333)
Constant	0.684**	0.684**	0.708**	0.708**
	(0.101)	(0.102)	(0.128)	(0.129)
N	62	62	62	62
R^2	0.12	0.15	0.12	0.16

Note: The variable Powell is an indicator set to one for press conferences under Chair Powell's tenure and zero otherwise. The relative market impact for each FOMC press conference date t is calculated as

$$\text{Relative Market Impact of Press Conference}(t) = \frac{\text{Volatility during Press Conference}(t)}{\text{Volatility after FOMC Statement Release}(t)},$$

where volatility is measured using the variance of returns in five-minute increments.

Table A6: Market volatility following macroeconomic releases.

Event	Release Time	Number of releases Apr 2011–Dec 2022	Squared average SPY returns All	Powell	Post-Covid	Difference p-value Powell	Post-Covid
Before Market Hours:							
Productivity and Unit Labor Costs	08:30	93	0.014	0.008	0.007	0.178	0.292
Philadelphia Fed Business Outlook	08:30	85	0.022	0.024	0.038	0.803	0.174
Unemployment Rate & Nonfarm Payrolls	08:30	139	0.170	0.140	0.187	0.427	0.772
Consumer Price Index (CPI)	08:30	138	0.278	0.652	1.066	0.002**	0.000**
Industrial Production & Capacity Utilization	09:15	138	0.006	0.006	0.008	0.803	0.560
During Market Hours:							
Chicago Purchasing Managers Index (PMI)	09:45	138	0.024	0.037	0.032	0.101	0.512
The Conference Board U.S. Consumer Confidence	10:00	140	0.027	0.031	0.045	0.467	0.028**
JOLTS Job Openings Report	10:00	142	0.038	0.071	0.113	0.016**	0.000**
The Conference Board Leading Index	10:00	140	0.050	0.045	0.065	0.804	0.579
FOMC Minutes	14:00	94	0.040	0.040	0.053	0.977	0.173
Federal Reserve Consumer Credit Report	15:00	141	0.016	0.019	0.024	0.735	0.439

Note: Squared average SPY returns are measured over ten minute window starting one minute before release. Data on market returns outside of market hours should be interpreted with caution. The final two columns report p-values from a two-sided t-test of whether squared SPY returns are equal for (1) conferences given by Chair Powell versus other chairs, and (2) conferences given post-Covid (since March 2020) versus other chairs.

Table A7: Snippets of Chair Powell's answers during November 2, 2022 press conference Q&A.

Meeting date	Time	Change in two-year Treasury yield (bp)	Quote
Nov 2, 2022	14:37	+4.35	We are taking forceful steps to moderate demand so that it comes into better alignment with supply. Our overarching focus is using our tools to bring inflation back down to our 2 percent goal and to keep longer-term inflation expectations well anchored. Reducing inflation is likely to require a sustained period of below-trend growth and some softening of labor market conditions.... **The historical record cautions strongly against prematurely loosening policy. We will stay the course until the job is done.**
Nov 2, 2022	14:39	-1.66	We do need to see inflation coming down decisively, and good evidence of that would be a series of down monthly readings. Of course, that's what we'd all love to see, but that's—**I've never thought of that as the appropriate test for slowing the pace of increases** or for identifying the appropriately restrictive level that we're aiming for.
Nov 2, 2022	14:47	+2.07	We're now 18 months into this episode of high inflation, and we don't have a clearly identified, scientific way of understanding at what point inflation becomes entrenched. And so the thing we need to do from a risk-management standpoint is to **use our tools forcefully** but thoughtfully and get inflation under control—get it down to 2 percent—get it behind us. **That's what we really need to do and what we're strongly committed to doing.**
Nov 2, 2022	14:51	+3.33	Let me say this: **It is very premature to be thinking about pausing.** So people, when they hear lags, they think about a pause. It's very premature, in my view, to think about or be talking about pausing our rate hike. **We have a ways to go.** Our policy—we need ongoing rate hikes to get to that level of sufficiently restrictive.
Nov 2, 2022	15:10	+2.28	So I would also say, **it's premature to discuss pausing.** And it's not something that we're thinking about. That's really not a conversation to be had now. **We have a ways to go.** And the last thing I'll say is that I would want people to understand our commitment to getting this done and to not making the mistake of not doing enough or the mistake of withdrawing our strong policy and doing that too soon. So those—I control those messages, and that's my job.

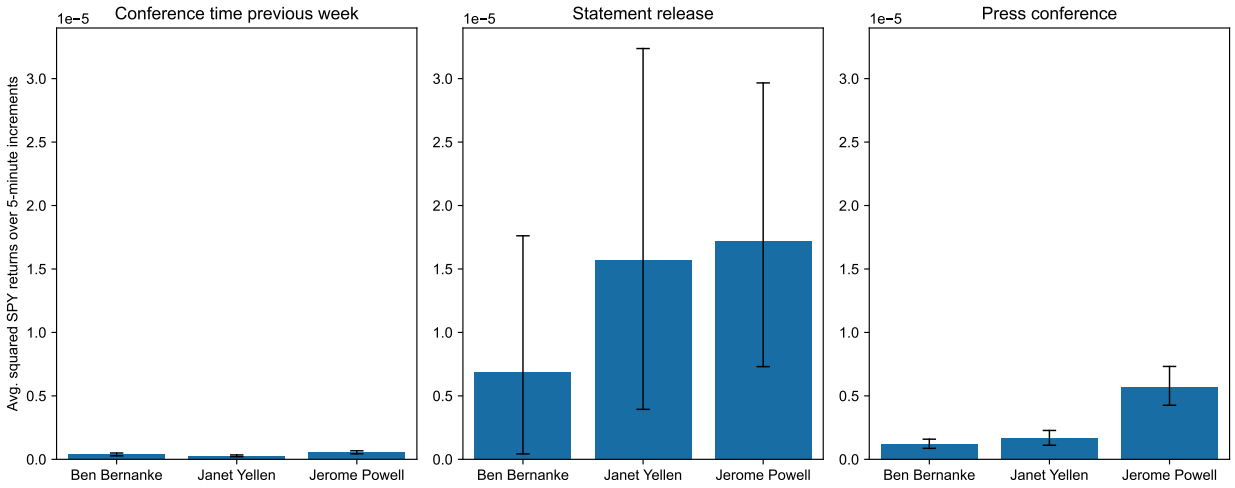
Note: The change in the two-year Treasury yield reported in the third column is the change from two minutes before to the minute given in the "Time" column. The quote column is a snippet from Chair Powell in the two minutes time window.

Table A8: Snippets of Chair Powell's answers during September 21, 2022 press conference Q&A.

Meeting date	Time	Change in two-year Treasury yield (bp)	Quote
Sep 21, 2022	14:41	-2.14	So far there's only modest evidence that the labor market is cooling off. Job openings are down a bit, as you know; quits are off their all-time highs; **there's some signs that some wage measures may be flattening out but not moving up**; payroll gains have moderated but not much. And in light of the high inflation we're seeing, we think we'll need to—and in light of what I just said, we think that we'll need to bring our funds rate to a restrictive level and to keep it there for some time.
Sep 21, 2022	14:42	-2.13	And that's why I noted in my opening remarks that, at some point, as the stance of policy tightens further, it will become **appropriate to slow the pace of rate hikes** while we assess how our cumulative policy adjustments are affecting the economy and inflation. So that's how we think about that.
Sep 21, 2022	14:45	-1.70	In addition, in this cycle, **longer-run inflation expectations have generally been fairly well anchored**, and, as I've said, there's no basis for complacency there. But to the extent that continues to be the case, **that should make it easier to restore price stability**.
Sep 21, 2022	14:46	-2.34	So these are the kinds of events that are not really seen in prior business cycles, and, in principle, if those things start to get better—and **we do see some evidence of the beginnings of that.** It's not much more than that, but it's good to see that. For example, commodity prices look like they may have peaked for now; supply chain disruptions are beginning to resolve. Those developments, if sustained, could help ease the pressures on inflation.
Sep 21, 2022	14:48	+2.34	**You want to be at a place where real rates are positive across the entire yield curve.** And I think that would be the case if you look at the numbers that we're writing down and think about—you measure those against some sort of forward-looking assessment of inflation, inflation expectations. I think you would see at that time—you'd see positive real rates across the yield curve, and that is also an important consideration.

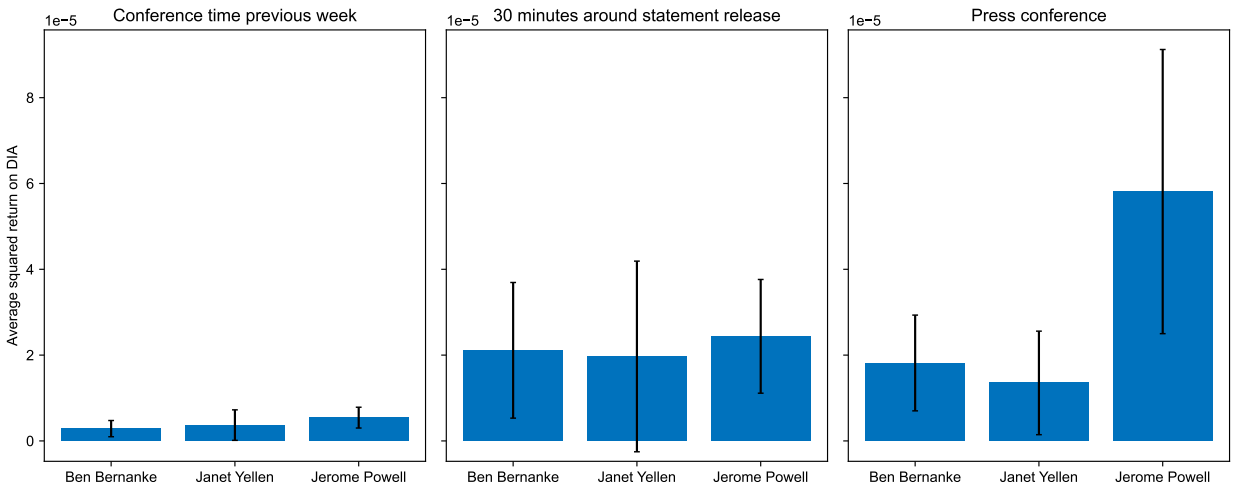
Note: The change in the two-year Treasury yield reported in the third column is the change from two minutes before to the minute given in the "Time" column. The quote column is a snippet from Chair Powell in the two minutes time window.

Figure A1: Market volatility for placebo conference, FOMC statement release, and press conference under three chairs, measured using returns in five-minute increments.



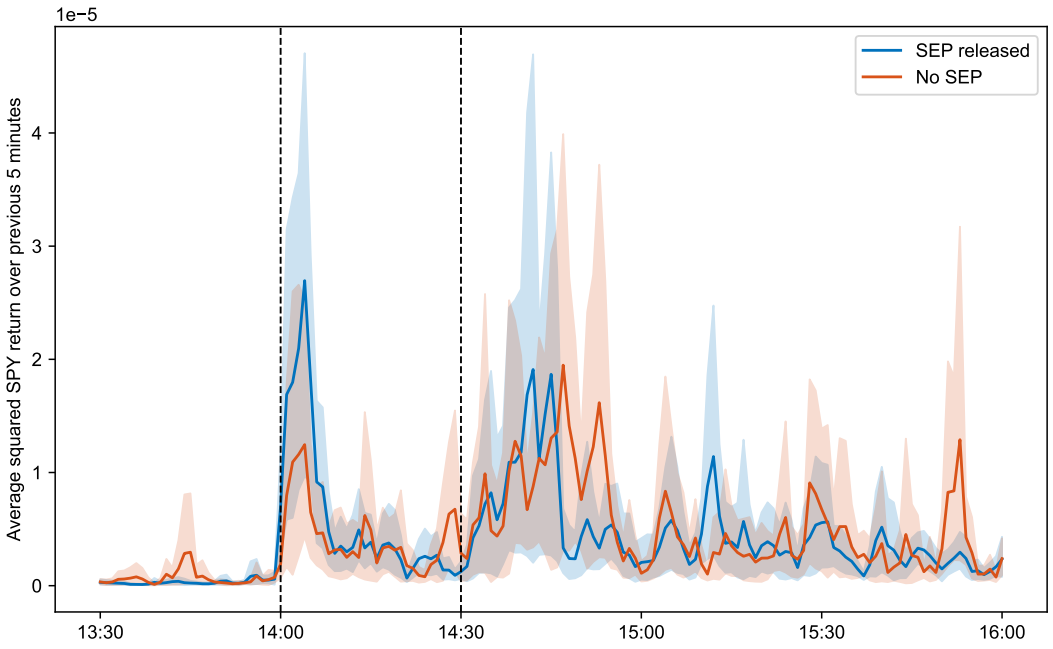
Note: The figure shows average squared returns of the S&P 500 index (proxied by the SPY ETF) over 5-minute increments during press conferences given by Chair Powell, Chair Yellen, and Chair Bernanke. We measure returns from the minute before the press conference starts to the minute it ends. We exclude emergency and unscheduled conferences: the March 4, 2014 unscheduled conference call under Chair Yellen and the emergency Covid-19 related press conferences given by Chair Powell on March 3, 2020 and March 15, 2020.

Figure A2: Market volatility for placebo conference, FOMC statement release, and press conference under three chairs, using returns on the Dow Jones Industrial index.



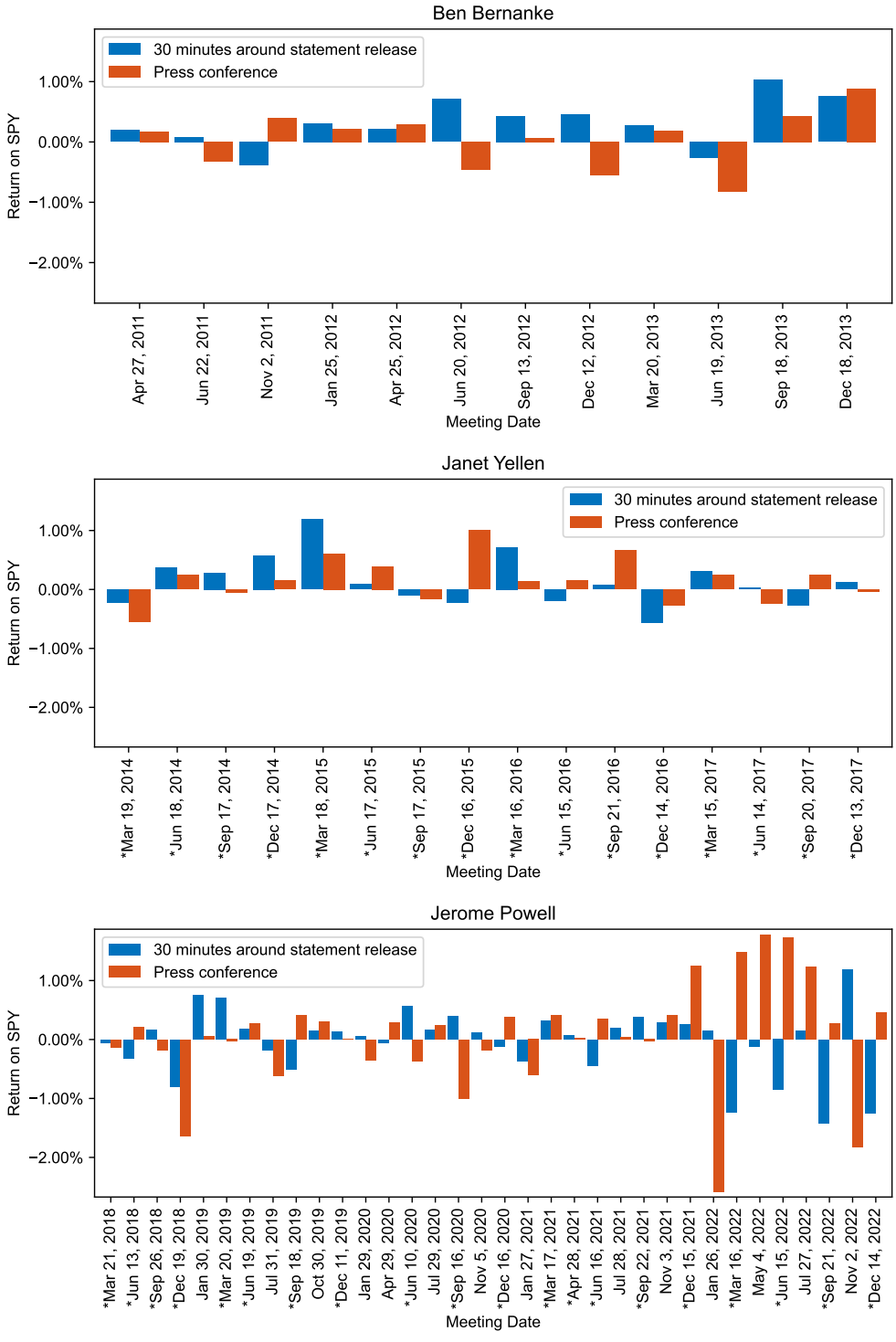
Note: The figure shows average squared returns of the Dow Jones Industrial index (proxied by the DIA ETF) during press conferences given by Chair Powell, Chair Yellen, and Chair Bernanke. We measure returns from the minute before the press conference starts to the minute it ends. We exclude emergency and unscheduled conferences: the March 4, 2014 unscheduled conference call under Chair Yellen and the emergency Covid-19 related press conferences given by Chair Powell on March 3, 2020 and March 15, 2020.

Figure A3: Market volatility on Chair Powell's press conference days, separated by whether or not a Summary of Economic Projections (SEP) was released.



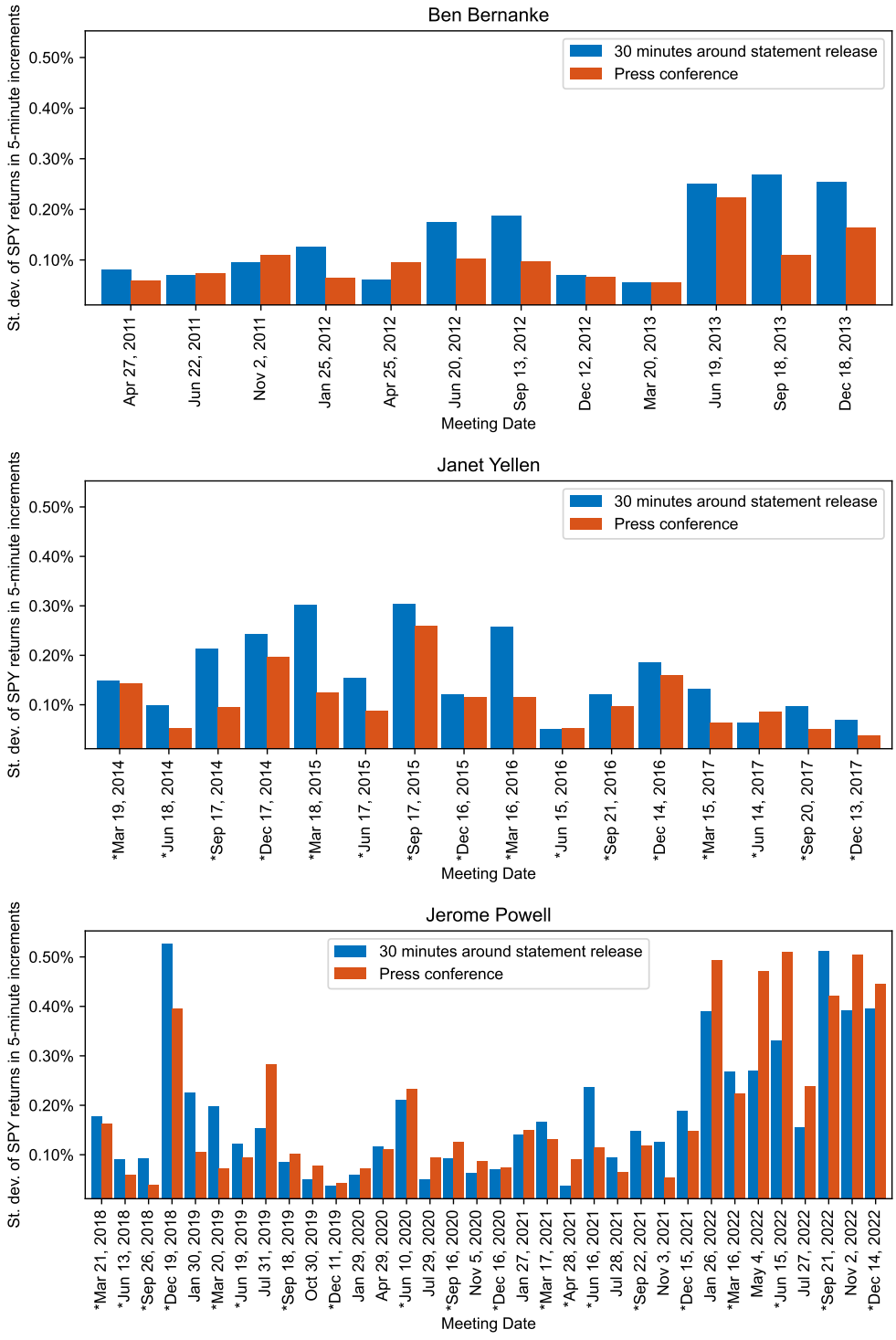
Note: Average squared returns of the S&P 500 (proxied by the SPY ETF) over five-minute periods from 1:30 PM to 4:00 PM on Chair Powell's press conference days. Dashed lines indicate the FOMC statement release time (2:00 PM) and the press conference start time (2:30 PM). The shaded area is a bootstrapped 95 percent confidence interval.

Figure A4: S&P 500 returns for FOMC statement release and press conference for each conference.



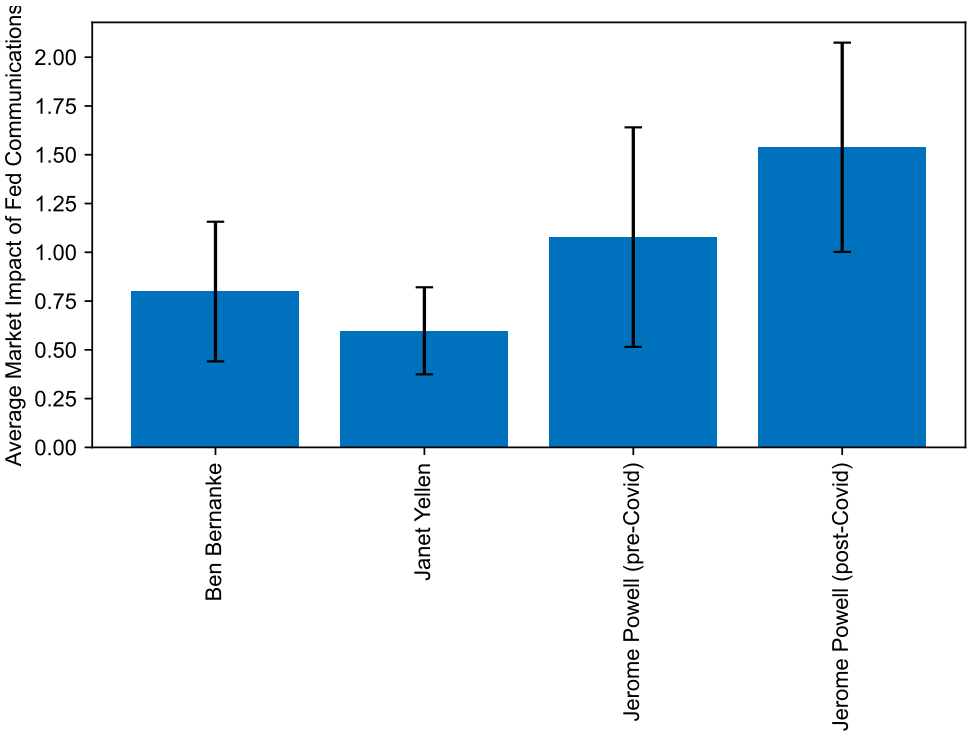
Note: Asterisks denote meetings at which an FOMC projections dot plot was released.

Figure A5: Standard deviation of S&P 500 returns measured in five-minute increments for each conference.



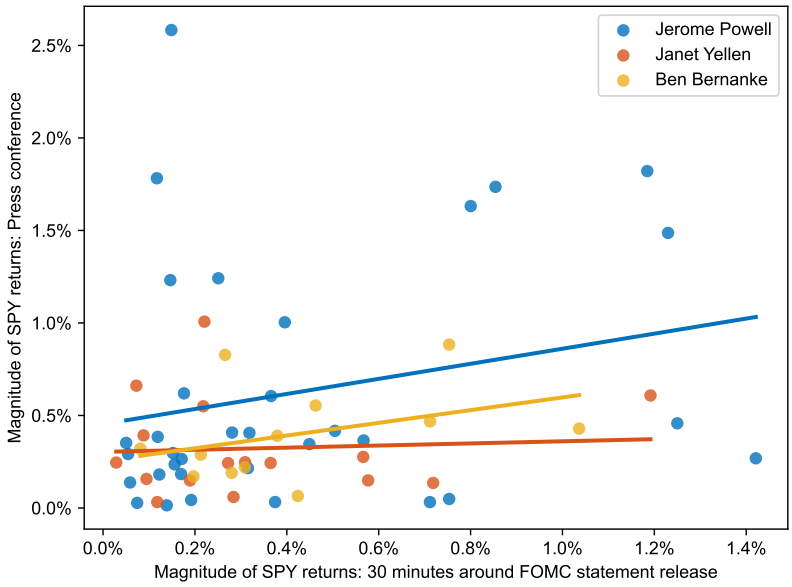
Note: Asterisks denote meetings at which an FOMC projections dot plot was released.

Figure A6: Market impact of Fed communications: Comparison across chairs.

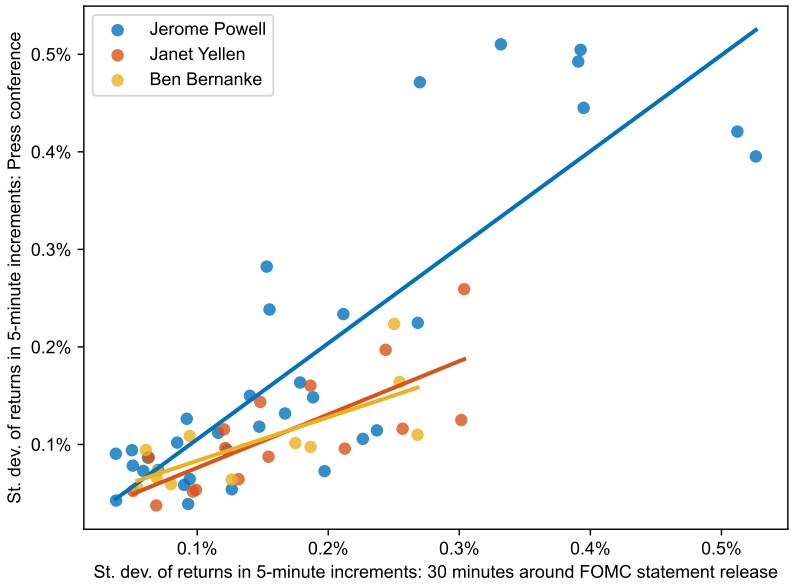


Note: The figure shows the average market impact of Fed communications by Chair. Please see the note for fig. 3 for information on how we construct the market impact. This figure uses returns on the S&P 500 index (proxied by the SPY ETF) for market returns. We exclude emergency and unscheduled conferences: the March 4, 2014 unscheduled conference call under Chair Yellen and the emergency Covid-19 related press conferences given by Chair Powell on March 3, 2020 and March 15, 2020. Pre-Covid conferences refer to Chair Powell's conferences before March 2020, and post-Covid conferences cover the following years.

Figure A7: Correlation of magnitude and volatility of market reaction to FOMC statement release and to press conference.



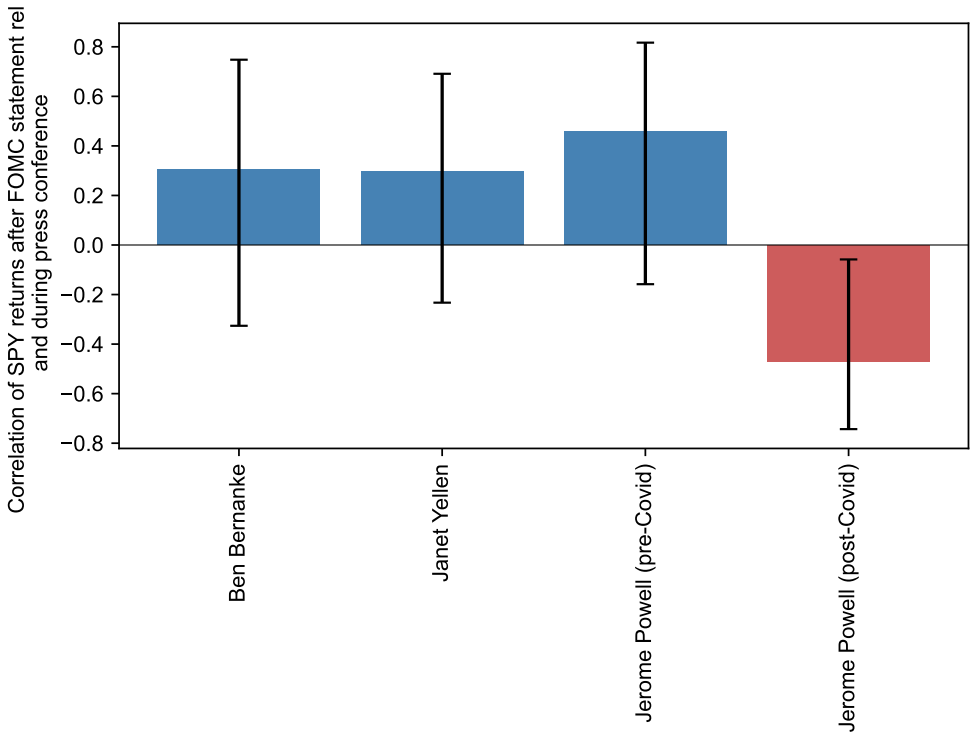
(a) Absolute magnitude of market reaction.



(b) Volatility of market reaction.

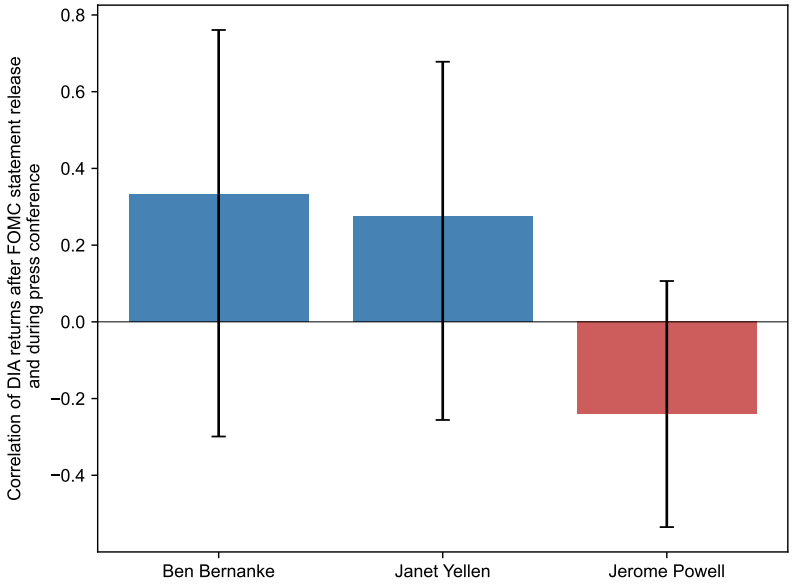
Note: The top panel plots the magnitude (absolute value) of the market return to the FOMC statement release against the magnitude of the market return during the press conference. The bottom panel plots the dispersion of returns measured in five-minute increments in the 15 minutes after the FOMC statement release against the dispersion of returns during the press conference. These figures use S&P 500 returns; results from returns on the Dow Jones Industrial index are similar.

Figure A8: Correlation of market reaction to FOMC statement release with market reaction to press conference.



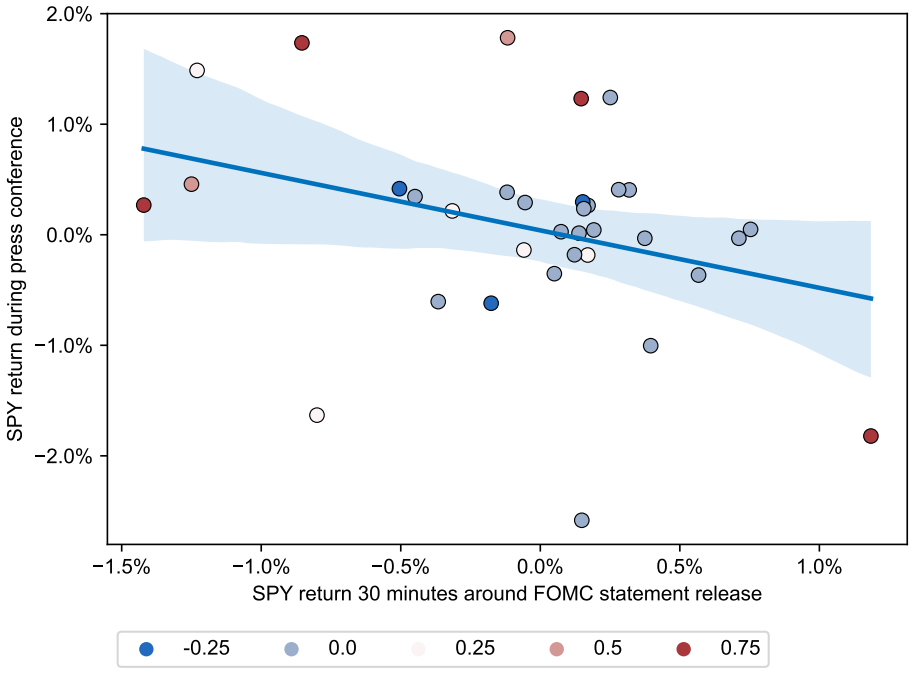
Note: Correlation of S&P 500 returns after statement release and during press conference for each chair. A positive correlation means that the S&P 500 tended to move in the same direction after the statement release and during the press conference given by the chair. Error bars indicate 95 percent confidence interval.

Figure A9: Correlation of market reaction to FOMC statement release with market reaction to press conference, using returns on the Dow Jones Industrial index.



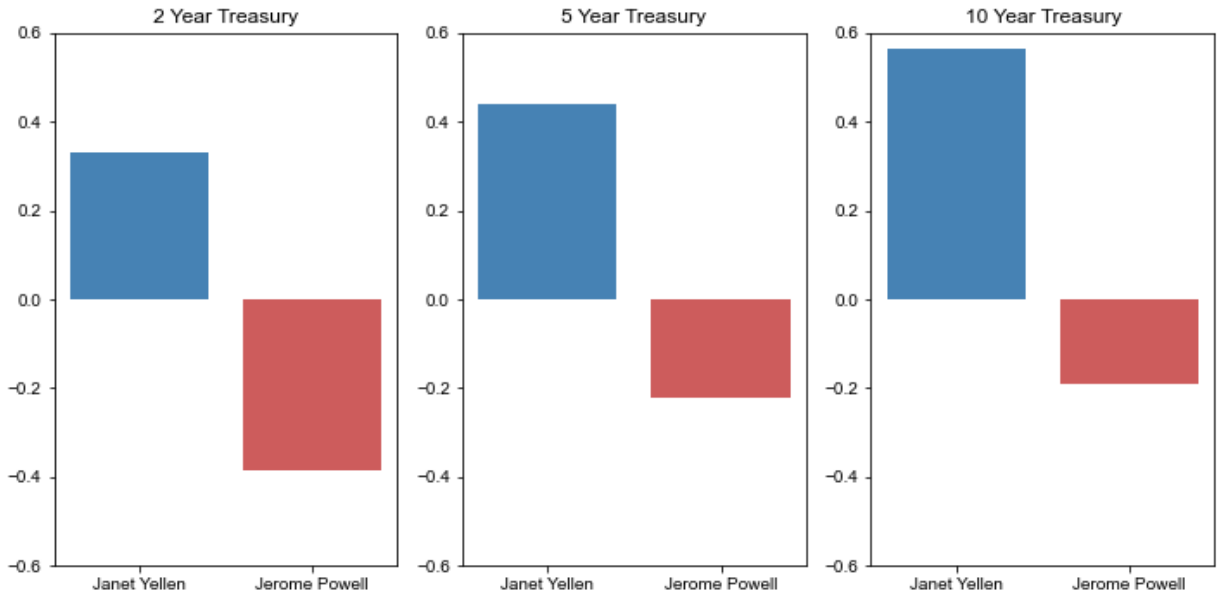
Note: Correlation of DIA returns after statement release and during press conference for each chair. A positive correlation means that the Dow Jones Industrial index tended to move in the same direction after the statement release and during the press conference given by the chair. Error bars indicate 95 percent confidence interval.

Figure A10: Correlation of market reaction to FOMC statement release and to press conference under Chair Powell.



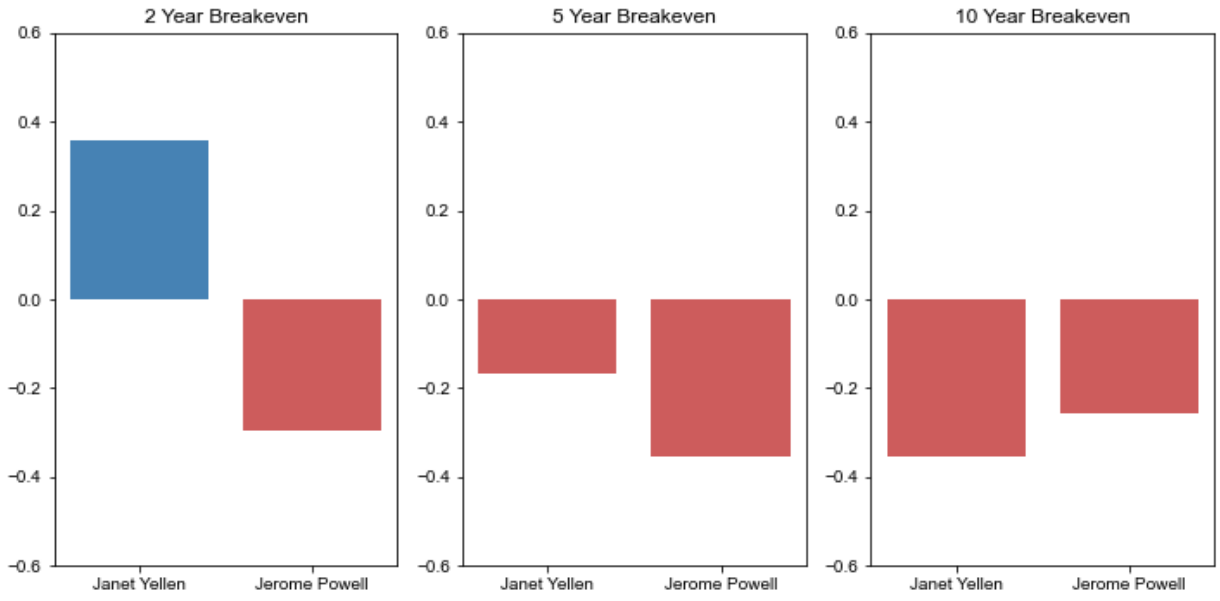
Note: Each point corresponds to an FOMC meeting date under Chair Powell's tenure. The color indicates the magnitude of the rate increase/decrease that was announced in that meeting. Results from returns on the Dow Jones Industrial index are similar.

Figure A11: Correlation of change in interest rates on Treasuries following FOMC statement release with change in interest rates during press conference.



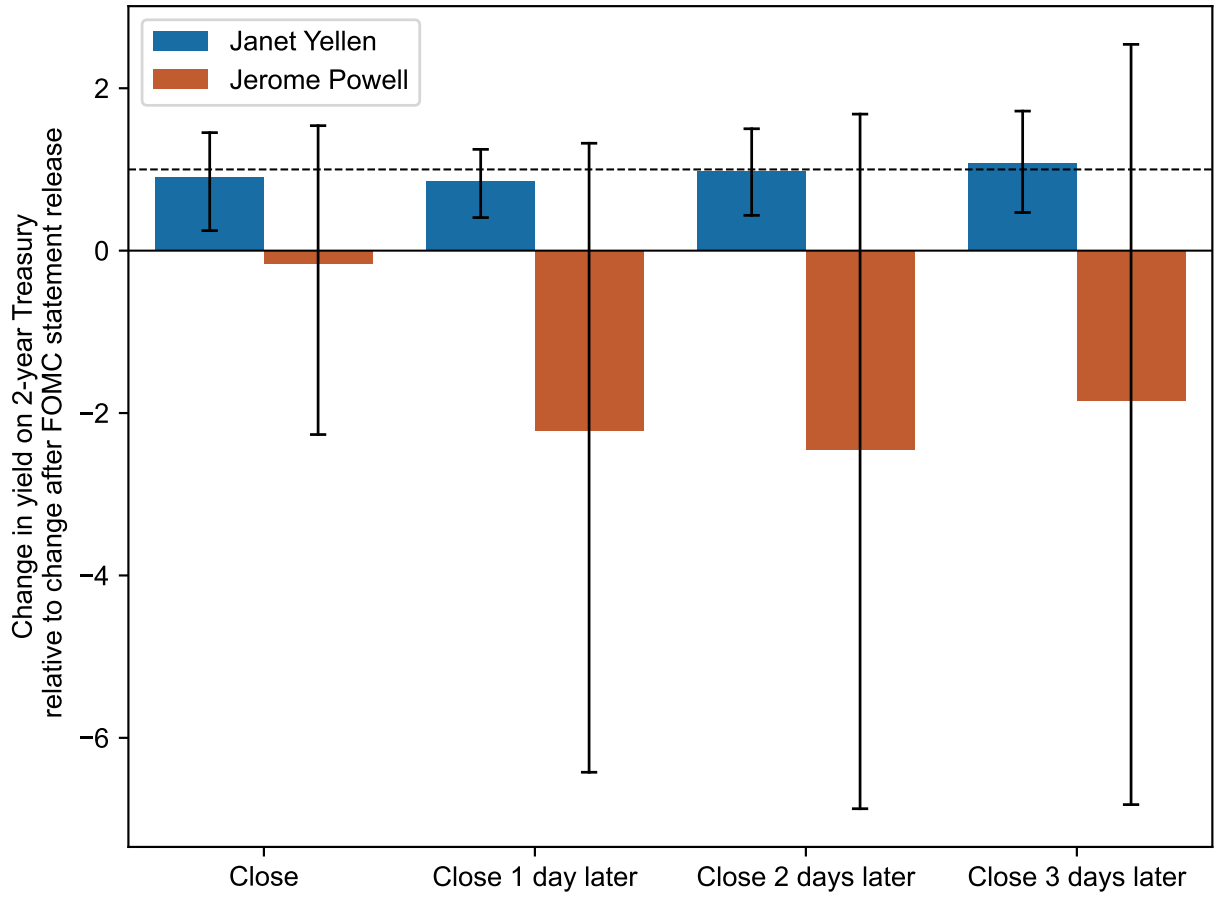
Note: Changes in interest rates on two-, five- and ten-year Treasuries are calculated using Bloomberg indices. A positive correlation means that the Treasury yields tended to move in the same direction after the statement release and during the press conference given by the chair.

Figure A12: Correlation of change in market-implied breakeven inflation rates following FOMC statement release with change in breakeven inflation rates during press conference.



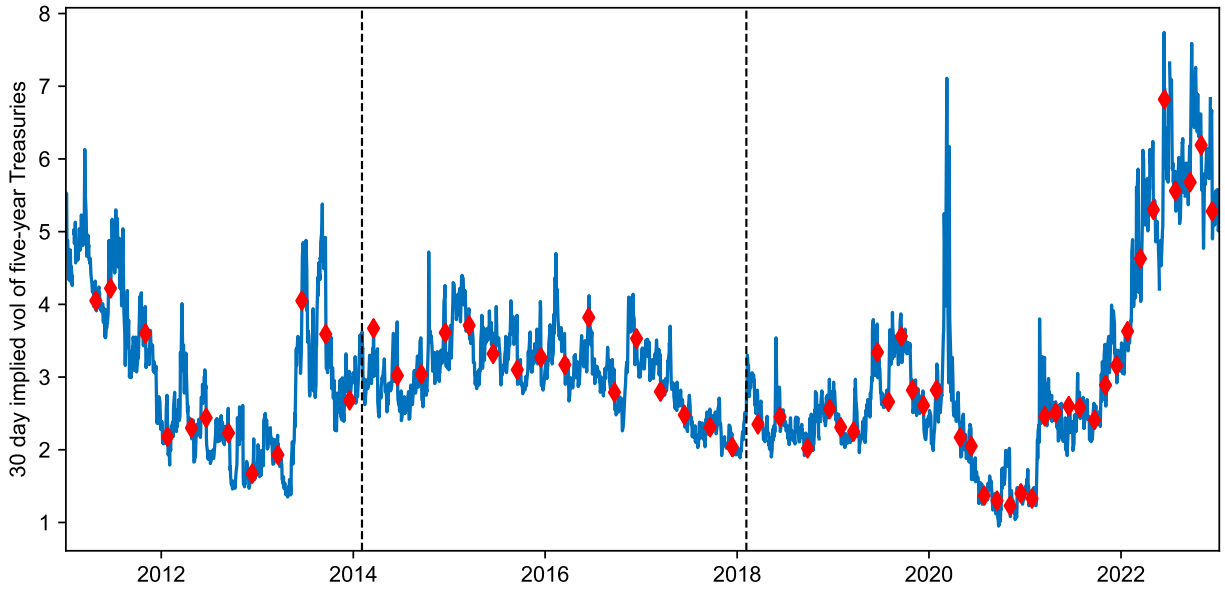
Note: Changes in breakeven two-, five- and ten-year inflation rates are calculated using Bloomberg indices. A positive correlation means that the breakeven inflation rates tended to move in the same direction after the statement release and during the press conference given by the chair.

Figure A13: Average change in two-year Treasury yields following FOMC press conference days, normalized by change in yields following FOMC statement release.



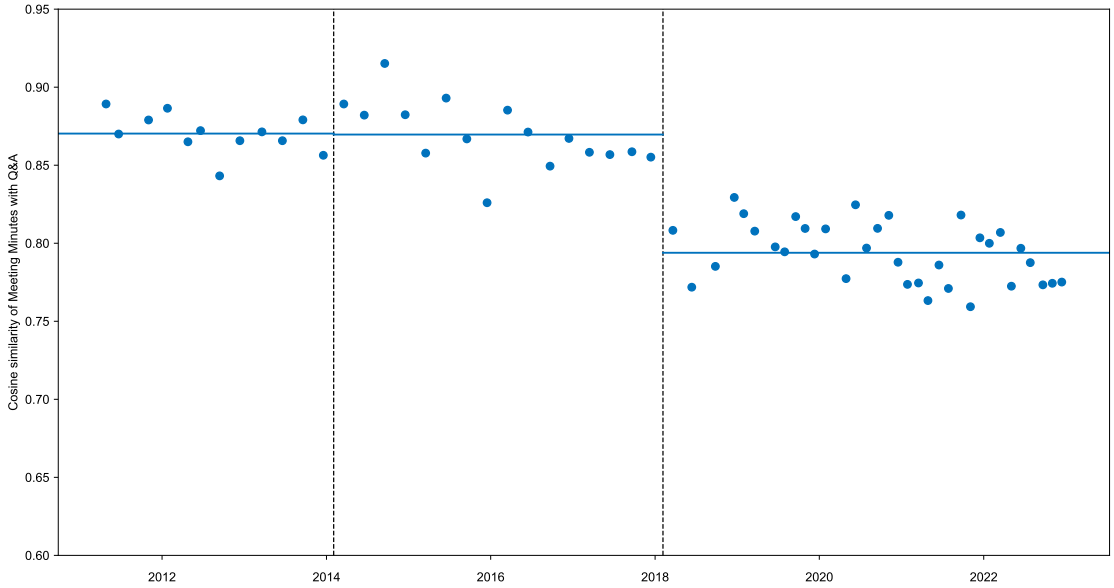
Note: The figure shows the average change in the yield of two-year Treasuries relative to 1:50 PM on the day of the FOMC press conference. The change in the yield is normalized by the change in the yield from 1:50 PM to 2:15 PM (after the FOMC statement release), so that a value of one means that the yield of two-year Treasuries is exactly the value from 2:15 PM on the FOMC statement release day. Bootstrapped standard errors.

Figure A14: Time series of 30-day implied vol on five-year Treasuries.

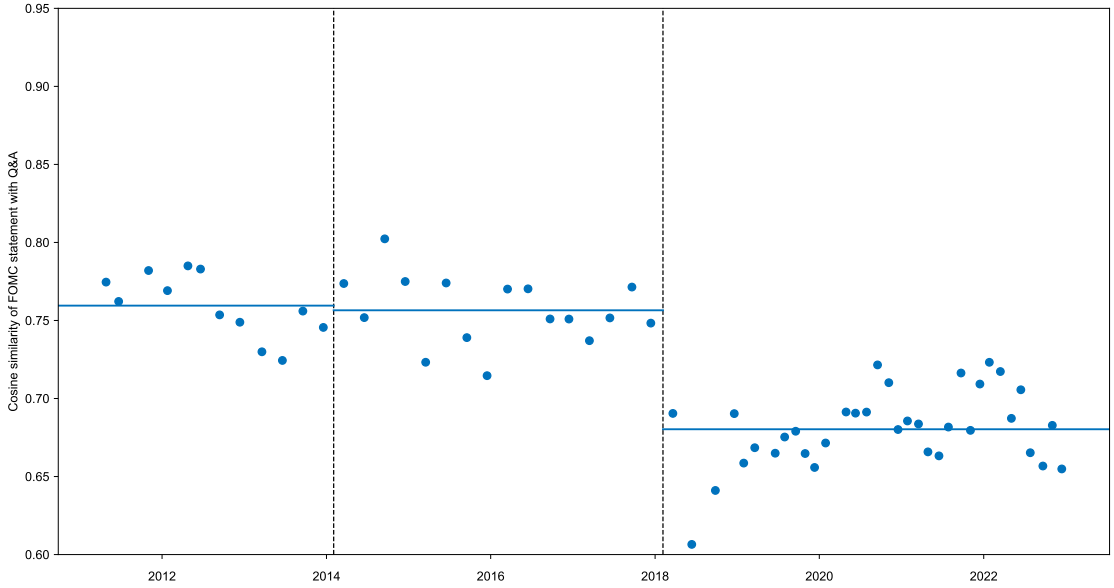


Note: The dotted lines refer to the start of Chair Yellen and Chair Powell's terms. The red diamonds indicate dates of FOMC press conferences (excluding unscheduled and emergency meetings).

Figure A15: Textual similarity of press conference Q&A with meeting minutes and FOMC statement.



(a) Cosine similarity: Press conference Q&A and FOMC meeting minutes.



(b) Cosine similarity: Press conference Q&A and FOMC statement.

Note: The top panel shows the cosine similarity between the press conference Q&A and the FOMC meeting minutes for each press conference since April 2011. The bottom panel shows the cosine similarity between the press conference Q&A and the FOMC statement for each conference since April 2011. The legends report the mean and standard deviation of the cosine similarity values for each chair.