The Economics of the Fed Put

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We document that low stock market returns predict accommodating monetary policy by the Federal Reserve. Negative stock returns realized between FOMC meetings are a more powerful predictor of subsequent federal funds target rate changes than almost all macroeconomic news releases. Using textual analysis of FOMC minutes and transcripts, we argue that stock returns cause Fed policy and document the mechanism underlying the relation. Consistent with a causal effect of stock returns on policy, FOMC participants are more likely to mention the stock market after market declines—a pattern that arises from the mid-1990s—and the frequency of negative stock market mentions in FOMC documents predicts target rate cuts. The FOMC discusses the stock market mostly as a driver of consumption and, to a lesser extent, investment and broader financial conditions. Less attention is focused on the stock market simply predicting (as opposed to driving) the economy. In a Taylor rule framework, about 80% of the Fed's reaction to the stock market can be explained by the Fed revising its expectations of economic activity down following stock market declines. The Fed's expectations updating is roughly in line with that of private sector forecasters and with the stock market's predictive power for growth and unemployment.

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I. Introduction

The interplay between the stock market and monetary policy is complex. Monetary policy may both affect the stock market and react to it. In this paper, we analyze the impact of the stock market on monetary policy, focusing on the U.S. Federal Reserve. Understanding the effect of the stock market on monetary policy is a topic of long-standing importance for policy with policymakers having to decide both whether to accommodate stock market slumps and whether to lean against the wind in times of stock market booms.

Establishing a causal impact of the stock market on policy is difficult because the stock market and Federal Reserve policy may be reacting to each other and may both be driven by underlying macroeconomic news. Rigobon and Sack (2003) use identification through heteroscedasticity and estimate that a 5 percent decrease in the stock market causes a 14 basis point reduction in the federal funds target at the next Federal Open Market Committee (FOMC) meeting. More recently, Ravn (2012) uses identification via heteroscedasticity to estimate whether the Fed reacts asymmetrically to stock market increase and decreases, but he finds that inference from this approach is sensitive to specific identifying assumptions.

An alternative approach is to estimate Taylor rules that include past stock returns in addition to the Fed's forecasts of macroeconomic variables. The inclusion of growth and inflation expectations in the Taylor rule helps overcome omitted variables problems while lagging stock returns to some extent addresses concerns about reverse causality (from policy to stock returns). Using this approach, Bernanke and Gertler (1999) find a modest but statistically significant effect of stock returns on the federal funds target. They argue that monetary policy should not respond to the stock market beyond its effect on inflation and output and conclude that actual US policy is largely consistent with this advice.

While useful for addressing the question of whether the Fed policy is excessively driven by the stock market relative to the Taylor-rule benchmark, the Taylor-rule approach has several limitations in terms of eliciting the impact of the stock market on policy. First, it does not answer the question how important the stock market is for policy setting relative to non-financial indicators that the Fed could be focusing on in setting its expectations. Second, the stock market may be insignificant when added to the Taylor rule either because the Fed does not pay attention to the stock market or because the stock market only affects policy via its effect on Fed growth and inflation expectations. Third, and related, even if the stock market was not significant relative to the Taylor-rule benchmark, Fed expectations may react too much or too little to stock market news implying a sub-optimal reaction of policy to the

stock market. Finally, the Taylor rule approach is silent about the economics behind any impact of the stock market on the Fed's growth or inflation expectations.

In this paper, we seek to better understand the effect of the stock market on Fed policy by asking four questions. First, how does the stock market compare to macroeconomic indicators as a predictor of Fed policy? Second, does the Fed pay attention directly to the stock market, a necessary condition for the stock market causing policy? Third, if the Fed does in fact react to the stock market, why is it doing that? Fourth, if the Fed reacts to the stock market, is the reaction appropriate or too strong?

To compare the explanatory power of the stock market for Fed policy to that of macroeconomic news, we use macro news releases from Bloomberg going back to 1996. We find that the explanatory power of negative stock returns for changes in the Federal funds target is stronger than that of almost all of the 38 macro variables covered by Bloomberg. The explanatory power of the stock market for the Fed funds target is driven by reductions in the Fed funds target following negative stock returns. This pattern is what is commonly referred to in the press as a "Fed put," i.e., strong accommodation following poor stock returns.[1]

To assess whether the strong statistical relation between the stock market and Fed policy is causal or coincidental, we conduct an extensive textual analysis of FOMC minutes and transcripts. A necessary condition for the stock market being a key causal factor for Fed policy is that the Fed pays close attention to its developments. We construct a list of phrases related to the stock market (e.g., "stock market", "equity prices", "S&P 500"). In our baseline approach, we search for these words in FOMC minutes. We find 983 mentions of the stock market in the 184 FOMC minutes covering the 1994–2016 period. We read the paragraphs that contain stock market mentions and classify them into whether FOMC meeting attendees discuss the market going up or down. The number of negative (down) stock market mentions and the number of positive (up) stock market mentions relate to actual stock returns with expected signs, with low stock returns leading to more negative stock market mentions and high stock returns to more positive stock market mentions. This relation is present both before and during the zero-lower bound period. Consistent with the Fed put, the number of negative stock market mentions—but not the number of positive stock market mentions—has a significant explanatory power for target changes over the 1994–2008 period, i.e., a high number of negative stock market mentions predict that the the Fed will

[1]The Financial Times, in one of the early articles on the subject, defines the Fed put as saying "when financial markets unravel, count on the Federal Reserve and its chairman Alan Greenspan (eventually) to come to the rescue," Financial Times, December 8, 2000.

provide monetary stimulus. To assess robustness of this result to using FOMC transcripts, we develop an algorithm to find and classify stock market mentions. The algorithm is based on a set of stock market phrases interacted with a list of direction words describing the market going down (negative words) or up (positive words). We train the algorithm on the FOMC minutes and then use it to show that our results are robust to studying FOMC transcripts.

In addition to arguing causality by textual analysis, we use textual analysis to study the mechanism for why the Fed pays attention to the stock market. We classify the 983 paragraphs in the minutes with stock market mentions based on what is said about the market. 551 cases are purely descriptive. These are mainly from the part of the FOMC meeting where staff summarizes financial conditions. More interesting, of the other 432 paragraphs, 265 (61%) discuss the impact of the stock market on consumption. Many of these specifically refer to the consumption-wealth effect, i.e. the notion that higher stock market wealth leads to higher consumption. The impact of the stock market on investment is another repeated theme in FOMC discussions, appearing 34 times. Many of these refer to the impact of the stock market on firms' cost of capital. While not mentioned explicitly, this relation is consistent with models of the financial accelerator in which firms' cost of external finance depends on how much collateral they can offer, with equity values being the key determinant of collateral values (Bernanke and Gertler, 1999, 2001). In another 44 cases, the stock market is discussed as part of a larger set of variables describing financial conditions, with financial conditions seen as influencing investment and, less frequently mentioned, consumption. Of the 432 paragraphs with stock market mentions that are not purely descriptive, over 90% are cases in which the Fed views the stock market as a causal factor for the economy, as opposed to just a predictor of economic conditions. We find a surprisingly small number of cases in which the stock market is discussed as a predictor of the economy. Overall, the Fed's attention to the stock market is consistent with a view that the stock market is an important driver of consumption and investment.

We take three approaches to quantify whether the Fed reacts with appropriate strength to the stock market. Our main approach is to estimate the relation between stock returns and Greenbook expectations to assess whether the Fed's growth and inflation expectations (formerly collected in Greenbooks, now in Tealbooks) update too much in response to stock market shocks. We benchmark the impact of the stock market on Fed economic forecasts to that on the corresponding private sector forecasts from the Survey of Professional Forecasters and the Blue Chip Economic Indicators, as well as to the predictive power of the stock

market for realized economic variables (output, unemployment and inflation). While the stock market has significant explanatory power for Fed forecast updates in both economic and statistical terms, we find little evidence that Fed expectations overreact to the stock market relative to these benchmarks. We also provide updated estimates of Taylor rules that include the stock market to estimate, within a standard Taylor rule framework, whether the Federal funds target responds more to the stock market than can be explained by updates to Fed growth and inflation expectations. Only about 20% of the impact of the stock market on the Federal funds target (in terms of the cumulative impact of a shock) remains after controlling for macro expectations and this residual impact is not statistically significant.[2] Our third approach to assess whether the Fed may be overreacting to the stock market is to correlate stock market mentions in FOMC minutes with a measure of how much households pay attention to the stock market, constructed from the Michigan Survey of Consumers. We find a correlation of 0.68 between Fed and household attention to the stock market, again suggesting a high similarity in how much the Fed and the private sector focuses on the stock market.

The relation between the stock market and the Federal Reserve is receiving renewed interest both in policy debates and the academic literature. The Federal Reserve has come under criticism for being excessively driven by asset prices, the stock market in particular, rather than by economic data. For example, former governor Kevin Warsh has stated: *"It is not obvious what their strategy is. I know they say they're data dependent. I don't know exactly what that means. [...] They look to me asset price dependent, more than they look [economic] data dependent. When the stock market falls like it did in the beginning of this year, they say: 'Oh, we'd better not do anything.' Stock markets are now at career highs. I suspect when they meet over the course of the next 10 days, they will suggest now they look like they can be somewhat more responsible."* (CNBC's "Squawk Box" interview, July 14, 2016)[3]

In academic work, recent papers focusing on the effect of Federal Reserve monetary policy on the stock market have documented large average returns in periods of Federal Reserve decision making since the mid-1990s. Lucca and Moench (2015) provide evidence that the stock market performs particularly well ahead of scheduled FOMC announcements. Focusing on the 24 hours from 2pm to 2pm prior to scheduled FOMC announcements and the time

[2]Furthermore, we discuss how a residual reaction could be optimal if the Fed cares separately about financial stability due large fiscal cost of bailouts (as argued recently by Peek, Rosengren, and Tootell (2016)), or if the stock market affects the natural Federal funds rate (r^*).

[3]The interview is available here.

period from September 1994 to March 2011, they document that stocks have outperformed Treasury bills by an average of 49 bps. With eight scheduled FOMC meetings per year that implies that the pre-FOMC equity performance accounts for a substantial part of the overall realized equity premium since 1994. Lucca and Moench (2015) consider several explanations for their finding but conclude it is a puzzle and may not in fact be driven by the Fed. Cieslak, Morse and Vissing-Jorgensen (2018) study stock returns over the full cycle between the scheduled FOMC meetings. They uncover a systematic pattern in stock returns over the cycle—with returns being significantly higher in even weeks in FOMC cycle time. The high even-week returns account for the entire equity premium earned in the post 1994 sample, with returns on average being negative in odd weeks. They argue that the high even-week returns are driven by unexpectedly accommodating monetary policy over the post-1994 period, with monetary policy news disproportionately coming out in even weeks on FOMC cycle time. [4] Most important for our current question of whether the stock market drives Fed policy, Cieslak, Morse and Vissing-Jorgensen (2018) document that unexpectedly accommodating monetary policy has followed poor stock returns in the period since 1994, with about half of the high even-week stock returns driven by stock market mean-reversion on even-week days that following significant stock market declines. While this evidence suggests that policy has had a dramatic effect on realized stock returns, it does not reveal whether the Fed was reacting to the stock market or to other factors correlated with the stock market. A central contribution of the textual analysis in the current paper is to document that, based on their own words, the Federal Reserve started paying attention to the stock market in the mid-1990s with negative realized returns predicting more concern about the stocks market in FOMC minutes and transcripts. This finding helps explain why the FOMC cycle in stock returns is stronger post-1994 than before. In particular, increased policymaker concern about negative stock market developments since the mid-1990s lines up with the fact that negative returns have preceded policy accommodation in the post-1994 period (as measured by target changes and even-week stock returns). As part of our analysis of the current paper, we provide sub-period evidence that poor stock returns predict high even-week stock returns even in the post-2008 period. The Fed put, defined as policy accommodation following poor stock returns is thus alive and well even in the post-2008 period where policy has been driven more by quantitative easing and forward guidance than by changes to the Fed funds target.

[4] First, changes to the Fed funds target tend to take place in even weeks in FOMC cycle time both post-1994 (where intermeeting changes are rare) and pre-1994 where they were common. Second, Fed funds futures rates on average decline in even weeks consistent with unexpectedly accommodating news arriving in even weeks. Third, stock returns are particularly high on even-week days with more Fed information production and decision making (days that follow board meetings of the Fed's Board of Governors).

As evidence of the Fed put becomes more widely documented and appreciated, moral hazard effects become a concern and quantifying such effects will become important for assessing whether policy is reacting appropriately to negative stock returns.

In terms of methodology, recent research increasingly exploits information in textual data to gain insight into the workings of monetary policy. Using tools from computational linguistics, Hansen et al. (2017) study how central bank transparency affects monetary policymakers' deliberations. Hansen and McMahon (2016) use textual analysis to document the effects of Fed communication on both asset markets and macroeconomic outcomes. Schmeling and Wagner (2017) show that changes in the tone of ECB's communication have a significant effect on asset prices. While this work focuses on the effects of central bank communication on asset markets, we explore Fed documents to understand how the stock market affects its monetary policy decision making. Peek, Rosengren, and Tootell (2016) use textual analysis to assess whether the Fed acts as if it has a tertiary mandate (financial stability). Cecchetti (2003) uses counts of words related to the stock market and asset prices to argue that the FOMC pays attention to the stock market. He does not distinguish between positive and negative stock market conditions, and does not study the mechanism underlying the Fed's response.

The rest of the paper proceeds as follows. Section II describes the relationship between the Fed funds target and stock returns, and compares the stock market to macroeconomic indicators as predictor of Fed policy. Section III contains the textual analysis evidence that the stock market causes Fed's policy while Section IV provides textual analysis evidence on the mechanisms through which the stock market drives Fed's thinking. Section V focuses on whether the Fed reacts too strongly to the stock market and Section VI concludes.

II. Stock market returns as predictor of monetary policy

This section documents the relation between stock returns and subsequent federal fund rate (FFR) changes and compares the predictive power of the stock market for target changes to that of a host of macroeconomic indicators. The evidence in this section documents the statistical relation between the stock market and policy. In later sections, we use textual analysis to argue that the documented relation is likely to be causal.

II.A. Defining target changes and intermeeting excess stock returns

Since 1981, the Fed has held 8 scheduled meetings per year roughly 6 to 8 weeks apart. Since 1994 changes to the federal fund rate target have been publicly announced. Prior to 1994, we rely on Thornton (2005) to determine when market participants learned about the FOMC decision. Thornton dates target changes based on when they were likely implemented in open markets operations by the Desk at the Federal Reserve Bank of New York (generally 1 or 2 days after the FOMC's decision). The time series of the FFR target going back to September 27, 1982 is available via FRED Economic Data. Following Cieslak, Morse and Vissing-Jorgensen (2018), we define the FOMC cycle day as the number of days from a scheduled FOMC meeting. Thus, day 0 in FOMC cycle time is the day of a scheduled meeting (the last day for 2-day meetings), day -1 ($+1$) is the day before (after) a meeting, and so on. For the period after 1994, we compute cumulative target changes from day 0 of cycle $m-1$ to day 0 of cycle $m+X$ where m indexes the scheduled FOMC meetings. For the 1982:09–1994 period, we calculate target changes from day 2 of cycle $m-1$ to day 2 of cycle $m+X$.

Daily stock returns and T-bill returns are from Ken French's website. We denote intermeeting excess stock returns as rx_m. From 1994 onward, we calculate the intermeeting return for FOMC cycle m as the excess return of stocks over Treasury bills from day 1 of cycle $m-1$ to day -2 of cycle m, i.e., excluding returns earned one day before and on the day of scheduled FOMC meetings. We exclude the day -1 and 0 returns since these may be particularly driven by monetary policy news, potentially leading to reverse causality. For the 1982:09–1993 period, we calculate intermeeting returns using returns from day 3 of cycle $m-1$ to day -2 of cycle m to reflect the fact that investors did not know the decision until a day or two after the meeting. For all years, we additionally exclude excess returns earned on days of intermeeting moves because the Fed's decisions likely influence the stock market on those days.[5] We identify days of intermeeting moves as those when the FFR target changed outside of scheduled meetings. To separately study the relation between monetary policy and bad versus good stock market news in the intermeeting period, we define a variable $rx_m^- = \min(0, rx_m)$ to captures movement in excess stock returns over the negative range

[5]One exception to this treatment is the intermeeting move on September 17, 2001—the first day of stock market trading after the 9/11 attacks. On this day, the S&P500 index lost 11.6%, despite an accommodating policy move, suggesting that the attacks (rather than monetary policy) was the dominant piece of news. We keep this observation in the computation of the intermeeting return between the August 21, 2001 and October 2, 2001 meeting. However, we verify that dropping this data point does not significantly influence our results.

and $rx_m^+ = \max(0, rx_m)$ to capture variation in excess stock return over the positive range. We refer to rx_m^- as the stock market put variable.

II.B. Low stock returns predict policy accommodation

The left graph in Figure 1 displays changes in the federal funds target as a function of past excess stock returns. Using data for 1994–2008, we plot the average cumulative change in the target from meeting $m-1$ to meeting $m+X$ (for different values of X) against average intermeeting excess stock returns, with both averages calculated by quintile of the intermeeting excess stock return.[6] Intermeeting excess stock returns in the lowest quintile (averaging around -7 percent) are associated with an average reduction in the target of as much as 119 basis points over the 8 subsequent FOMC cycles from $m-1$ to $m+7$. No such pattern of Fed accommodation following low stock returns is seen pre-1994 (right graph in Figure 1).

In Table I, we provide corresponding regression evidence. Columns 1–4 Panel A show regressions of target changes on a dummy variable equal to one for an intermeeting excess return in the lowest quintile. Over horizons ranging from one FOMC cycle ($X = 0$) to a year ($X = 7$, i.e., 8 cycles), target changes are significantly lower following intermeeting excess return in the lowest quintile. To exploit the continuous variation in excess returns, in columns 5–8, we report analogous regressions using rx_m^- and rx_m^+ as the explanatory variables. The R^2 values for explaining target changes are substantially higher relative to the quintile dummy regressions, indicating that the Fed's accommodation is stronger following more negative intermeeting excess returns. The results also point to an asymmetry in that positive intermeeting returns are in most cases not significant predictors of target changes. Table I Panel B avoids the use of overlapping data for the dependent variable and instead regresses the change in the target (from $m-1$ to m) on two lags and either a dummy for an intermeeting excess stock return in the lowest quintile (in column 2), the negative realized intermeeting returns rx_m^- (in column 3), and both negative and positive realized intermeeting returns (in column 4). Compared to column 1 which includes only the lags of the dependent variable, rx_m^- increases the R^2 from 0.35 to 0.51 suggesting a strong statistical relation between negative realizations of stock market returns in the intermeeting period and target changes.

[6] The quintiles of intermeeting returns are constructed over the full 1994–2016 sample. We obtain similar results when calculating quintiles in real time.

The analysis of the federal funds target over the 1994-2008 period is not informative for whether the stock market has predictive power for monetary policy in the post-2008 period, during most of which the target was at the zero-lower bound. To assess this, we exploit the finding from CMVJ (2018) that the Fed has had an unexpectedly large effect on the stock market in the post-1994 period, especially following poor stock returns. Figure 2 Panel A shows the finding from CMVJ (2018) that stock returns have been high in even weeks in FOMC cycle time on days that follow poor stock returns over the prior week, a "Fed put in stock returns". Figure 2 Panel B documents that this pattern is not present in the pre-1994 period, consistent with Figure 1 for the Fed funds target over the pre-1994 period. Figure 2 Panel C splits the 1994-2016 period into 1994–2008 and 2009–2016. In both sub-periods, stock returns are high on even-week days that follow poor stock returns, implying that poor stock returns predict (unexpectedly large) monetary policy accommodation in both sub-periods.

II.C. How does the stock market compare to macroeconomic indicators as predictor of monetary policy?

To put the explanatory power of the stock market for target changes into perspective, we compare it to the explanatory power of macroeconomic variables. We obtain data on macro announcements from Bloomberg. We start from the universe of variables included in Bloomberg's calendar of US economic releases. The Bloomberg data go back to October 1996. We use data up to the last FOMC meeting of 2008 where the Fed lowered the target to 0–25 basis points, resulting in a sample of 98 FOMC meetings for this part of our analysis. We consider macroeconomic variables for which at least 10 years of announcement data are available in Bloomberg over the October 1996–December 2008 sample. There are 38 such variables, 32 of which have monthly announcements. Of the rest, one variable has weekly announcements (Initial Jobless Claims), one has 24 announcements per year (University of Michigan Confidence), two variables have 4 announcements per year (Current Account Balance, Employment Cost Index), and two variables have 8 announcements per year (Nonfarm Productivity, Unit Labor Costs).

For each explanatory variable x, we estimate the following two regressions:

$$\Delta \text{FFR}_m = \beta_0 + \beta_1 \Delta \text{FFR}_{m-1} + \beta_2 \Delta \text{FFR}_{m-2} + \delta_1 x_m + \delta_2 x_{m-1} + \gamma_1 \mathbf{1}_{x_m} + \gamma_1 \mathbf{1}_{x_{m-1}} + \varepsilon_m \quad (1)$$

$$\Delta \text{FFR}_m = \beta_0 + \beta_1 \Delta \text{FFR}_{m-1} + \beta_2 \Delta \text{FFR}_{m-2} + \gamma_1 \mathbf{1}_{x_m} + \gamma_1 \mathbf{1}_{x_{m-1}} + \varepsilon_m \quad (2)$$

The regressions are estimated with one observation per scheduled FOMC meeting. $\Delta\text{FFR}_m = \text{FFR}_m - \text{FFR}_{m-1}$ is the change in the Fed funds target between meetings $m-1$ and m. x_m denotes the latest realized value of the explanatory variable that is available as of date of the m-th meeting. $\mathbf{1}_{x_m}$ is a dummy variable equal to one if x_m is missing and similarly for $\mathbf{1}_{x_{m-1}}$. Missing values occur mainly because some series start later than October 1996. We also code a variable as missing if there has been no announcement for this variable since the last FOMC announcement date. We use the actual values of the macro variables as regressors rather than the surprises relative to consensus. We want our x_m-variables to capture news that has arrived since the $(m-1)$-th meeting. Consensus forecasts for a given variable are generally dated just before the release of the variable and thus reflect information about the likely value of the release that arrives between $(m-1)$-th meeting and (just before) the release. Surprises relative to consensus forecasts would therefore focus only on a subset of the news contained in x_m. We include x_{m-1} as a regressor to allow for a delayed Fed response to the news contained in the particular macro announcement. We calculate the R^2 values from each of the regressions and use the difference as a measure of the incremental R^2 generated by the particular variable. By using incremental R^2, rather than simply the R^2 from equation (1), we disregard any explanatory power due to the lags of the target changes and the dummy variables for missing data. To assess whether a given x_m-variable has statistically significant explanatory power for Fed policy, we report the p-values from an F-test of $H_0 : \delta_1 = \delta_2 = 0$.

The results are reported in Table II. Variables are listed in order of declining incremental R^2. For the stock market put variable, the incremental R^2 is 0.180 and the p-value for the test of $H_0 : \delta_1 = \delta_2 = 0$ is less than 0.1%. Only the Philadelphia Fed Business Outlook Survey comes close in its incremental R^2 with a value of 0.159.

To assess the explanatory power of macroeconomic variables combined (as opposed to individually), we consider the Chicago Fed National Activity Index (CFNAI), available monthly. This index is the first principal component of 85 macroeconomic series. It has been made available in real time since 2001 but data are available back to 1967 for each release. We use data from the June 2018 release and re-estimate the incremental R^2 for the (non-real time) CFNAI over the 1996:10 to 2008 period used in Table II. The results are included in the last row of Table II and show an incremental R^2 of 0.129, lower than that of the stock market put and the Philadelphia Fed Manufacturing Business Outlook Survey.

The strong predictive power of the stock market put suggests that the Federal funds target is particularly sensitive to bad news. To treat macro variables and the stock markets similarly in terms of a functional form, we have re-estimated Table II using the minimum of the 20th percentile and the actual value of each variable as the regressor (including the stock market for which the 20th percentile over the 1996:10–2008 sample is -4.4 percent and using the negative of the values for initial jobless claims and the unemployment rate, for which bad news corresponds to high values). This approach also results in the stock market put, the Philadelphia Fed Business Outlook and the CFNAI having the highest incremental R^2, at 0.174, 0.182, and 0.177 respectively, with none of the other macro variables reaching incremental R^2 above 0.12.

Overall, the explanatory power of the stock market put for target changes is large relative to that of macroeconomic indicators, with only the Philadephia Fed Business Outlook (or the non-real time CFNAI index) reaching similar levels of incremental R^2 values.

III. Establishing causality by textual analysis: Does the stock market *cause* Fed policy or is the relation coincidental?

There are two possible interpretations of the above evidence regarding the high explanatory power of the stock market for the Fed funds target changes. One possibility is that the relation is *causal* in that the stock market drives or predicts economic variables the Fed cares about, thus causing the Fed to rationally pay attention to the stock market. Alternatively, the relation between the target and the stock market may be *coincidental*. The stock market may be correlated with variables that drive or predict Fed's decision making. In the latter case, the Fed may not actually pay attention to the stock market, and yet an econometrician will find that the stock market has explanatory power for target changes.

A necessary condition for the explanatory power of the stock market for the target to be causal is that the Fed pays significant attention to the stock market. Thus, we perform extensive textual analysis of FOMC meeting minutes and transcripts to document: (a) the frequency of stock market mentions in these documents, (b) the direction of how the stock market is discussed (going up or down), (c) whether the direction of the stock market mentions moves with realized stock returns as one would expect (e.g., more negative mentions following stock market declines), and (d) whether the count of negative (down) stock market mentions in the FOMC documents predicts target changes, consistent with the Fed put being causal (i.e., low stock returns causing Fed policy accommodation). We document the results

of this analysis in the current section and then turn to using textual analysis to understand the mechanism behind these results in the next section.

III.A. Textual data

We collect texts of minutes and transcripts of FOMC meetings. The longest sample we consider is from 1976 through 2016. FOMC meetings are highly structured events which always include:

1. Staff Review of the Economic Situation
2. Staff Review of the Financial Situation
3. Staff Economic Outlook
4. Participants' Views on Current Conditions and the Economic Outlook
5. Committee Policy Action

FOMC minutes are carefully crafted with the goal to "record all decisions taken by the Committee with respect to these policy issues and explain the reasoning behind these decisions."[7] From 1993 through today, the minutes have followed a standardized format with sections corresponding to the five parts of the FOMC meetings.[8] We refer to sections 1–3 as representing the views of the staff, and sections 4 and 5 as concerning the views of the participants. Minutes also contain lists of who attended the meeting, authorizations for Fed's operations, and summaries of any discussions of special topics. We drop those parts for our analysis. The sections of the minutes corresponding to the above five parts of the FOMC meeting are typically 7–10 pages long. Since 2005 minutes have been published three weeks after the FOMC meeting. Before 2005 they were published three days after the next FOMC meeting. Minutes are available up to the end of our sample period in 2016. Before 1993, the type of material now included in the FOMC minutes was covered in two separate documents: Record of Policy Actions (ROPA) and the Minutes of Actions (MOA). We also collect these texts and treat them jointly as one unit of observation related to a given FOMC meeting.

[7] The quote is from https://www.federalreserve.gov/monetarypolicy/fomc_historical.htm.

[8] These sections headings appear explicitly in the minutes from April 2009 onward. However, given that the structure of the documents has remained essentially unchanged since the early 1990s, for the period between 1994 and March 2009, we manually assign text to sections.

FOMC transcripts contain verbatim comments made by individual staff members and meeting participants. They are released with a 5-year lag with transcripts available up to 2011. Each meeting transcript is around 200–300 pages long. Due to the length of the transcripts, we manually code the stock market mentions focusing on the FOMC minutes. We then develop an algorithm to find and classify such mentions in an automated way. We use this algorithm on the transcripts to show that our results are robust to studying the transcripts. We follow this approach both in signing the stock market mentions and in studying the context of a given stock market mention.

III.B. Counts of stock market mentions in the minutes and transcripts

Figure 3 displays simple counts of stock-market related phrases in the minutes (Panel A) and in the transcripts (Panel B) starting in 1976. The counts are based on the following phrases: stock market*, stock pri*, stock ind*, S&P 500 index, equities, equity and home price*, equity and house price*, equity ind*, equity market*, equity price*, equity value*, equity wealth, home and equity price*, house and equity price*, housing and equity price*, where * allows for different word endings. The main observation from the graph is that the stock market is rarely mentioned during the FOMC deliberations before mid-1990s, with the exception of a spike in October 1987. From the mid-1990s, the number of mentions increase, varies persistently over time and remains elevated through the end of the sample. Given the change in attention paid to the stock market in mid-1990s, our subsequent textual analysis focuses mainly on the post 1993 period. This is also the period for which our analysis of the funds target and of stock market returns in even-weeks in FOMC cycle time suggests that policy is affected by the stock market.

III.C. Results based on manual coding of stock market mentions in FOMC minutes

We extract all paragraphs in the 1994–2016 FOMC minutes that mention the stock market. The counts for each phrase are shown below:

Phrase	Count
stock market*	153
stock pri*	137
stock ind*	5
S&P 500 index	51
equities	22
equity and home price*	3
equity and house price*	6
equity and housing price*	2
equity ind*	58
equity market*	125
equity price*	385
equity value*	23
equity wealth	6
home and equity price*	4
house and equity price*	2
housing and equity price*	1
Total	**983**

Over the 1994–2016 period, there are 983 references to stock market conditions in FOMC minutes. This number represents 14% of times that minutes mention inflation, and 31% of times they mention (un)employment. Figure 4 Panel A reports the counts of stock-market phrases by section of the minutes. About half are in the section of the minutes covering the staff's summary of the financial situation, with the other more interesting half split between the staff and the FOMC decision makers ("participants" in Fed terminology).

We read the 983 paragraphs with stock market mentions and classify them based on the direction of the market's evolution: positive (discussion of the stock market going up), negative (discussion of the stock market going down), neutral (stock market flat), and hypothetical (discussion of would happen if the stock market were to move in a particular way). If the direction is unclear or cannot be determined, we mark the phrase as "n/a" and these stock market mentions are not counted in the 983 mentions described above.

Figure 4 Panel B (left bar chart) displays the positive, negative, neutral and hypothetical counts by staff and participants, respectively. Consistent with the stock market on average having increased over the 1994–2016 period, there are more positive than negative stock market mentions in both the sections summarizing participant comments and the sections summarizing staff presentations. Figure 5 graphs the time series of negative (Panel A) and positive (Panel B) stock market mentions. Peaks in the number of negative mentions often correspond to periods of market stress. The time series properties of positive stock market mentions in Panel B are less apparent.

To systematically relate stock market mentions to stock returns, Figure 6 Panel A and B plots negative and positive stock market mentions in a given FOMC minute document against intermeeting excess stock returns. In Panel C and D, we display the average number of mentions against average intermeeting excess stock returns, with averages calculated by intermeeting excess stock return quintiles. From Panel A and C, it is clear that lower intermeeting excess stock returns lead to more negative stock market mentions, especially in the lowest quintile of returns. Similarly, Panel B and D show that higher stock returns lead to more positive stock market mentions, although the pattern is more linear than for negative mentions.

To assess whether these relations are statistically significant, in Table III we regress stock market mentions on intermeeting excess stock returns. In columns 1 and 5, the explanatory variable is the intermeeting excess stock return and its two lags. In columns 2–4 and 6–8, we include separate variables for negative and positive intermeeting returns. The coefficients on $rx_m^- = \min(rx_m, 0)$ and $rx_m^+ = \max(rx_m, 0)$ (and their lags) capture, respectively, the impact of negative and positive intermeeting excess stock returns. From column 1, the intermeeting excess stock return and its lags have strong explanatory power for negative stock market mentions with an R^2 of 0.50. The explanatory power strengthens further when we consider the negative return realizations in columns 2–4. In column 2, the sum of the coefficients on the stock market put rx_m^- and its lags is -63.6. This implies that in the region of negative excess returns, a 10% lower excess stock return leads to 6.4 more negative stock market mentions, a substantial impact relative to the mean (1.8) and standard deviation (2.6) of the number of negative stock market mentions. Columns 3 and 4 indicate that the relation between low stock returns and a high number of negative stock market mentions is present both before and during the zero lower bound period. For positive stock market mentions, columns 6–8 also suggest a strong relation in both statistical and economic terms, with more positive stock returns leading to more positive stock market mentions as one would expect.

Table IV panel A presents results on whether counts of stock market mentions in the FOMC minutes predict target changes over the 1994–2008 period. This should be the case if the Fed's concern about the impact of the stock market on the economy is causing it to change the target. Consistent with the Fed put argument, negative stock market mentions in the minutes of the current and past FOMC meeting have statistically significant explanatory power for target changes. Both the current and lagged number of negative stock market mentions are significant as are the first two lags of the dependent variable. The estimates in column 1 imply that a one standard deviation increase in the number of negative stock market

mentions (2.6 more mentions) leads to a cumulative reduction in the Fed funds target of 32 bps (6 bps at the current meeting, 12 additional bps at the next meeting etc.). Importantly for arguing causality, negative stock market mentions predict target changes even if we focus only on mentions by FOMC participants (column 3) rather than staff (column 2). As we discuss in more detail below, some of the stock market mentions by the staff are purely descriptive summarizing recent financial developments. If all explanatory power of stock market mentions came from such staff mentions one would be concerned that the stock market was not causally affecting FOMC decision makers. This is not the case given the strong result in column 3. Accordingly, when we split the stock market mentions into those that are purely descriptive versus others (column 4 and 5), we find significant results even for those mentions that do not simply summarize recent developments (column 5).

III.D. Robustness: Results based on algorithmic coding of stock market mentions in FOMC minutes and transcripts

To assess whether the above results are robust to using FOMC transcripts we develop a computer algorithm to identify negative and positive stock market mentions in the transcripts. The algorithm looks for a set of 47 stock market related phrases. It then searches for a direction word (negative/positive) near the stock market phrase based on a list of 52 negative and 41 positive words. Negative words correspond to the market going down and positive words to it going up. The word lists are shown in Appendix Table IA-1. We train the algorithm on the minutes in order to identify and correctly classify as many of the 983 stock market mentions as possible. The algorithm captures 589 stock market mentions in the minutes without inducing a substantial number of misclassified phrases. A central parameter in the algorithm determines within how many words around the stock market phrase a direction word should occur (search is bounded within a sentence). The lower this distance is, the more accurately a given stock market mention is classified but the more likely it is that no positive or negative word is found. We use a distance of zero words, i.e., a match is found if a direction word directly precedes or follows a stock market phrase. This rule is applied after dropping stop words as well as certain descriptive phrases, and defining sentences as laid out in the Appendix. Such a setup allows us to err on the side of obtaining an accurate classification of stock market mentions rather than to capture a maximum number of phrases. We do not seek to code neutral or hypothetical phrases in the algorithmic approach. Figure 4 Panel B compares algorithm-based and manual searches

of the FOMC minutes in terms of the distribution of positive and negative stock market mentions, both for participants and the staff.

Turning to the FOMC transcripts, we find 2,680 stock market mentions over the 1994–2011 period, using the stock market search words listed in Section III.B. Of these, our algorithm picks up 1,197 mentions, i.e. 45% of the overall count, of which 618 are negative matches and 579 are positive matches.

For robustness, we replicate our earlier results obtained using manual searches by applying the algorithm to both minutes and transcripts. Appendix Figure IA-1 shows the relation between intermeeting returns and negative and positive stock market mentions in the minutes and transcripts, respectively. The results indicate that our algorithmic approach is able to capture the same key features of this relationship that we have established using the manual search approach. Appendix Table IA-3 shows that the predictability of negative and positive stock market mentions by intermeeting excess stock returns is robust to using the algorithmic approach. Likewise, Table IV Panel B predicts target changes using counts from the algorithmic approach and documents similar patterns as for the manual coding: While there is no relationship between positive stock market counts and target changes, negative stock market counts predict target reductions.

In summary, the Fed pays attention directly to the stock market rather than merely to variables correlated with the stock market. Our textual analysis has documented lots of discussion of the stock market at the FOMC meetings by both the staff and by the FOMC participants. Positive and negative stock market mentions move with intermeeting excess stock returns in the expected direction and the Fed put is present in the textual analysis results in that counts of negative stock market mentions predict target reductions. Taken together, these facts are consistent with the view that the stock market is a causal factor influencing Fed policy making.

III.E. Discussion of broader financial conditions

Our above analysis may understate the FOMC's concern with the stock market. The FOMC minutes often talk about "financial conditions" without explicitly mentioning the stock market. To assess the frequency of references to financial conditions that do not explicitly mention the stock market (and thus may not be accounted for above), we create a list of words that relate to financial conditions along with lists of positive and negative direction

words used to describe them. We then algorithmically code the number of negative and positive financial conditions phrases that do not explicitly mention the stock market. The word lists are shown in the Appendix Table IA-2.

We find 350 negative and 232 positive financial conditions mentions in the FOMC minutes. To the extent that the stock market is one of the indicators of financial conditions, this suggests even more attention paid to the stock market (and other financial markets) than our prior analysis would suggest. We graph the count of negative financial conditions phrases over time in Appendix Figure IA-2 with our series for manually coded negative stock market mentions included for comparison. Not surprisingly, the negative financial conditions series spikes during the financial crisis in 2008 and 2009. In Appendix Table IA-4 we show that counts of financial conditions mentions are predictable by the intermeeting stock returns in the same way as are the counts of stock market mentions (reported in Table III above). Additionally, in Appendix Table IA-5, we find that financial conditions predict Fed fund target changes (column 1–2). Including both financial conditions mentions and stock market mentions, financial conditional have predictive power over and above the stock market (column 3 and 5). However, this result is driven by year 2008. Dropping 2008 from the analysis, the stock market mentions subsume the explanatory power of financial conditions for target changes (columns 4 and 6).

To distinguish stock market mentions from specific other financial conditions, Figure 7 Panel A graphs textual analysis counts for mentions of interest rates, credit and spreads, and exchange rates, along with our series for stock market mentions. As recently described by the President of the NY Fed Dudley,[9] "financial conditions can be broadly summarized by five key measures: short- and long-term Treasury rates, credit spreads, the foreign exchange value of the dollar, and equity prices." To assess the relative importance of those different measures of financial conditions in Fed's deliberations, we analyze the number of times they are mentioned in FOMC minutes. The textual analysis counts in Figure 7 show that the focus on the stock market picks up in the mid-1990s whereas mentions of interest rates, credit and spreads, and exchange rates are prevalent going back to the start of our textual analysis in the late 1970s.[10]

[9] Dudley (2017), https://www.newyorkfed.org/newsevents/speeches/2017/dud170330

[10] Word lists for each of the concepts graphed are available on request.

IV. Establishing mechanism by textual analysis: Why does the stock market cause Fed policy?

To shed light on the Fed's economic reasoning about the stock market as a determinant of policy, we analyze the content of the 983 paragraphs in the FOMC minutes that contain stock market mentions. Our goal is to uncover whether the Fed thinks of the stock market as a *driver* of the economy or as a *predictor* of the economic outlook. If the first possibility dominates, we would like to understand the economic channels though which the Fed believes the stock market impacts the economy. We again take both a manual and an algorithmic approach.

IV.A. Results based on manual coding of discussion in paragraphs with stock market mentions

Our main results are based on reading the 983 paragraphs in the FOMC minutes with stock market mentions. We classify the discussion of the stock market into the eight categories, listed below. For each category, we include an example extracted from one of the paragraphs with a stock market mention.

Descriptive: "Broad U.S. equity price indexes were highly correlated with foreign equity indexes over the intermeeting period and posted net declines." (Staff Review of the Financial Situation, 9/17/2015)

The different ways in which the stock market *drives* the economy are as follows:

Consumption: "With regard to the outlook for key sectors of the economy, a number of members commented that consumer spending had held up reasonably well in recent months despite a variety of adverse developments including the negative wealth effects of stock market declines, widely publicized job cutbacks, heavy consumer debt loads, and previous overspending by many consumers." (Participants' Views on Current Conditions and the Economic Outlook, 5/15/2001)

Investment: "Many businesses also were inhibited in their investment activities by less accommodative financial conditions associated with weaker equity markets and tighter credit terms and conditions imposed by banking institutions. As a consequence, a substantial volume of planned investment was being postponed, if not cancelled." (Participants' Views on Current Cond. and the Economic Outlook, 3/20/2001)

Demand (no detail on which component of demand): "Financial market conditions continued to improve, providing support to aggregate demand and suggesting that market participants saw some reduction in downside risks to the outlook: Equity prices rose further, credit spreads declined somewhat, and the dollar depreciated over the

intermeeting period." (Participants' Views on Current Conditions and the Economic Outlook, 4/27/2016)

Financial conditions (stock market as part of financial conditions driving the economy): "Participants noted that financial conditions had worsened significantly over the intermeeting period. The failure or near failure of a number of major financial institutions had deepened market concerns about counterparty credit risk and liquidity risk. As a result, financial intermediaries had cut back on lending to some counterparties, particularly for terms beyond overnight, and in general were conserving liquidity and capital. Moreover, risk aversion of investors increased, driving credit spreads sharply higher. Survey results and anecdotal information also suggested that credit conditions had tightened significantly further for businesses and households. Equity prices had varied widely and were substantially lower, on net." (Participants' Views on Current Conditions and the Economic Outlook, 10/29/2008)

Stock market as driver of the economy, no mechanism stated: "In the discussion of monetary policy for the intermeeting period, most members believed that a further significant easing in policy was warranted at this meeting to address the considerable worsening of the economic outlook since December as well as increased downside risks. As had been the case in some previous cyclical episodes, a relatively low real federal funds rate now appeared appropriate for a time to counter the factors that were restraining economic growth, including the slide in housing activity and prices, the tightening of credit availability, and the drop in equity prices." (Participants' Views on Current Conditions and the Economic Outlook, 1/30/2008)

Economic outlook (stock market as predictor of the economy): "Participants noted that financial markets were volatile over the intermeeting period, as investors responded to news on the European fiscal situation and the negotiations regarding the debt ceiling in the United States. However, the broad declines in stock prices and interest rates over the intermeeting period were seen as mostly reflecting the incoming data pointing to a weaker outlook for growth both in the United States and globally as well as a reduced willingness of investors to bear risk in light of the greater uncertainty about the outlook." (Participants' Views on Current Conditions and the Economic Outlook, 8/9/2011)

Financial stability: "However, during the discussion, several participants commented on a few developments, including potential overvaluation in the market for CRE, the elevated level of equity values relative to expected earnings, and the incentives for investors to reach for yield in an environment of continued low interest rates."(Participants' Views on Current Conditions and the Economic Outlook, 7/27/2016)

Table V summarizes our findings on how the Fed thinks about the stock market based on the above classification. About half (551) of the 983 stock market mentions are descriptive in nature. Most of these mentions are in the Staff Review of the Financial Situation. Of the other 432 stock market mentions, the stock market is most frequently discussed in

the context of it affecting consumption, with 265 such cases (61% of the non-descriptive mentions). When more detail is provided, discussions of the stock market wealth effect—higher household wealth leading to increased consumption—is common. The word "wealth" appears 192 times. A second quite frequent theme is the impact of the stock market on investment, with 34 such cases. In many of these cases, the discussion refers to the effect of the stock market on firms' cost of capital or ability to raise equity financing on favorable terms. In 44 cases the discussion of the stock market is in the context of financial conditions more broadly. Other stock market mentions discuss the stock market's impact on demand without specifying which component of demand (15 cases) or discusses the stock market as a driver of the economy without specifying the mechanism (37 cases). We find only a small number of cases (13) where stock market is viewed simply as a predictor of the economy.

The substantial focus on consumption in paragraphs mentioning the stock market is consistent with recent comments by President Dudley of the New York Fed and President Fisher of the Dallas Fed:

"We care about financial conditions not for themselves, but instead for how they can affect economic activity and ultimately our ability to achieve the statutory objectives of the Federal Reserve – maximum employment and price stability. [...] A rise in equity prices can boost household wealth, which is one factor that underpins consumer spending." (William Dudley, speech, March 30, 2017)

"Basically, we had a tremendous rally and I think a great digestive period is likely to take place now and it may continue because, again, we front-loaded at the Federal Reserve an enormous rally in order to accomplish a wealth effect." (CNBC interview, January 5, 2016)[11]

IV.B. Robustness: Results based on algorithmic coding of economic content of paragraphs with stock market mentions

In addition to the manual coding of the mechanisms that describe Fed's thinking about the causal effect of the stock market on the economy (Table V), we also study algorithmically which economic phrases are most frequently discussed in conjunction with the stock market. We conduct the analysis at the level of the paragraph in FOMC minutes in which we have identified a stock market phrase with our manual searches ("stock-market paragraph" below). We first create a dictionary of economic phrases that appear in the stock-market paragraphs.

[11] Available at:
http://www.cnbc.com/2016/01/06/dont-blame-china-for-the-market-sell-off-commentary.html

Then, we count the number of times that each economic phrase is mentioned both within the stock-market paragraphs as well as within the full sections of the minutes that contained the stock-market paragraphs.

Table VI lists economic phrases that are most frequently discussed within the stock-market paragraphs, by section of the minutes, displaying only phrases that occur 20 times or more. The table provides the counts of each economic phrase in the stock-market paragraph (column 1), in the minutes' section (column 2), and their ratio (column 3). It also reports the odds ratio (column 4), i.e. the odds of finding a given economic phrase in the stock-market paragraph relative to the odds of finding it in the overall section.

As we tabulated above in Table V, the two sections containing the largest share of non-descriptive stock market mentions are Staff Review of Economic Situation and Participants' Views.[12] Focusing on these two sections, Table VI makes clear that the economic variables that are most frequently discussed together with the stock market are related to consumption. For example, the participants mention "consumer spending" 187 times within the stock-market paragraph, which corresponds to 43% of their total references to consumer spending. This implies that it is 3.22 times more likely that consumer spending will be mentioned in a stock-market paragraph within this section of the minutes than that it will be mentioned in this section in general.

Similarly, 50% or more of participants' mentions of "consumer confidence," "consumer expenditures" and "consumer sentiment" occur within the stock market paragraph. In Staff Review of Economic Situation, "disposable income," "consumer sentiment," and "personal consumption expenditure*" are most tightly linked to the stock market occurrences as measured by the ratios is column (3) and (4). Consistent with our manual coding of the mechanism, mentions of business investment are relatively less common, with participants referring to it only 16% of the time within the context of the stock market paragraph.

A firm belief in the importance of wealth effects on consumption from stock market declines would imply that the Fed should also focus on wealth effects from the housing market to consumption. Figure 7 Panel B shows textual analysis results for mentions of the housing market or mortgage markets in the FOMC minutes. The series for the housing market spikes as the financial crisis hits, while the mortgage series peaks later, likely because a lot of the

[12]Staff Economic Outlook section also contains a significant number of non-descriptive statements. However, given that in early years it is frequently comprised of just a single paragraph, the interpretation of co-occurrences of stock market and economic phrases is less tight than for the Staff Review of Economic Situation and Participants' Views, both of which contain multiple paragraphs focusing on distinct topics.

mortgage discussion is in the context of various rounds of quantitive easing. In the next version of the paper we will repeat the analysis from Table VI to study which economic concepts are discussed in the context of housing market mentions.

V. Does the Fed react too strongly to the stock market?

In this section, we use several benchmarks to assess whether the Fed may be reacting too strongly to the stock market. First, we estimate whether the Fed's growth and inflation expectations update more in response to the stock market than the expectations of private sector forecasters or than what the predictability of the stock market for realized growth and inflation would suggest. Second, we ask whether the federal funds target responds more to the stock market than can be explained by updates to Fed growth and inflation expectation. Third, we study consumer attention to the stock market in the Michigan Survey of Consumers to assess whether Fed and consumer attention to the stock market are highly correlated.

V.A. Comparing the sensitivity of Fed economic forecasts to the stock market with that of the private sector forecasts and of the realized data

Table VII documents how much Fed Greenbook (now called Tealbook) expectations update in response to the stock market. Greenbook data are available up to 2010. Regressions are estimated at the FOMC meeting frequency, resulting in 136 observations for the 1994–2010 period. Greenbooks report Fed expectations for various calendar quarters. We consider how expectations for a given calendar quarter are updated from one FOMC meeting to the next based on the intermeeting excess stock return. We present results for how much expectations regarding the next year are updated, calculated by summing the updates made in the current Greenbook for quarters zero through three quarters forward. Since Greenbook unemployment rate expectations are for the level of the unemployment rate (as opposed to a growth rate as for GDP and prices), we study how expectations for unemployment in the third quarter forward update in response to stock market news. We allow for one lag of the stock return variable to account for gradual expectations updating (additional lags are generally not significant). The top part of Table VII documents that Fed growth and unemployment expectations update asymmetrically to stock returns, reacting significantly to the current and lagged intermeeting excess stock returns over the range of negative returns, with a smaller and in most cases insignificant reaction to positive return realizations. The sum of the coefficients on the current and lagged intermeeting excess stock returns are reported at

the bottom. For real GDP growth in column 1, a 10 percent lower intermeeting excess stock return implies a reduction of the total expected growth rate over the next four quarters of 0.97 percentage point. Before 1994, going back to September 1982 for comparison with Table I, there is only a weak relationship between the stock market and updates to Fed growth expectations (column 2). In particular, there is little downgrading of growth expectations following poor stock returns. Table VII column 3-4 shows the same analysis for changes in Fed expectations about the unemployment rate. Based on the sum of the coefficients of the Fed put variables, a 10 percent lower intermeeting excess stock return implies an increase of 0.47 percentage point in the expected unemployment rate over the one-year period from last quarter to three quarters out. In the positive region, the excess stock return has little explanatory power for Fed unemployment updates and none of the stock market variables are significant in the pre-1994 period. The bottom part of Table VII refers to updating of Fed inflation expectations. The impact of the stock market on these appears sensitive to the measure of inflation used. Overall, estimates in Table VII thus suggests that there is a robust and quite large impact of negative stock market returns on Fed expectations for real output growth and the unemployment rate, with no clear pattern for inflation.

Table VIII Panel A presents analogous results for how much private sector expectations from the Survey of Professional Forecasters (SPF) for the same three dependent variables update in response to stock market news. The SPF conducts four surveys per year, resulting in 92 observations over the 1994-2016 period. The deadline for respondents supplying their expectations to the survey are only available from the third survey of 1990 so we do not present pre-1994 results. We calculate cumulative inter-survey excess stock returns over the period from the date of the prior survey deadline to the day before the deadline for the current survey. As in earlier analysis we omit returns on day -1 and 0 relative to scheduled FOMC meetings as well as days with intermeeting target changes as defined earlier. The explanatory power of the stock market for private sector expectations of both real output growth and the unemployment rate is again apparent over the range of negative excess stock returns. Based on column 1, summing the coefficients of 4.56 and 4.26 on the current and lagged inter-survey excess stock returns, a 10 percent lower inter-survey excess stock return implies a reduction of the total expected growth rate over the next four quarters of 0.88 percentage point, similar to the 0.97 percentage point found for Fed Greenbook expectations for real GDP growth. The impact of the stock market on private sector unemployment rate expectations in column 2 is also similar to that seen for Fed expectations, with a 0.54 percentage point increase in SPF unemployment expectations following a 10 percent lower

excess stock return. Furthermore, similar to the Fed expectations, the SPF data show no clear relation between the stock market and updates to inflation expectations.

Table VIII Panel B presents result for private sector expectations from the Blue Chip Economic Indicators (BCEI). This survey is available monthly back to 1980. Survey results are released the 10th of each month, with the survey conducted during the preceding 1-week period. We do not know the exact deadline for responses but assume that respondents set their expectations based on data up to the first business day of the month. In analogy to the SPF, we compare expectations from a given survey to expectations three months earlier and define the excess stock return since the last survey accordingly. We then report results based on all BCEI data, i.e. both those using months 1, 4, 7, 10, months 2, 5, 8, 11 and months 3, 6, 9, 12, with standard errors allowing for autocorrelation up to order 2. Column 1 and 2 show that BCEI expectations for both real GDP growth and the unemployment rate update significantly in response to stock returns over the range of negative stock returns (with some significance for positive stock returns too). BCEI expectations update a bit less strongly to negative stock returns than the expectations of the Fed or the SPF in economic terms but differences are modest. Unlike the Fed's expectations, column 3 and 4 show that BCEI expectations were sensitive to negative stock returns even in the 1982:9-1993 period though less strongly so than in the later period.

In Table IX, we document the strength of the relationship between excess stock returns and realized macro variables. Quarterly NIPA data on real GDP growth and the GDP deflator are available from 1947 to 2016 as are data on the unemployment rate from the BLS. We show results both for the 1994–2016 period, the pre-1994 period and the full 1947–2016 period. We regress the realized sum of growth rates, unemployment rate changes, or inflation rates over a four-quarter period (the current and the subsequent three quarters) on quarterly excess stock returns for the current quarter. We do not include lags here since the lags in Table VII and VIII were motivated by gradual expectations updating and the current table is for realized values as opposed to expectations.

For real GDP growth, the coefficient on the stock market put of 9.74 for the 1994–2016 period translates to a 0.97 percentage point lower growth rate for a 10 percent drop in the stock market, the same effect (within rounding error) as for Fed growth expectations in Table VII. For the unemployment rate changes, the coefficient of -6.23 post-1994 implies a 0.62 percentage point change in response to a 10 percent drop in the stock market, slightly larger than the 0.47 to percentage point for the Fed. The relation between excess stock returns

and realized GDP growth or unemployment rate changes is asymmetric being stronger over the range of negative excess return values. The main difference between the results for the realized variables and for Fed expectations is that the realized data show similar relations to the stock market pre- and post-1994. Realized inflation for the GDP deflator is only weakly related to the stock market, consistent with the mixed results for inflation expectations for the Fed (across inflation measures) and across private sector surveys where only BCEI inflation expectations are significantly related to stock returns.

Overall, relative to either private sector expectations or realized macroeconomic variables there is little evidence that Fed expectations for growth or unemployment overreact to stock market news.

V.B. Estimating whether the stock market impacts target changes even controlling for Fed economic forecasts

Our second approach to evaluate whether the Fed reacts too strongly to the stock market is to use the benchmark of Bernanke and Gertler (1999, 2001) who argue that the Fed should not respond to the stock market beyond the effect of the stock market on Fed expectations for the real economy and inflation.

In Table X, we estimate Taylor rules augmented with stock market variables using data for the 1994–2008 period. All columns regress the change in the Fed funds target (from meeting $m-1$ to m) on its two lags plus a set of additional variables. In column 1, the additional variables are the stock market put and its lag, in column 2 it is Greenbook variables and in column 3 is it both stock market put and Greenbook variables.[13] Comparing column 1 and 3, the coefficient on the stock market put drops from 1.93 to 0.82 and the coefficient on the lagged stock market put drops from 2.73 to 1.26. In column 4, we allow for an asymmetric response of the target to positive and negative updates to the Fed's growth expectations over the next four quarters. The stock market coefficients drops further and are statistically insignificant. Columns 5 to 8 shows that results are similar when estimating the Taylor rules using the level of the Federal funds target rather than the first difference.

[13]We determine the horizon of Greenbook forecasts using the AIC criteria, resulting in the inclusion of the expectations for current quarter real GDP growth, next quarter inflation (in the GDP deflator) and next quarter's unemployment rate, along with the expectations update for real GDP summed over the current and subsequent three quarters.

Using the coefficients on the two lags of the Fed funds target change and the coefficient on the stock market put variable and the lagged stock market put variable, a 10% drop in the stock market (over the negative range) leads to a cumulative drop in the target over the next year of 102 bps in column 1 and (a statistically insignificant) 21 bps in column 4. About 80% of the explanatory power of the stock market put for target changes thus work via Fed expectations for growth, unemployment and inflation (especially the growth expectations update).

There is thus little evidence to suggest that the Fed reacts to the stock market by more than a Taylor rule would suggest. There is an active debate on whether the Fed should respond to the stock market beyond its effects on expectations for output gap and inflation. Gilchrist and Leahy (2002) extend the model evidence of Bernanke and Gertler to study the optimal response of monetary policy to asset prices in a setting with two types of shocks: technology shocks that are phased in gradually over time and net worth shocks. For the technology shocks, they confirm the result that the Fed should react to asset prices only to the extent that they affect expected inflation (thereby affecting the real rate). However, in the scenario with net worth shocks, such policy fails to stabilize the economy. Cecchetti et al. (2000) argue that central banks can improve macroeconomic performance by responding to asset prices. The reason is the at asset price bubbles create distortions in investment and consumption, leading to extreme rises and then falls in both output and consumption. Related, Peek et al. (2016) argue that any residual predictive power of the stock market could be optimal if the Fed is concerned with the fiscal costs of financial instability. Alternatively, the Fed may view the equilibrium real rate (the natural Federal funds rate) as being dependent on the stock market, as argued by Taylor (2008), Meyer and Sack (2008), and Curdia and Woodford (2010).

V.C. Do consumers pay attention to stock market news?

Our third benchmark for assessing whether the Fed reacts appropriately to the stock market is less quantitative. We assess whether households – like the Fed – express concern about the stock market after it declines and estimate the correlation between our textual analysis measure of Fed stock market mentions and a measure of housing concern about the stock market constructed from the Michigan Survey of Consumers (MSC). This third benchmark also does not provide evidence that the Fed is over-emphasizing the stock market it decision making.

The survey elicits responses about important economic news that affected participants' recent economic decisions by asking: "During the last few months, have you heard of any favorable or unfavorable changes in business conditions? What did you hear?" Respondents indicate (un)favorable news in the following categories: government, employment, elections, consumer demand, prices, stock market, trade deficit, energy. We measure the relative attention of consumers to negative stock market news as the number of respondents mentioning unfavorable stock market news in survey conducted in month t relative to the number of respondents mentioning any news in that survey:

$$\text{MSC negative stocks news ratio}_t = \frac{\#\text{respondents citing unfavorable stock market news}_t}{\#\text{respondents citing any news}_t},$$

and analogously for positive stock market news.[14] Figure 8 superimposes the frequency of negative stock market mentions in the FOMC minutes with the negative stocks news ratio in the MSC. The figure shows that the two series are highly positively correlated with a correlation of 0.68. The correlation between the positive stock market mentions in the minutes and the positive stocks news ratio in the MSC is 0.44 (not plotted). In terms of magnitudes, over the 1994–2016 period, a one standard deviation increase in the MSC negative stocks news ratio is associated with 1.75 more negative stock market mentions in FOMC minutes in the same month (with a robust t-statistic of 8.65). The relationship is weaker on the positive side, with one standard deviation increase in the MSC positive news ratio corresponding to 0.93 more positive stock market mentions in the FOMC minutes (with a robust t-statistic of 7.04).

VI. Conclusion

From the mid-1990s, negative intermeeting stock market returns are a stronger predictor of subsequent target changes than almost all commonly followed macroeconomic variables. We study the economic underpinnings of this "Fed put," i.e., the tendency of negative stock market returns to preceed monetary policy accommodation by the Federal Reserve.

We argue in favor of a causal (rather than coincidental) interpretation of this result. Using textual analysis of FOMC minutes and transcripts, we document that the Fed pays significant

[14] Over the 1994–2016 sample, 60% of responses cited at least one piece of economic news. The stock market constituted 8% of all news mentions and was the third most commonly referenced news category, preceded by news about the employment situation (20% of mentions) and declines/improvements in specific industries (16% of mentions). For comparison, news about inflation represented 6.2% of all news mentions.

attention to stock market developments. Intermeeting stock market returns predict the tone of the Fed's discussions about the stock market during subsequent FOMC meetings with the expected sign. The Fed's concern about the stock market increases disproportionately following negative stock market realizations during the intermeeting period. Accordingly, a negative tone of the stock market mentions during FOMC meetings (i.e., the Fed discussing negative stock market developments) predicts significant cuts to the Fed funds target rate; no analogous relationship exists for positive stock market mentions.

We use textual analysis to establish whether the Fed thinks about the stock market as merely a predictor of future economic outcomes or as a driver of the economy. We find overwhelming evidence in favor of the latter. Discussions of stock market conditions by the FOMC attendees are most frequently cast in the context of consumption, with the consumption-wealth effect highlighted as one of the main channels through which the stock market affects the economy. Some attention is also paid to the stock market working through investment and, relatedly, through the cost of capital.

We show that the Fed updates its macroeconomic expectations (about growth and unemployment) in a way that is highly sensitive to stock market outcomes during the intermeeting period. This relationship is pervasive starting from the mid-1990s, but is largely absent before that. To understand whether the Fed's reaction to the stock market is appropriate or excessive, we benchmark it to the stock market sensitivity of private sector macro forecasts and to the predictive power of the stock market for realized macro variables. Relative to both of these benchmarks, we find little evidence for the Fed overreacting to the stock market. We also ask whether the Federal funds target responds more to the stock market than what would be warranted by the updates to the Fed's macroeconomic expectations. Using a Taylor rule, we find that updates of Fed growth expectations subsume about 80% the stock market effect on the target. The stock market thus primarily affects Fed policy via its effects on growth and inflation expectations.

Table I. Stock returns and target changes

Panel B regresses FFR target changes on a dummy for intermeeting excess return being in quintile 1 (lowest), and on the stock return put $rx_m^- = \min(0, rx_m)$. Excess return quintiles are defined over the full 1994–2016 period in the 1994–2008 regressions and over the 1982:9–1993 period in the regressions for that period. T-statistics are robust to heteroscedasticity and autocorrelation up to order X. In all panels *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

Panel A. The Fed put in target changes: Multi-period target changes following low excess stock returns

	Dependent variable: (FFR target on day 0 of cycle $m+X$)−(FFR target on day 0 of cycle $m-1$)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sample: 1994-2008							
	$X=0$	$X=1$	$X=4$	$X=7$	$X=0$	$X=1$	$X=4$	$X=7$
Dummy (rx_m in qtile 1)	-0.15	-0.42***	-0.93***	-1.20***				
	(-1.65)	(-2.87)	(-3.79)	(-3.06)				
rx_m^-					3.15***	7.13***	10.3***	12.7***
					(4.11)	(6.32)	(3.54)	(3.05)
rx_m^+					-1.91*	-2.30	1.58	2.08
					(-1.75)	(-1.35)	(0.40)	(0.33)
Constant	0.011	0.049	0.069	0.011	0.075**	0.13*	0.026	-0.058
	(0.41)	(0.87)	(0.36)	(0.03)	(2.00)	(1.77)	(0.10)	(-0.12)
N	120	120	120	120	120	120	120	120
R^2	0.039	0.10	0.11	0.093	0.13	0.22	0.13	0.096
	Sample: 1982:9-1993							
	$X=0$	$X=1$	$X=4$	$X=7$	$X=0$	$X=1$	$X=4$	$X=7$
Dummy (rx_m in qtile 1)	0.11	0.14	0.24	0.14				
	(0.90)	(0.88)	(0.80)	(0.37)				
rx_m^-					0.25	0.0047	0.25	-3.35
					(0.17)	(0.00)	(0.09)	(-0.75)
rx_m^+					-0.23	0.58	-1.77	1.55
					(-0.17)	(0.22)	(-0.40)	(0.26)
Constant	-0.093**	-0.17*	-0.34	-0.46	-0.064	-0.15	-0.25	-0.51
	(-2.16)	(-1.71)	(-1.27)	(-1.06)	(-1.01)	(-1.21)	(-0.84)	(-1.05)
N	90	90	90	90	90	90	90	90
R^2	0.013	0.0075	0.0062	0.0011	0.00043	0.00063	0.0016	0.0034

Table I. Stock returns and target changes (continued)

Panel B reports regressions of FFR target changes between meeting $m-1$ and m on quintiles of the intermeeting excess stock return (column 2) and on the stock return put rx_m^- (column 3). HAC t-statistics are in parentheses. Quintiles of intermeeting returns are defined over the 1994-2016 sample. In column (2), we lose one observation due to the inclusion of the lagged return quintile dummy. The sample period is 1994–2008.

Panel B. The Fed put in target changes, one-period changes

	(1)	(2)	(3)	(4)
	Dependent variable: $\Delta\text{FFR}_m = \text{FFR}_m - \text{FFR}_{m-1}$			
L.ΔFFR$_m$	0.41***	0.36***	0.25***	0.25**
	(3.76)	(3.85)	(2.91)	(2.51)
L2.ΔFFR$_m$	0.30**	0.29**	0.32***	0.32***
	(2.13)	(2.13)	(2.85)	(2.76)
Dummy (rx_m in qtile 1)		-0.025		
		(-0.29)		
L.Dummy (rx_m in qtile 1)		-0.21***		
		(-2.68)		
rx_m^-			1.93**	2.26**
			(2.08)	(2.26)
L.rx_m^-			2.73***	2.80***
			(4.53)	(4.39)
rx_m^+				-1.20
				(-1.08)
L.rx_m^+				-0.29
				(-0.31)
Constant	-0.015	0.036*	0.074***	0.11**
	(-0.65)	(1.89)	(3.12)	(2.00)
N	120	119	120	120
R^2	0.35	0.43	0.51	0.52
$\bar{R}^2$	0.33	0.41	0.50	0.49

Table II. Ability of the stock market put and macroeconomic indicators to predict FFR target changes

The table reports estimates of regressions (1) and (2). The incremental R^2 is the difference between the R^2 from regression (1) and (2). The p-values are for the F-test of the null hypothesis H_0: $\delta_1 = \delta_2 = 0$. The sample period is 1996:10–2008:12.

Indicator	Bloomberg ticker	Incremental R^2	p-value
Stock market put, rx^-		0.180	<0.0001
Philadelphia Fed Business Outlook Survey	OUTFGAF Index	0.159	<0.0001
ISM Manufacturing	NAPMPMI Index	0.110	0.0001
ISM Non-Manufacturing	NAPMNMI Index	0.096	0.0005
Housing Starts	NHSPSTOT Index	0.091	0.001
Industrial Production	IP CHNG Index	0.087	0.001
Consumer Confidence	CONCCONF Index	0.075	0.003
Change in Manufact. Payrolls	USMMMNCH Index	0.061	0.010
Import Price Index (MoM)	IMP1CHNG Index	0.060	0.010
New Home Sales	NHSLTOT Index	0.054	0.016
Change in Nonfarm Payrolls	NFP TCH Index	0.053	0.018
Chicago Purchasing Manager	CHPMINDX Index	0.052	0.019
U. of Michigan Confidence	CONSSENT Index	0.050	0.023
Capacity Utilization	CPTICHNG Index	0.049	0.024
Consumer Price Index NSA	CPURNSA Index	0.049	0.025
Leading Indicators	LEI CHNG Index	0.047	0.030
Avg Hourly Earning MOM Prod	USHETOT% Index	0.045	0.034
Producer Price Index (MoM)	PPI CHNG Index	0.041	0.047
Avg Weekly Hours Production	USWHTOT Index	0.032	0.088
Unemployment Rate	USURTOT Index	0.031	0.099
Domestic Vehicle Sales	SAARDTOT Index	0.027	0.115
GDP QoQ (Annualized)	GDP CQOQ Index	0.027	0.130
Initial Jobless Claims	INJCJC Index	0.027	0.137
Consumer Price Index (MoM)	CPI CHNG Index	0.022	0.195
Personal Income	PITLCHNG Index	0.020	0.229
Business Inventories	MTIBCHNG Index	0.015	0.331
CPI Ex Food & Energy (MoM)	CPUPXCHG Index	0.014	0.345
Personal Spending	PCE CRCH Index	0.012	0.398
Current Account Balance	USCABAL Index	0.012	0.417
Factory Orders	TMNOCHNG Index	0.008	0.560
Nonfarm Productivity	PRODNFR% Index	0.007	0.600
Employment Cost Index	ECI SA% Index	0.006	0.660
Trade Balance	USTBTOT Index	0.005	0.675
Consumer Credit	CICRTOT Index	0.005	0.697
Unit Labor Costs	COSTNFR% Index	0.005	0.694
Monthly Budget Statement	FDDSSD Index	0.005	0.719
Durable Goods Orders	DGNOCHNG Index	0.004	0.752
Wholesale Inventories	MWINCHNG Index	0.002	0.850
Chicago Fed National Activity Index (CFNAI)		0.129	<0.0001

Table III. Predicting negative and positive stock market phrases in the FOMC minutes by intermeeting stock market excess returns (manual coding)

The table presents regressions of counts of positive and negative stock market phrases on intermeeting stock market returns. The regressions are estimated at the frequency of FOMC meetings, i.e. counts of the m-th meeting are regressed on the latest intermeeting stock market excess return, rx_m. rx_m is the excess return realized between one day after the previous FOMC meeting ($m-1$-st meeting) to two days before the current meeting (m-th meeting); thus rx_m excludes returns realized from day -2 and $+1$ around FOMC meetings. rx^-_{m-1} denotes the negative portion of the intermeeting return, $rx^-_m = \min(rx_m, 0)$, and rx^+_m denotes the positive portion of the intermeeting return, $rx^-_m = \max(rx_m, 0)$. The results are based on manual coding of the positive and negative stock market phrases.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Negative stock market phrases				Positive stock market phrases			
Sample:	1994-2016	1994-2016	1994-2008	2009-2016	1994-2016	1994-2016	1994-2008	2009-2016
rx_m	-30.0***				22.6***			
	(-6.15)				(5.88)			
L.rx_m	-12.2***				7.61***			
	(-5.59)				(2.92)			
L2.rx_m	-5.89**				1.80			
	(-2.39)				(0.75)			
rx^-_m		-38.5***	-32.3**	-72.1***		8.01**	5.35**	26.7***
		(-2.92)	(-2.40)	(-4.55)		(2.26)	(2.07)	(3.32)
L.rx^-_m		-19.0***	-21.5***	-1.18		-1.24	-1.42	-0.045
		(-7.06)	(-7.15)	(-0.20)		(-0.58)	(-0.80)	(-0.01)
L2.rx^-_m		-6.10	-12.5	2.16		2.65	3.16	0.71
		(-1.48)	(-1.63)	(0.46)		(0.83)	(0.76)	(0.22)
rx^+_m		-18.2***	-22.2***	-10.5**		43.2***	30.9***	46.1***
		(-2.62)	(-2.65)	(-2.20)		(8.13)	(6.80)	(4.92)
L.rx^+_m		1.08	-0.96	-4.96		26.5***	21.1***	23.6***
		(0.22)	(-0.17)	(-0.76)		(4.55)	(2.80)	(2.91)
L2.rx^+_m		0.39	-2.89	-4.82		9.57***	7.95**	3.96
		(0.08)	(-0.46)	(-0.74)		(2.76)	(2.00)	(0.64)
Constant	1.98***	1.03**	0.85	1.68***	2.08***	0.66**	0.60**	1.73***
	(11.75)	(2.32)	(1.58)	(4.54)	(12.78)	(2.22)	(2.40)	(4.07)
$\sum$coef rx	-48.2***				32.0***			
$\sum$coef rx^-		-63.6***	-66.2***	-71.1***		9.42	7.09	27.3***
$\sum$coef rx^+		-16.7	-26.0*	-20.2*		79.2***	60.0***	73.7***
N	184	184	120	64	184	184	120	64
R^2	0.50	0.52	0.57	0.65	0.38	0.49	0.44	0.56
$\bar{R}^2$	0.49	0.51	0.55	0.61	0.37	0.47	0.41	0.52

Table IV. Predicting target changes with positive and negative stock market phrases

The table presents regressions of FFR target changes between meetings $m-1$ and m, ΔFFR_m, on counts of positive and negative stock-market phrases appearing in FOMC documents of meeting m and $m-1$. The sample period is 1994–2008. One observation is lost due the use of lagged stock-market counts in minutes documents, which are available from 1994. Regression control for the number of sentences in the minutes of the m-th meeting $\#\text{Doc.length}_m$ (lags of this variable are not significant). All counts used as explanatory variables are standardized to have unit standard deviation.

Panel A. Minutes, manual coding

	(1) All	(2) Staff	(3) Partic.	(4) Desc.	(5) Nondesc.
L.ΔFFR_m	0.19**	0.26***	0.22***	0.30***	0.20***
	(2.51)	(3.32)	(3.32)	(3.47)	(2.98)
L2.ΔFFR_m	0.26*	0.28*	0.23	0.31**	0.23
	(1.72)	(1.79)	(1.40)	(2.03)	(1.43)
$\#\text{Stocks}_m^-$	-0.073***	-0.072**	-0.050***	-0.083***	-0.061***
	(-2.71)	(-2.02)	(-3.01)	(-2.79)	(-2.64)
L.$\#\text{Stocks}_m^-$	-0.10***	-0.13***	-0.072***	-0.098***	-0.078***
	(-3.25)	(-3.29)	(-3.34)	(-3.15)	(-2.80)
$\#\text{Stocks}_m^+$	-0.047**	-0.060*	0.0029	-0.068***	0.00098
	(-2.30)	(-1.83)	(0.19)	(-2.68)	(0.06)
L.$\#\text{Stocks}_m^+$	0.0037	-0.0023	0.0074	0.030	-0.0080
	(0.13)	(-0.07)	(0.37)	(1.14)	(-0.31)
$\#\text{Doc.length}_m$	-0.11***	-0.095***	-0.12**	-0.083***	-0.11**
	(-2.86)	(-2.81)	(-2.48)	(-2.63)	(-2.49)
Constant	-0.11***	-0.14***	-0.076*	-0.12***	-0.077**
	(-3.28)	(-4.33)	(-1.77)	(-4.26)	(-2.01)
N	119	119	119	119	119
R^2	0.52	0.50	0.48	0.51	0.49

Panel B. Minutes and transcripts, algorithm-based coding

	(1)	(2)	(3)	(4)	(5)	(6)
	Minutes			Transcripts		
	All	Staff	Partic.	All	Staff	Partic.
L.ΔFFR_m	0.16**	0.27***	0.15**	0.16**	0.29***	0.20***
	(2.38)	(4.39)	(2.13)	(2.06)	(3.07)	(2.63)
L2.ΔFFR_m	0.21	0.24	0.21	0.23	0.28*	0.20
	(1.34)	(1.51)	(1.36)	(1.58)	(1.78)	(1.21)
$\#\text{Stocks}_m^-$	-0.063**	-0.056	-0.061***	-0.049*	-0.093**	-0.030**
	(-1.97)	(-1.44)	(-2.86)	(-1.89)	(-2.51)	(-2.41)
L.$\#\text{Stocks}_m^-$	-0.090**	-0.071	-0.083***	-0.092***	-0.016	-0.095***
	(-2.54)	(-1.40)	(-3.80)	(-3.80)	(-0.96)	(-4.37)
$\#\text{Stocks}_m^+$	-0.039	-0.048	0.00060	-0.012	0.013	-0.019
	(-1.39)	(-1.47)	(0.04)	(-0.87)	(0.71)	(-1.37)
L.$\#\text{Stocks}_m^+$	0.0076	0.015	0.0020	-0.0043	0.013	-0.016
	(0.40)	(0.56)	(0.17)	(-0.27)	(0.44)	(-1.34)
$\#\text{Doc.length}_m$	-0.11***	-0.096**	-0.12**	-0.14***	-0.096**	-0.14***
	(-2.59)	(-2.40)	(-2.42)	(-3.33)	(-2.16)	(-2.99)
Constant	-0.093***	-0.100***	-0.076*	-0.058	-0.064**	-0.053
	(-2.60)	(-3.17)	(-1.75)	(-1.56)	(-2.29)	(-1.23)
N	119	119	119	119	119	119
R^2	0.53	0.47	0.52	0.55	0.50	0.54

Table V. Economic content of stock market mentions in FOMC minutes

The table describes the economic content of the stock market related mentions in FOMC minutes. Stock market mentions that are not purely descriptive are assigned into categories for the mechanism through which the stock market affects the economy. We report the number of stock market mentions by category and FOMC minutes sections. The sample period is 1994–2016.

	Staff Review of Economic Situation	Staff Review of Financial Situation	Staff Economic Outlook	Particip. Views	Committee Policy Action	Other	**Total**
Descriptive	4	491	10	11	1	34	**551**
Consumption	72	0	43	150	0	0	**265**
Investment	2	2	1	29	0	0	**34**
Financial conditions	0	0	0	40	4	0	**44**
Causal, no mechanism	3	3	11	12	6	2	**37**
Demand	0	1	5	9	0	0	**15**
Economic outlook	0	1	0	12	0	0	**13**
Financial stability	0	2	0	5	0	0	**7**
Other	0	3	0	4	1	9	**17**
Total	**81**	**503**	**70**	**272**	**12**	**45**	**983**

Table VI. Algorithmic coding of economic content of stock-market mentions in FOMC minutes

The table shows counts of phrases related to economic conditions that occur within the same paragraph (# in par.) and within the same section (# in sec.) in which a stock market phrase is mentioned. Stock market phrases and paragraphs are obtained by manual searches within FOMC minutes over the 1994–2016 sample period. The odds ratio is defined as (# phrase i in paragraph mentioning stocks / # all phrases in paragraph mentioning stocks) / (# phrase i in section / # all phrases in section). We display only phrases that occur 20 times or more in the same paragraph as a stock market phrase.

Phrase	(1) # in par.	(2) # in sec.	(3) Ratio (1)/(2)	(4) Odds ratio
Staff Review of Economic Situation				
disposable income	39	69	0.57	6.82
consumer sentiment	50	111	0.45	5.44
personal consumption expenditure*	34	112	0.30	3.66
retail sales	34	141	0.24	2.91
pce	44	206	0.21	2.58
consumer spending	50	235	0.21	2.57
motor vehicle*	70	591	0.12	1.43
Staff Review of Financial Situation				
un(employment)	30	56	0.54	1.81
oil prices	20	43	0.47	1.57
economic activity	32	70	0.46	1.55
economic outlook	22	60	0.37	1.24
inflation	114	495	0.23	0.78
economic growth	29	129	0.22	0.76
Staff Economic Outlook				
wealth effect*	21	22	0.95	3.76
final demand	24	27	0.89	3.50
exports	31	67	0.46	1.82
labor market*	21	53	0.40	1.56
business investment	26	69	0.38	1.49
potential output	28	78	0.36	1.42
economic activity	62	178	0.35	1.37
consumer spending	24	85	0.28	1.11
real gdp	66	291	0.23	0.89
gdp growth	32	167	0.19	0.76
un(employment)	32	180	0.18	0.70
inflation	71	547	0.13	0.51
Participants' Views				
wealth effect*	23	30	0.77	5.68
consumer expenditures	32	58	0.55	4.09
consumer confidence	63	126	0.50	3.70
consumer sentiment	31	62	0.50	3.70
retail sales	39	82	0.48	3.52
consumer spending	187	430	0.43	3.22
motor vehicle*	47	114	0.41	3.05
consumption	22	63	0.35	2.59
house prices	20	83	0.24	1.79
economic expansion	26	129	0.20	1.49
household* spending	20	100	0.20	1.48
housing activity	20	106	0.19	1.40
aggregate demand	22	121	0.18	1.35
business investment	38	243	0.16	1.16
productivity	54	356	0.15	1.12
economic activity	62	505	0.12	0.91
energy prices	28	276	0.10	0.75
economic growth	33	372	0.09	0.66
exports	22	256	0.09	0.64
economic outlook	29	365	0.08	0.59
labor market*	51	674	0.08	0.56
un(employment)	73	993	0.07	0.54
inflation	128	2404	0.05	0.39

Table VII. Impact of stock market on Federal Reserve growth, unemployment and inflation expectations (Greenbook forecasts)

The table reports regressions of updates to Greenbook expectations of macroeconomic variables on intermeeting stock market returns. Updates are relative to expectations in prior Greenbook for same calendar quarter, i.e., for a variable Z an update is defined as $E_m^{GB}(Z_{qi}) - E_{m-1}^{GB}(Z_{qi})$, where qi is a particular calendar quarter (q0 is the current quarter, q1 is the next quarter relative to meeting m, etc.); $E_m^{GB}(\cdot)$ denotes a Greenbook forecast at meeting m. Core CPI expectations data start in 1986. All specifications include one lag of the dependent variable and a constant (not reported). Intermeeting returns are in decimals.

	Real GDP growth forecast update		Unemployment rate forecast update	
	(1)	(2)	(3)	(4)
	1994–2010	1982:9-1993	1994–2010	1982:9-1993
	q0+q1+q2+q3	q0+q1+q2+q3	q0+q1+q2+q3	q0+q1+q2+q3
rx_m^-	5.08***	2.28	-2.79***	-0.80
	(2.78)	(1.41)	(-4.96)	(-0.89)
L.rx_m^-	4.67***	-0.89	-1.92***	-0.43
	(3.69)	(-0.48)	(-2.81)	(-0.51)
rx_m^+	2.32	2.52*	-0.46	-0.18
	(1.39)	(1.66)	(-0.75)	(-0.16)
L.rx_m^+	1.56	2.81	0.92	-0.79
	(1.12)	(1.56)	(1.01)	(-0.63)
Lag dept	-0.1	0.13	0.02	0.14
	(-1.09)	(-1.17)	-0.25	(1.07)
Constant	0.033	-0.11	-0.08**	-0.01
	(0.42)	(-1.38)	(-2.34)	(-0.27)
$\sum$coef rx^-	9.74***	1.39	-4.71***	-1.22
$\sum$coef rx^+	3.88	5.33*	0.45	-0.97
N	136	90	136	90
R^2	0.38	0.12	0.37	0.05

	Inflation forecast update					
	(1)	(2)	(3)	(4)	(5)	(6)
	1994–2010, q0+q1+q2+q3			1982:9–1993, q0+q1+q2+q3		
	GDP defl.	CPI	Core CPI	GDP defl.	CPI	Core CPI
rx_m^-	0.62*	3.97***	1.17**	-0.62	0.23	0.90
	(1.84)	(3.29)	(2.33)	(-0.77)	(0.12)	(0.59)
L.rx_m^-	0.46	0.62	0.48	0.87*	-0.97	-1.17
	(0.61)	(0.40)	(0.74)	(1.78)	(-1.11)	(-1.38)
rx_m^+	-1.17**	-3.09***	-1.22*	-0.42	-3.26**	-0.91
	(-1.99)	(-2.73)	(-1.91)	(-0.42)	(-2.17)	(-0.91)
L.rx_m^+	-1.24**	-0.55	-0.74	-0.49	0.33	1.49
	(-2.07)	(-0.41)	(-1.19)	(-0.58)	(0.21)	(1.28)
Lag dept	0.03	0.31**	0.24**	0.30***	0.23	0.33***
	(0.29)	(2.35)	(2.61)	(2.74)	(1.57)	(2.75)
Constant	0.09**	0.19***	0.06*	-0.0002	-0.004	-0.04
	(2.57)	(2.79)	(1.86)	(-0.01)	(-0.08)	(-0.80)
$\sum$coef rx^-	1.07	4.58***	1.65**	0.25	-0.74	-0.27
$\sum$coef rx^+	-2.40**	-3.63**	-1.97	-0.91	-2.93*	0.58
N	136	136	136	90	90	62
R^2	0.06	0.26	0.14	0.11	0.14	0.14

Table VIII. Impact of stock market on growth, unemployment and inflation expectations (private sector forecasts)

The table presents regressions of forecast updates in the SPF and BCEI surveys on stock market returns. T-statistics (in parentheses) are robust to heteroscedasticity.

Panel A. SPF forecasts (1994-2016, q0+q1+q2+q3)

	(1)	(2)	(3)
	Real GDP growth	Unemployment rate	Inflation (GDP deflator)
rx_t^-	4.56***	-3.48***	0.30
	(3.05)	(-3.44)	(0.89)
rx_{t-1}^-	4.26***	-1.95***	1.51
	(4.68)	(-2.91)	(1.52)
rx_t^+	1.48	0.54	-0.72
	(1.41)	(0.83)	(-1.46)
rx_{t-1}^+	0.01	0.44	-0.45
	(0.02)	(0.71)	(-0.79)
Lag dept	0.10	0.32**	0.16
	(0.88)	(2.63)	(1.54)
Constant	0.01	-0.14**	0.03
	(0.11)	(-2.31)	(0.79)
$\sum$coef rx^-	8.82***	-5.44***	1.81
$\sum$coef rx^+	1.49	0.98	-1.16
N (quarters)	92	92	92
R^2	0.53	0.52	0.15

Panel B. BCEI forecasts

	1994–2016, q0+q1+q2+q3			1982:9–1993, q0+q1+q2+q3	
	(1)	(2)	(3)	(4)	(5)
	Real GDP growth	Unemployment rate	Inflation (GDP deflator)	Real GDP growth	Unemployment rate
rx_m^-	4.64***	-3.58***	1.65***	3.94***	-1.62***
	(4.02)	(-5.04)	(3.27)	(6.28)	(-4.85)
L.rx_m^-	1.25*	-0.83	-0.03	-0.32	0.22
	(1.72)	(-1.41)	(-0.09)	(-0.59)	(0.35)
rx_m^+	1.65***	-0.15	-0.50	2.19***	-0.16
	(3.07))	(-0.37)	(-1.45)	(3.64)	(-0.30)
L.rx_m^+	1.10***	-0.50	-0.24	0.25	0.14
	(2.93)	(-1.57)	(-1.08)	(0.36)	(0.28)
Lag dept	0.15	0.29***	0.32***	0.30***	0.54***
	(1.36)	(3.09)	(4.40)	(5.70)	(6.76)
Constant	-0.08*	-0.06*	0.04	-0.08*	-0.02
	(-1.68)	(-1.78)	(1.32)	(-1.73)	(-0.58)
$\sum$coef rx^-	5.89***	-4.41***	1.63***	3.62***	-1.40***
$\sum$coef rx^+	2.75***	-0.65	-0.74	2.44***	-0.02
N	276	276	276	141	144
R^2	0.56	0.56	0.25	0.43	0.32

Table IX. Predictive power of stock market for realized macro variables

The table presents predictive regressions of realized macro variables (four-quarter growth rates or changes) on lagged positive and negative stock market realizations. Real GDP data are from NIPA Table 1.1.1. The unemployment rate is the seasonally adjusted series for individuals 16 years and over from the Bureau of Labor Statistics. The GDP deflator is from NIPA Table 1.1.4. The regressions are estimated at the quarterly frequency. HAC t-statistics are in parentheses.

	Real GDP growth q0+q1+q2+q3			Unemployment rate change q0+q1+q2+q3		
	1994-2016	1947-1993	1947-2016	1994-2016	1948-1993	1948-2016
rx_t^-	9.74**	13.34***	12.52***	-6.23***	-6.59**	-6.94***
	(2.47)	(2.64)	(3.39)	(-2.81)	(-2.44)	(-3.53)
rx_t^+	5.82*	9.24**	7.973**	-2.73	-3.57	-3.18***
	(1.73)	(2.01)	(2.40)	(-1.32)	(-1.51)	(-2.02)
Lag of q0-value	1.05***	0.40**	0.54***	1.84***	0.77***	0.97***
of dept. var.	(3.54)	(1.99)	(2.81)	(4.52)	(3.39)	(4.32)
Constant	1.77***	3.19***	2.77***	-0.07	0.03	-0.03
	(4.21)	(6.95)	(7.93)	(-0.37)	(0.17)	(-0.18)
N (quarters)	89	186	275	89	182	271
R^2	0.31	0.12	0.15	0.50	0.15	0.21

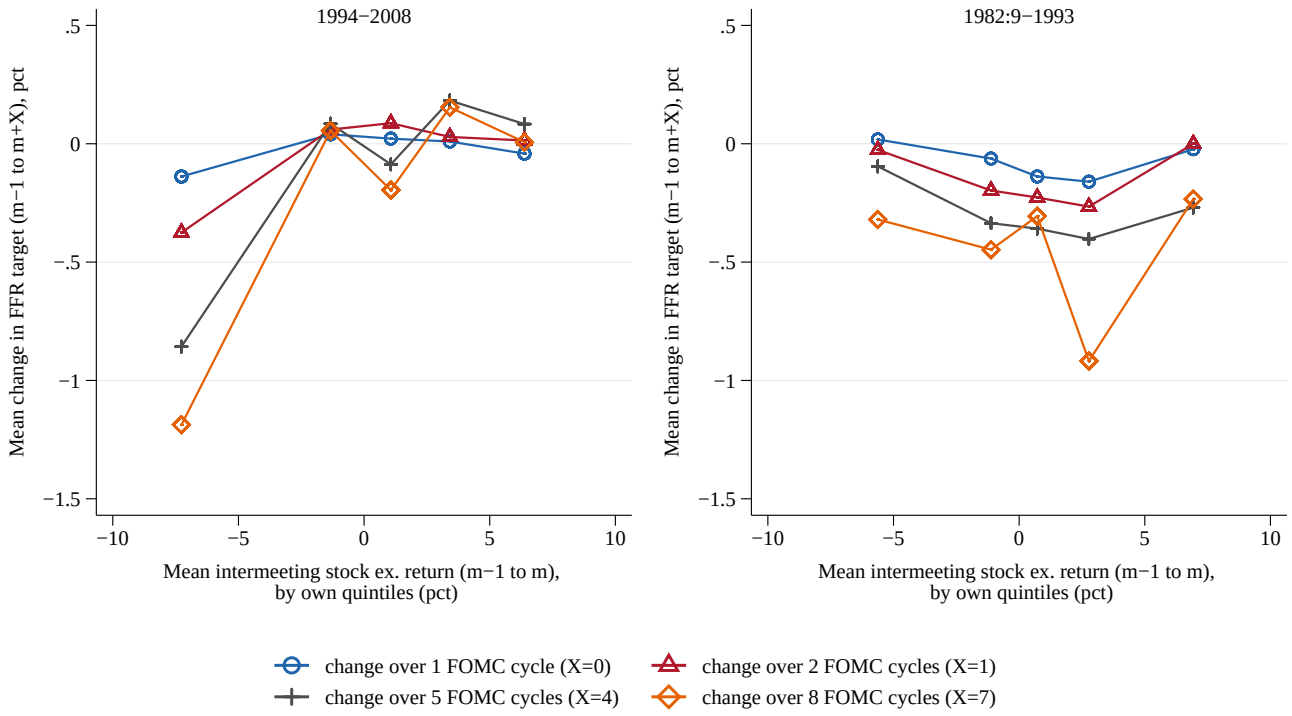
	Inflation (GDP deflator) q0+q1+q2+q3		
	1994-2016	1947-1993	1947-2016
rx_t^-	0.036*	-0.051	-0.015
	(1.74)	(-1.53)	(-0.56)
rx_t^+	-0.01	0.002	-0.002
	(-1.07)	(0.07)	(-0.12)
Lag of q0-value	1.62***	2.59***	2.75***
of dept. var.	(4.20)	(6.69)	(7.93)
Constant	0.013***	0.01***	0.01***
	(7.07)	(3.30)	(3.67)
N (quarters)	89	186	275
R^2	0.33	0.56	0.59

Table X. Taylor rules

The table presents estimates of different specifications of Taylor rules. $E_m^{GB}(\cdot)$ denotes Greenbook expectations for real GDP growth (current quarter $g_{m,q0}$), inflation (GDP deflator, next quarter, $\pi_{m,q1}$) and unemployment rate (next quarter, $u_{m,q1}$). The horizons for Greenbook expectations are chosen by Akaike information criterion. $\Delta E_m^{GB}(g_{m,q1})$ is the average expectations update of real GDP growth rate between previous and current meeting, and $\Delta E_m^{GB}(g_{m,1}^+) = \max(\Delta E_m^{GB}(g_{m,q1}), 0)$, $\Delta E_m^{GB}(g_{m,1}^+) = \min(\Delta E_m^{GB}(g_{m,q1}), 0)$. The sample period is 1994–2008. HAC t-statistics are in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.ΔFFR$_m$	0.25***	0.017	0.011	0.0090				
	(2.91)	(0.14)	(0.09)	(0.08)				
L2.ΔFFR$_m$	0.32***	0.23**	0.24**	0.23**				
	(2.85)	(1.99)	(2.25)	(2.21)				
L.FFR$_m$					1.23***	0.99***	0.99***	0.99***
					(14.62)	(9.45)	(9.41)	(9.97)
L2.FFR$_m$					0.095	0.23	0.25	0.25
					(0.54)	(1.26)	(1.44)	(1.44)
L3.FFR$_m$					-0.35***	-0.28***	-0.30***	-0.29***
					(-3.30)	(-2.73)	(-3.14)	(-3.05)
$E_m^{GB}(g_{m,q0})$		0.10***	0.089***	0.088***		0.085***	0.074***	0.073***
		(5.40)	(4.29)	(4.38)		(4.36)	(3.49)	(3.60)
$E_m^{GB}(\pi_{m,q1})$		0.088***	0.072**	0.074**		0.15***	0.13***	0.13***
		(3.02)	(2.17)	(2.23)		(5.11)	(4.01)	(3.98)
$E_m^{GB}(y_{m,q1})$		0.067***	0.063**	0.062**		-0.023	-0.026	-0.022
		(2.81)	(2.42)	(2.30)		(-0.61)	(-0.66)	(-0.56)
$\Delta E_m^{GB}(g_{m,1})$		0.10***	0.066***			0.11***	0.072***	
		(4.14)	(2.74)			(4.90)	(3.32)	
$\Delta E_m^{GB}(g_{m,1}^+)$				-0.025				-0.0053
				(-0.52)				(-0.11)
$\Delta E_m^{GB}(g_{m,1}^-)$				0.12***				0.12***
				(3.06)				(3.34)
rx_m^-	1.93**		0.82	0.61	2.00**		0.79	0.61
	(2.08)		(1.17)	(0.91)	(2.07)		(1.06)	(0.87)
L.rx_m^-	2.73***		1.26*	0.96	2.84***		1.27**	1.01
	(4.53)		(1.92)	(1.26)	(5.46)		(2.32)	(1.59)
Constant	0.074***	-0.78***	-0.67***	-0.64***	0.19***	-0.17	-0.059	-0.066
	(3.12)	(-4.04)	(-3.35)	(-3.15)	(3.26)	(-0.65)	(-0.21)	(-0.24)
N	120	120	120	120	120	120	120	120
$\bar{R}^2$	0.50	0.59	0.60	0.61	0.98	0.99	0.99	0.99

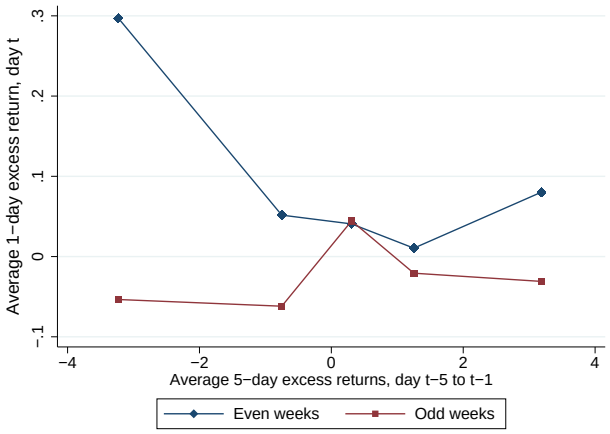
Figure 1. Changes in FFR target conditional on intermeeting stock excess returns



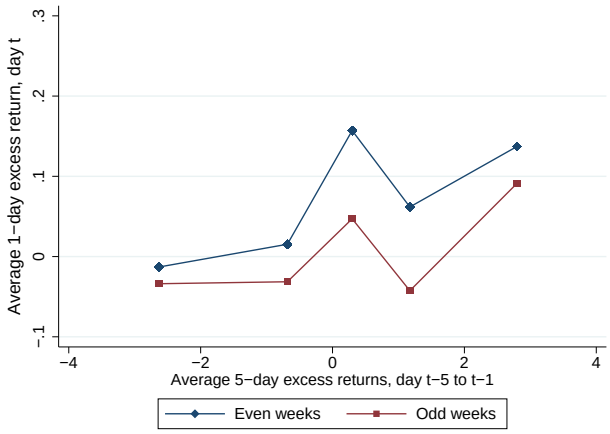
The figure plots the change in FFR target against quintiles of intermeeting stock excess returns. The average cumulative FFR target change from day 0 of cycle $m-1$ to day 0 of cycle $m+7$ (approximately a one-year period) is plotted as a function of the intermeeting excess return.

Figure 2. The Fed put in stock returns: pre/post-2008

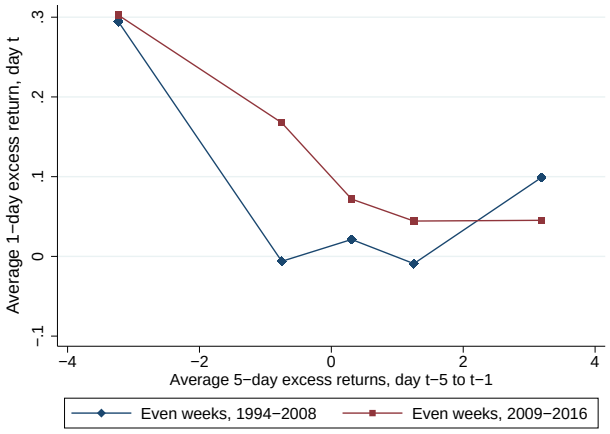
Panel A. 1994–2016



Panel B. 1982:9-1993



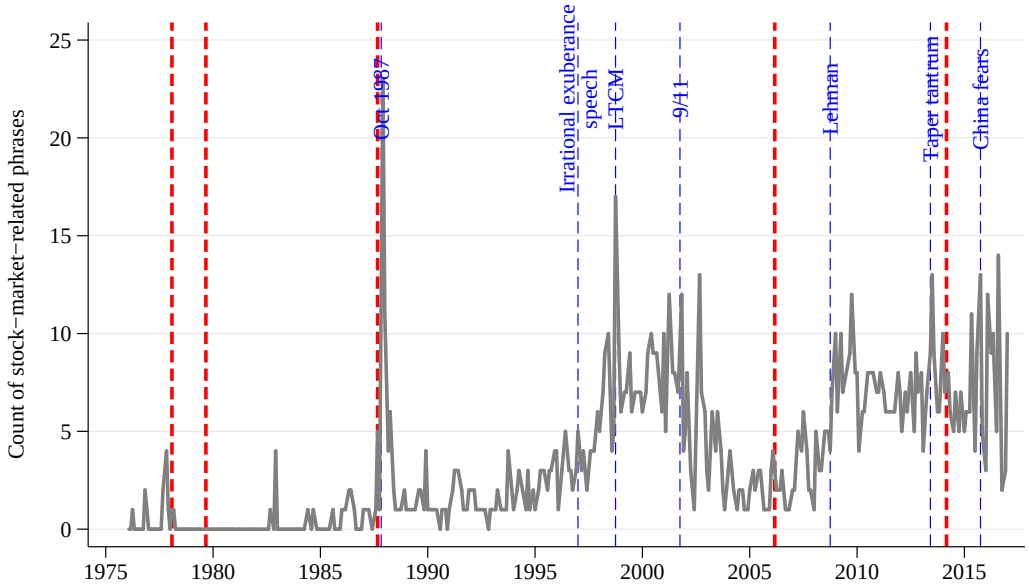
Panel C. 1994–2016, pre/post-2008



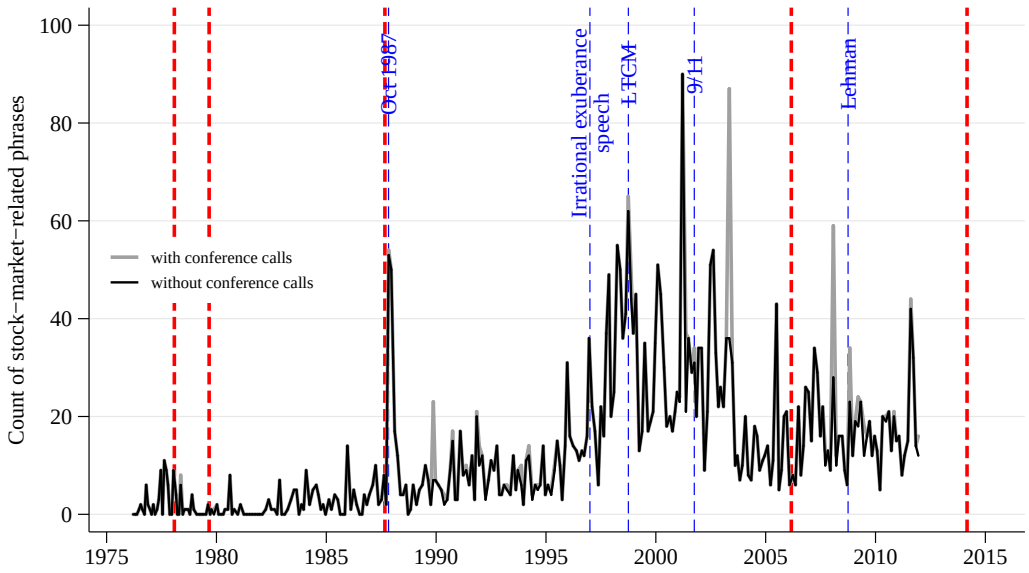
The figure graphs average excess stock returns conditional on the returns in the previous week, conditional on the week of the FOMC cycle. Following CMVJ (2018), even weeks are defined as weeks 0, 2, 4 and 6 in FOMC cycle time, where week 0 of the FOMC cycle starts on the day before a scheduled FOMC announcement day (weekends are excluded).

Figure 3. Counts of stock-market-related phrases in FOMC documents

Panel A. FOMC minutes (1976–2016)



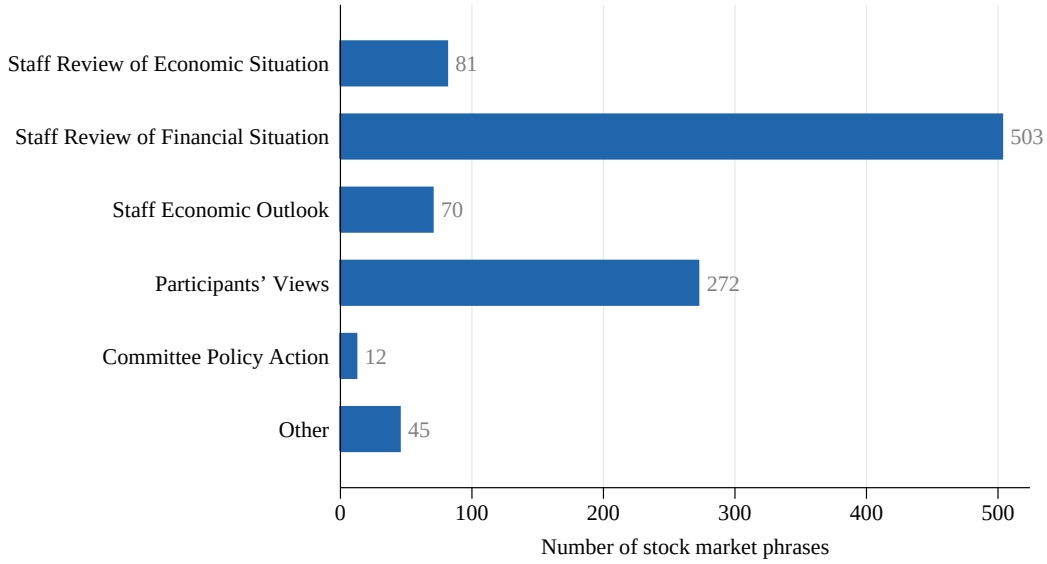
Panel B. FOMC transcripts (1976–2011)



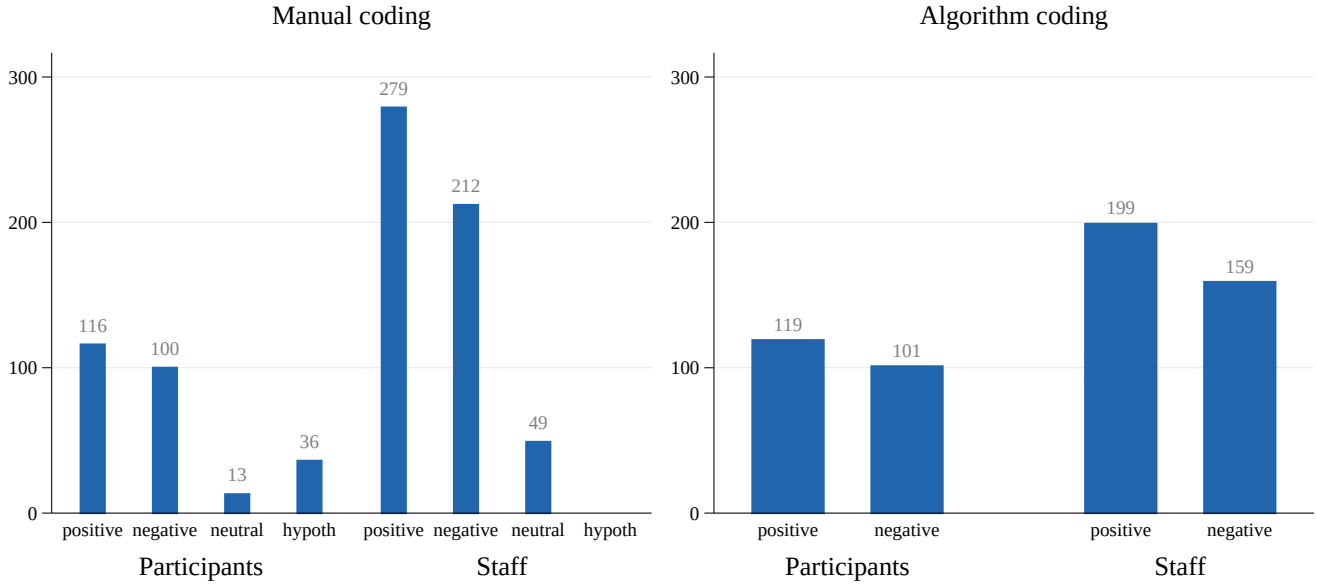
Panel A reports combined counts in Record of Policy Actions and Minutes of Actions for the 1976–1992 sample and in FOMC minutes for the 1993–2016 sample. Panel B reports counts in the transcripts of FOMC meetings (solid black line) and those combined with counts in transcripts of FOMC conference calls (solid gray lines). Counts in transcripts of conference calls in the intermeeting period are added to the counts in the transcripts of the next FOMC meeting; instances when conference calls in the intermeeting period have more than 10 mentions of stock market are marked with a plus (+), with labels indicating the date of the corresponding FOMC meeting. Vertical thick dashed lines in both panels mark ends of tenures of subsequent Fed Chairs: Miller, Burns, Volcker, Greenspan, Bernanke.

Figure 4. Summary statistics for stock market counts in FOMC minutes (1994–2016)

Panel A. Counts by section of the minutes



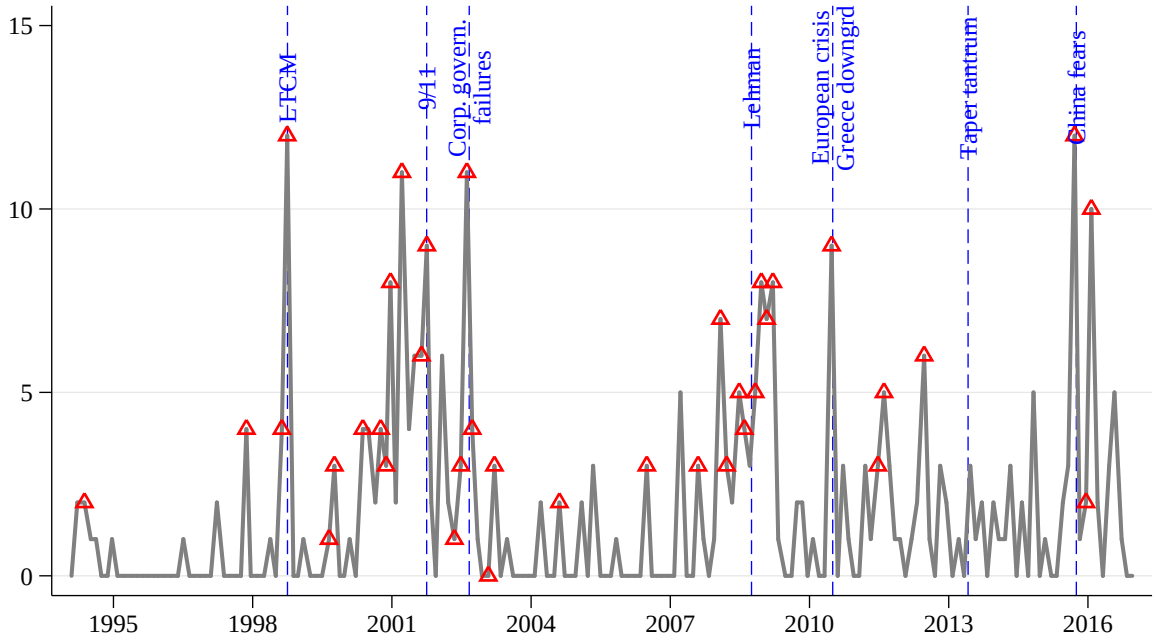
Panel B. Positive/negative counts by staff and participants



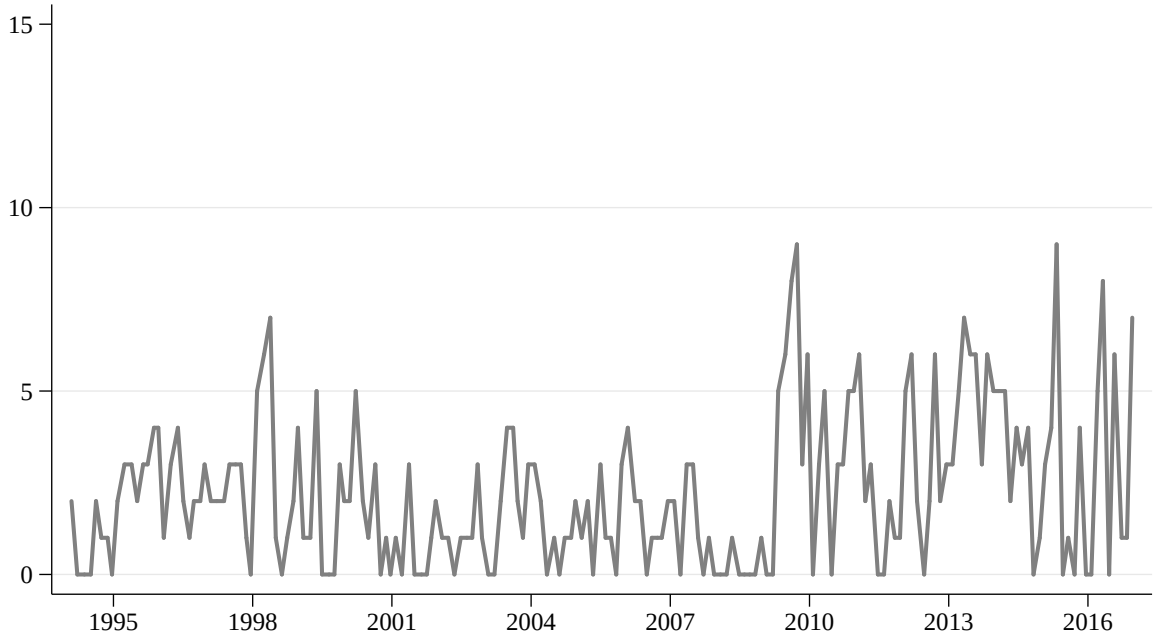
Panel A reports the number of stock market phrases, by section of the FOMC minutes. Panel B presents the total number of positive and negative stock market phrases, split by participants and staff, respectively. The left graph is based on manual coding of the phrases, and the right graph on the algorithm-based coding. The sample period is 1994–2016.

Figure 5. Time series of positive and negative stock market phrases in FOMC minutes

Panel A. Negative phrases count

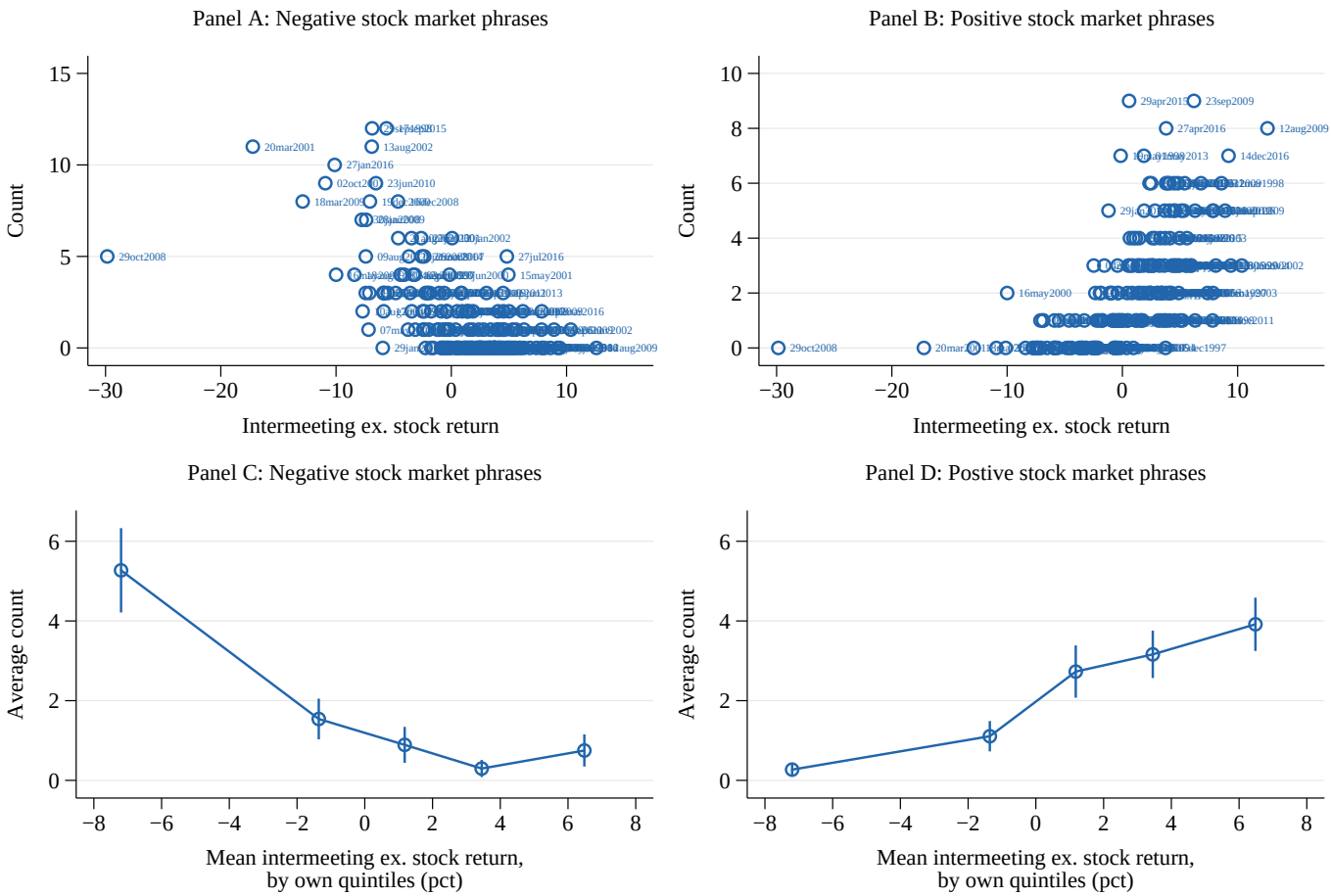


Panel B. Positive phrases count



The figure presents the time series of negative and positive stock market phrases in FOMC minutes based on manual coding. The sample period is 1994–2016. The triangles in Panel A indicate FOMC meetings that were preceded by intermeeting stock market returns in the lowest quintile.

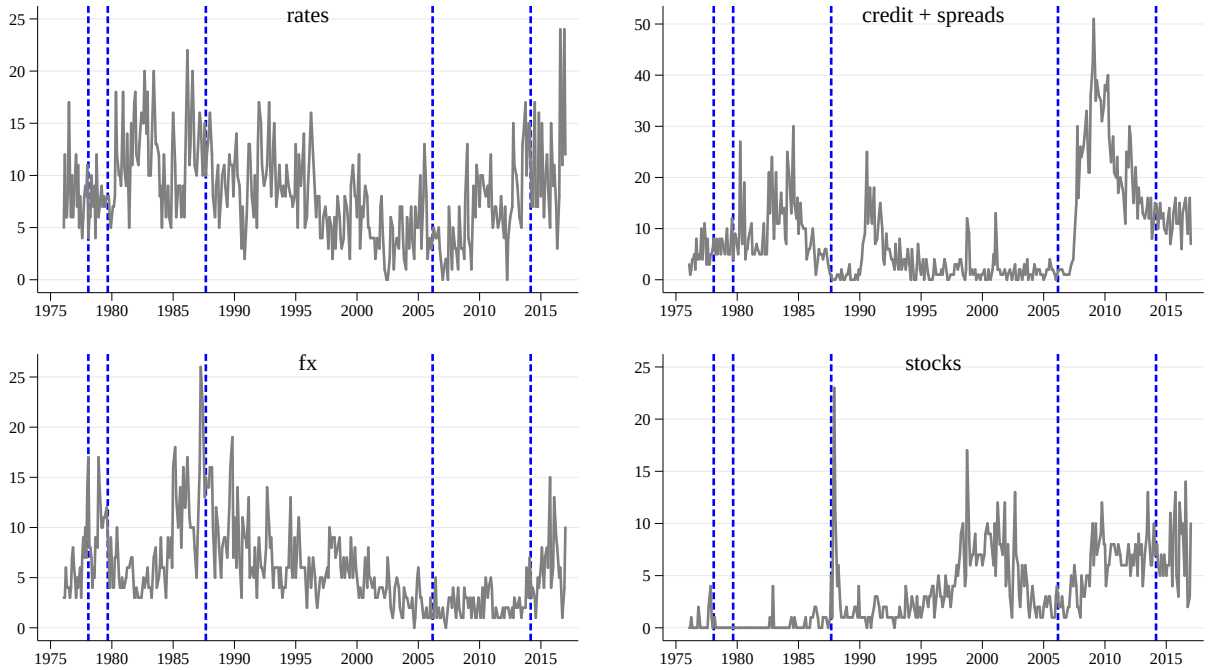
Figure 6. Impact of intermeeting stock returns on negative and positive stock market phrases in FOMC meetings



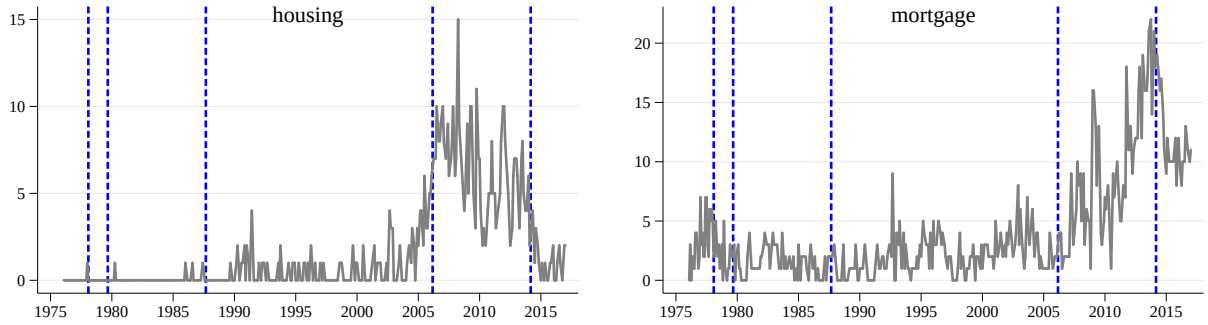
The figure presents nonparametrically the relationship between intermeeting stock market excess returns and number of positive and negative stock market mentions in FOMC minutes. The bottom panels present the average count of positive and negative stock market phrases conditional on the quintiles of intermeeting stock market excess returns (x-axis labels report the average intermeeting return within a given quintile). The sample period is 1994–2016. The results are based on manual coding of the minutes content.

Figure 7. Mentions of specific financial conditions in FOMC minutes

Panel A. Various financial conditions

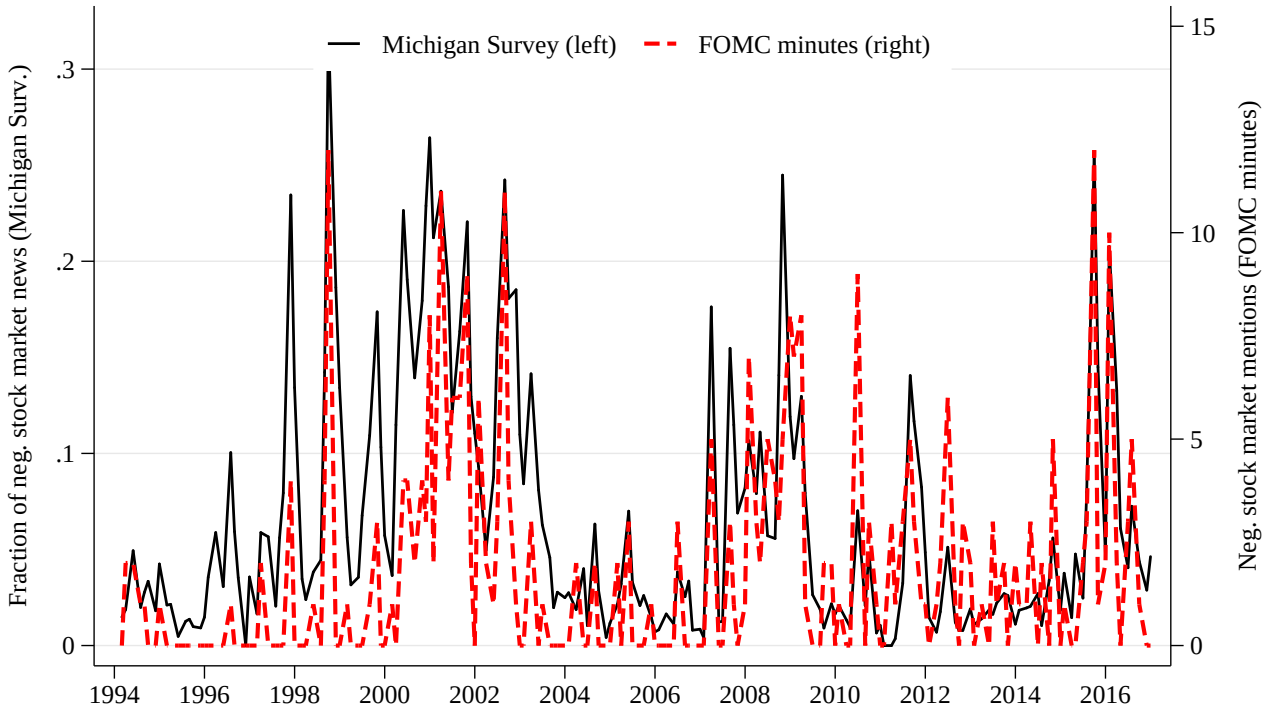


Panel B. Financial conditions relating to housing and mortgage markets



The figure displays counts of mentions of different variables determining financial conditions. The counts are obtained from FOMC minutes. Dashed vertical lines indicate the end of tenures of subsequent Fed Chairs.

Figure 8. Consumer attention to negative stock market news (Michigan Survey of Consumers)



The figure superimposes the MSC negative stocks news ratio (number of Michigan survey respondents citing negative stock market news relative to the number of respondents citing any news) with the frequency of negative stock market mentions in the FOMC minutes.

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Appendix for
The Economics of the Fed Put

A. Details on the algorithm-based textual analysis

We develop an algorithm to search for positive and negative phrases associated with economic and financial conditions in FOMC minutes and transcripts. We build dictionaries associated with the following categories: The stock market; financial conditions; economic growth; inflation and wages. For each category, the dictionary contains a list of noun phrases along with two groups of direction word (group 1 and 2). Word groups 1 and 2 are assigned to each of the noun phrases to form a positive or negative match. The dictionaries are available in Table IA-1 through Table IA-2.

All FOMC documents are downloaded from the FRB website. The documents are available in a pdf format (for transcripts) and in a pdf and web formats for the minutes and statements. We convert all documents into a txt format and use utf-8 encoding.

Below we describe the main steps in the algorithm.

Defining a sentence. In order to avoid incorrect matches that neglect the sentence structure, we apply several rules for defining a "sub-sentence." Typically one sentence contains several sub-sentences. The matching of noun phrases with direction words happens within a sub-sentence. The rules for defining a sub-sentence are as follows:

- Treat ",", ".", "!", "?", ";", "and", "as", "or", "to", "of", "after", "because", "but", "from", "if", "or", "so", "when", "where", "while", "although", "however", "though", "whereas", "so that", "despite" as the start of a new sub-sentence.
  - The need to include "as" in the above list is sentences like: "Subsequently, interest rates fell as stock prices tumbled."
  - The need to include "to" in the above list is sentences like: "adjustments in financial markets to low rates."
  - The need to include "of" in the above list is sentences like: "These negative factors might be offset to some extent by the wealth effects of the rise in stock market prices."
- Remove period marks (".") that do not indicate an end of a sentence. For example, we remove periods in abbreviations (U.S. replaced by US, a.m. by am, etc.), periods indicating decimals (e.g., "The unemployment rate rose to 9.3, but inflation went up." will be treated as as two sub-sentences separated by a comma: "The unemployment rate rose to 93, but inflation went up."), and periods indicating abbreviations of names (e.g., in transcripts "Robert P. Forrestal" will be coded as "Robert P Forrestal").

Word combinations. For every noun phrase, we allow combinations with *"rate* of, growth of, level* of, index* of, indices of"* at the beginning of the noun phrase. Then, we use those

new combinations to match group words. The direction of the combined phrase is the same as of the original phrase. For example, for "employment", we have combined phrases such as: rate of employment, level of employment and so on, which we match with group words. The direction of "rate of employment" is the same as "employment."

Ordering of words. We do not count matches in which an economic/financial phrase is followed by "reduced", "reduce", "reducing ", "boosted", "boost", "boosting", "fostered", "foster", "fostering", "encouraged", and "encourage". For example, in the sentence "Credit conditions continued to tighten for both households and businesses, and ongoing declines in equity prices further reduced household wealth", we do not count "equity prices reduced" but we do count "declines in equity prices" and "reduced household wealth."

Negative phrases without direction words. Phrases such as financial crisis, financial turmoil are counted as negative. These are listed separately in Table IA-2.

Removing descriptive words. We remove common descriptive adverbs and adjectives (e.g. "somewhat", "unusual*" , "remarkabl*", "much", "rapid*" as in "bond market rapidly improved"), and verbs ("experience*", "show", "register*" as in "Core PCE price inflation registered an increase of 1.6 percent").

Removing stop words. After making the above adjustments, we remove stop words ("a", "the", "are", "had", etc.) using the list of English language stop words (Phyton `stop_words` package) unless they appear as part of a direction phrase (e.g., we allow for matches of nouns with "mov* down", although "down" is a stop word).

Treatment of "not". We do not treat the word "not" as a stop word, and thus we keep it in the text. This avoids misclassification of cases like: "Several participants indicated that recent trends in euro-area equity indexes and sovereign debt yields had not been encouraging." We code "not" plus a group 1 word as a group 2 word (i.e., "not encouraging" is the opposite of the "encouraging"), and "not" plus a group 2 word as a group 1 word.

Stemming. We take into account different grammatical forms of words. These are marked with a "*" in our dictionary lists. For example, "decreas*" would include decrease, decreased, decreasing.

Distance parameter. A central parameter in the algorithm determines the distance between a noun phrase and a positive/negative group word. The lower this distance is, the more accurately a financial/economic phrase is classified as positive or negative but the more likely it is that no match is found. We currently use a distance of zero words, i.e. the match is found if a direction word directly precedes or follows a financial/economic phrase.

Sectioning of documents. We assign each matched phrase into a "staff" or "participants" category:

- For the minutes, the assignment is made by section of the document. We divide minutes into sections listed in Section III of the paper. Sections 1–3 are classified as presenting the views of the staff, and sections 4–5 as presenting the views of participants. Section headings appear explicitly in the minutes from April 2009 onward. However, given that the structure of the documents has remained essentially unchanged since the

early 1990s, for the period between the start of 1994 and March 2009, we manually assign text to sections. We drop other parts of the minutes, e.g. discussions of special topics occurring only in particular meetings.

- For the transcripts, we have direct information about the speaker. A comment by a speaker starts with his/her capitalized name (e.g., CHAIRMAN GREENSPAN, MR. BROADDUS). For each meeting, we assign all governors and regional Fed presidents (who were in office at the time of the meeting) to the participants' category, and everybody else to the staff category. The names and start/end dates for the tenures of regional Fed presidents as well as members of the Board of the Governors are collected from the websites of the Federal Reserve Board and regional Federal Reserve Banks.[15]

[15] E.g., information about the membership at the Board of Governors can be accessed at: https://www.federalreserve.gov/aboutthefed/bios/board/boardmembership.htm#members.

Table IA-1. Noun phrases and direction words related to the stock market

Nouns	Match w/ direction words		Direction words	
	Positive	Negative	Group 1	Group 2
asset index*	2	1	*adjust* downward*	*acceler**
asset indic*	2	1	*adverse*	*adjust* upward*
asset market*	2	1	*burst**	*advanc**
asset price index*	2	1	*contract**	*bolster**
asset price indic*	2	1	*cool**	*boost**
asset price*	2	1	*deceler**	*edge* up*
asset valu*	2	1	*declin**	*elevat**
equities	2	1	*decreas**	*encourag**
equity and home price*	2	1	*deteriorat**	*expand**
equity and home valu*	2	1	*down*	*fast**
equity and house price*	2	1	*downturn*	*favor**
equity and housing price*	2	1	*downward*	*gain**
equity index*	2	1	*downward adjust**	*go* up*
equity indic*	2	1	*downward movement*	*high**
equity market index*	2	1	*downward revision*	*improv**
equity market indic*	2	1	*drop**	*increas**
equity market price*	2	1	*eas**	*mov* high**
equity market valu*	2	1	*edge* down*	*mov* up*
equity market*	2	1	*fall**	*mov* upward*
equity price index*	2	1	*fell*	*pick* up*
equity price indic*	2	1	*go* down*	*rais**
equity price measure*	2	1	*limit**	*rallied*
equity price*	2	1	*low**	*rally**
equity valu*	2	1	*moderate**	*rebound**
financial wealth	2	1	*moderati**	*recoup**
home and equity price*	2	1	*mov* down*	*revis* up**
house and equity price*	2	1	*mov* downward*	*rise**
household wealth	2	1	*mov* lower*	*rising*
household* net worth	2	1	*plummet**	*rose*
housing and equity price*	2	1	*pressure**	*run up*
price* of risk* asset*	2	1	*pull* back*	*runup*
ratio of wealth to income	2	1	*pullback*	*stop decline*
risk* asset price*	2	1	*reduc**	*strength**
s p 500 index	2	1	*revis* down**	*strong**
stock index*	2	1	*slow**	*tick* up*
stock indic*	2	1	*slow* down*	*up*
stock market index*	2	1	*soft**	*upward*
stock market price*	2	1	*stagnate**	*upward adjust**
stock market wealth	2	1	*stall**	*upward movement*
stock market*	2	1	*strain**	*upward revision*
stock price indic*	2	1	*stress**	*went up*
stock price*	2	1	*subdu**	
stock prices index*	2	1	*take* toll on*	
stock val*	2	1	*tension**	
us stock market price*	2	1	*tick* down*	
wealth effect*	2	1	*tight**	
wealth to income ratio	2	1	*took toll on*	
			*tumbl**	
			*weak**	
			weigh on*	
			went down	
			*worse**	

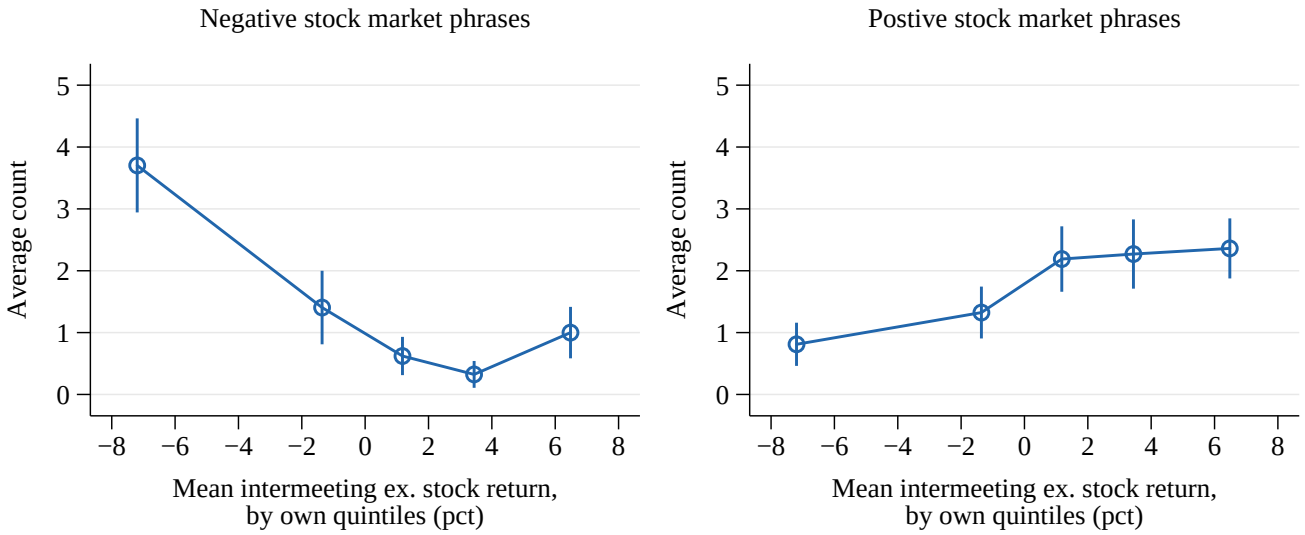
Table IA-2. Noun phrases and direction words related to financial conditions

Nouns	Match w/ direction words		Direction words	
	Positive	Negative	Group 1	Group 2
appetite* risk taking	2	1	*adjust* downward*	*acceler**
appetite* risk*	2	1	*adverse*	*adjust* upward*
appetite* risk* asset*	2	1	*contract**	*advanc**
appetite* risk* investment*	2	1	*cool**	*bolster**
appetite* taking risk*	2	1	*deceler**	*boost**
condition* credit market*	2	1	*declin**	*eas**
condition* financial market*	2	1	*decreas**	*elevat**
credit condition*	2	1	*deteriorat**	*encourag**
credit growth	2	1	*down*	*expand**
credit market	2	1	*downturn*	*fast**
credit market conditions	2	1	*downward*	*favor**
credit market demand	2	1	*downward adjust**	*gain**
development financial market*	2	1	*downward revision*	*go* up*
financial condition*	2	1	*drop**	*high**
financial development*	2	1	*fall**	*improv**
financial instabilit*	1	2	*fell*	*increas**
financial market condition*	2	1	*go* down*	*loos**
financial market confidence	2	1	*limit**	*mov* higher*
financial market development	2	1	*low**	*mov* up*
financial market index*	2	1	*moderate**	*mov* upward*
financial market indic*	2	1	*moderati**	*normaliz**
financial market pressure*	1	2	*mov* down*	*pick* up*
financial market price*	2	1	*mov* downward*	*rais**
financial market sentiment	2	1	*mov* lower*	*rallied*
financial market*	2	1	*pressure**	*rally**
financial situation	2	1	*pullback*	*rebound**
financial stability	2	1	*reduc**	*recoup**
investor* appetite*	2	1	*restrictive*	*revis* up**
investor* appetite* risk*	2	1	*revis* down**	*rise**
investor* confidence	2	1	*slow**	*rising*
investor* risk appetite*	2	1	*soft**	*rose*
investor* sentiment	2	1	*stagnate**	*run up*
investor* sentiment toward risk*	2	1	*stall**	*runup*
investor* sentiment toward risk* asset*	2	1	*strain**	*stop decline*
liquidity	2	1	*stress**	*strength**
pressure* financial market	1	2	*subdu**	*strong**
risk appetite*	2	1	*take a toll on*	*tick* up*
			*tension**	*up*
			tick down*	*upward*
			*tight**	*upward adjust**
			took toll on	*upward revision*
			turbulent	*went up*
			*weak**	
			weigh on*	
			went down	
			*worsen**	
Negative phrases:	financial strain*; financial crisis; financial turmoil; financial turbulence; financial dislocat*; financial stress*; financial distress*			

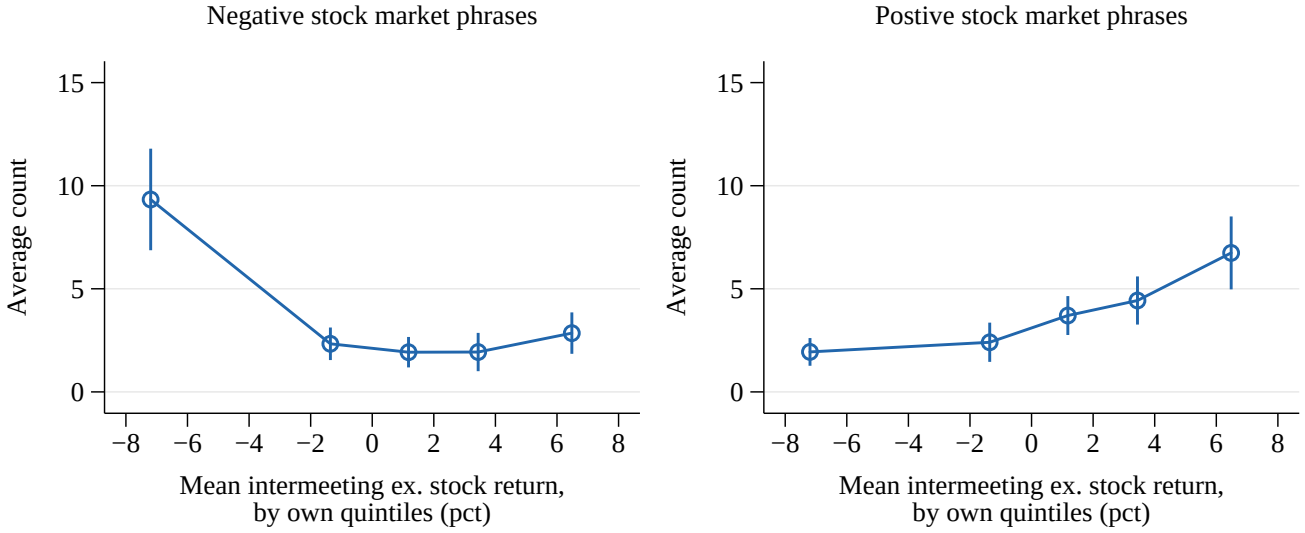
B. Additional tables and figures

Figure IA-1. Impact of stock market returns in FOMC minutes and transcripts: Algorithm-based searches

Panel A. Minutes

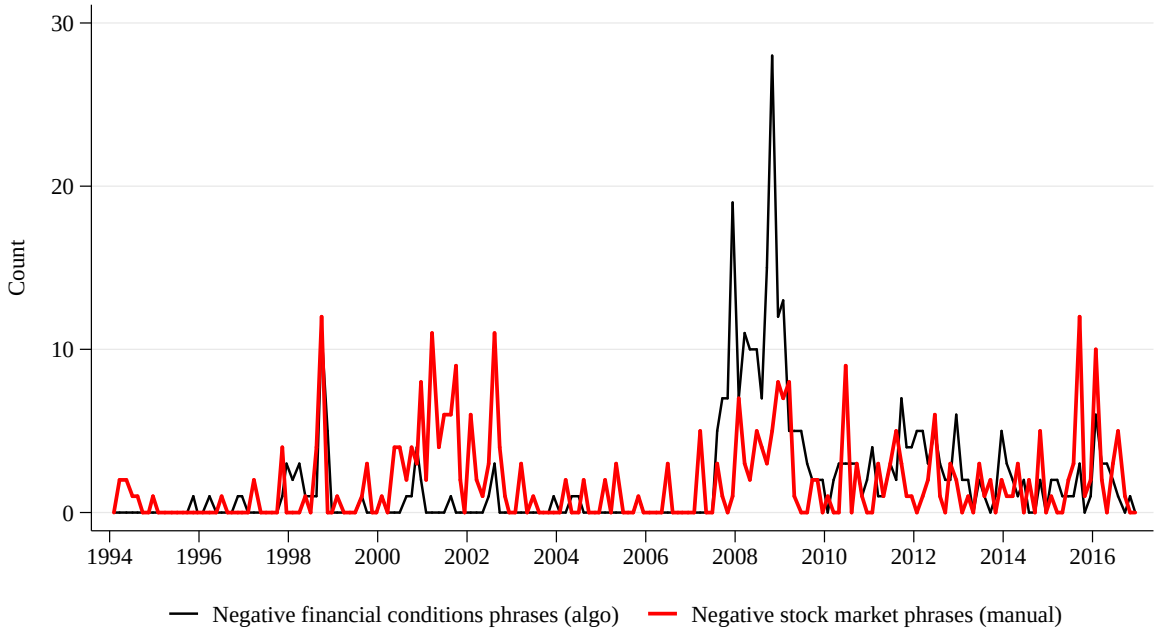


Panel B. Transcripts



The figure presents the average count of positive and negative stock market phrases in FOMC documents conditional on the quintiles of intermeeting stock market excess returns. The x-axis reports the mean of intermeeting stock return within a quintile. The counts of stock market phrases are based on our automated search algorithm. The upper panels display the results based on the FOMC minutes (sample: 1994–2016), and the bottom panels display results based on the FOMC transcripts (sample: 1994–2011).

Figure IA-2. Negative financial conditions versus stock market phrases in FOMC minutes



The figure superimposes the counts of negative financial conditions phrases against negative stock market phrases in FOMC minutes over the 1994–2016 sample. Financial conditions phrases are obtained using algorithm-based coding, and stock market phrases are obtained by manual coding.

Table IA-3. Predicting negative and positive stock market phrases in the FOMC minutes by intermeeting stock market excess returns (algorithm-based coding)

This table reproduces results from Table III, but uses the algorithm-based coding of the positive and negative stock market phrases. See caption of Table III for details.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Negative stock market phrases				Positive stock market phrases			
Sample:	1994-2016	1994-2016	1994-2008	2009-2016	1994-2016	1994-2016	1994-2008	2009-2016
rx_m	-18.9***				10.6***			
	(-5.79)				(4.19)			
L.rx_m	-11.8***				6.04***			
	(-4.45)				(2.83)			
L2.rx_m	-5.97**				1.72			
	(-2.04)				(0.82)			
rx_m^-		-27.5***	-26.1***	-35.1***		3.05	0.69	12.2***
		(-3.61)	(-2.99)	(-3.11)		(1.24)	(0.28)	(3.47)
L.rx_m^-		-21.1***	-23.5***	-6.92		-1.87	-4.07	7.66
		(-6.52)	(-11.05)	(-0.83)		(-0.84)	(-1.48)	(1.49)
L2.rx_m^-		-6.80	-17.6**	0.69		1.88	2.78	-1.04
		(-1.17)	(-1.99)	(0.22)		(0.59)	(0.53)	(-0.25)
rx_m^+		-6.96	-15.0**	2.43		21.0***	15.4***	26.3***
		(-1.36)	(-2.15)	(0.64)		(4.93)	(3.39)	(3.92)
L.rx_m^+		5.34	3.93	0.67		20.8***	22.3***	13.7*
		(1.21)	(1.04)	(0.07)		(4.09)	(3.03)	(1.77)
L2.rx_m^+		2.43	6.01	-4.62		7.57*	11.2	0.29
		(0.60)	(1.06)	(-0.83)		(1.71)	(1.58)	(0.04)
Constant	1.58***	0.45	0.20	1.00**	1.70***	0.77***	0.57*	1.43***
	(10.07)	(1.34)	(0.55)	(2.20)	(11.41)	(3.15)	(1.91)	(5.20)
$\sum$coef rx	-36.6***				18.3***			
$\sum$coef rx^-		-55.4***	-67.2***	-41.3***		3.06	-0.61	18.8***
$\sum$coef rx^+		0.80	-5.02	-1.52		49.3***	48.9***	40.3***
N	184	184	120	64	184	184	120	64
R^2	0.44	0.51	0.64	0.35	0.19	0.27	0.20	0.38
$\bar{R}^2$	0.43	0.49	0.62	0.28	0.17	0.24	0.16	0.31

Table IA-4. Predicting positive/negative financial conditions phrases with intermeeting returns

This table provides evidence analogous to Table III, but using financial condition phrases as the dependent variable. Financial condition phrases are classified into positive and negative by applying the algorithm-based approach to the FOMC minutes. Other specification details are as in Table III for details.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Negative fin. cond. phrases				Positive fin. cond. phrases			
Sample:	1994-2016	1994-2016	1994-2008	2009-2016	1994-2016	1994-2016	1994-2008	2009-2016
rx_m	-23.3*				4.52			
	(-1.80)				(1.06)			
L.rx_m	-13.8***				3.92			
	(-3.03)				(1.26)			
L2.rx_m	-12.4**				-7.51*			
	(-2.04)				(-1.90)			
rx_m^-		-46.8**	-49.3**	-23.5**		-9.67**	-6.92	-5.89
		(-2.39)	(-2.07)	(-2.28)		(-2.40)	(-1.31)	(-0.95)
L.rx_m^-		-20.4***	-20.8**	-12.5*		-6.40*	-2.81	-9.88
		(-3.35)	(-2.52)	(-1.75)		(-1.87)	(-0.83)	(-1.11)
L2.rx_m^-		-18.1**	-6.87	-29.6***		-12.6**	-2.55	-19.1***
		(-2.49)	(-0.55)	(-7.18)		(-2.53)	(-0.49)	(-3.64)
rx_m^+		9.96	-1.76	10.0		24.3***	4.50	35.0***
		(1.10)	(-0.12)	(1.50)		(3.71)	(1.03)	(4.00)
L.rx_m^+		4.73	-6.11	4.11		24.6***	6.01	35.6***
		(0.58)	(-0.45)	(0.55)		(3.46)	(0.88)	(4.42)
L2.rx_m^+		7.77	-6.85	14.7**		9.93**	-2.84	8.28
		(0.89)	(-0.45)	(2.24)		(2.27)	(-0.66)	(0.92)
Constant	2.13***	-0.053	0.36	0.77	1.26***	-0.51	0.26	-0.22
	(4.34)	(-0.06)	(0.27)	(1.61)	(5.65)	(-1.28)	(0.66)	(-0.50)
$\sum$coef rx	-49.6**				0.93			
$\sum$coef rx^-		-85.3***	-77.0**	-65.6***		-28.6***	-12.3	-34.8***
$\sum$coef rx^+		22.5	-14.7	28.8**		58.8***	7.67	78.9***
N	184	184	120	64	184	184	120	64
R^2	0.22	0.31	0.33	0.55	0.063	0.23	0.075	0.44
$\bar{R}^2$	0.21	0.28	0.29	0.50	0.047	0.20	0.026	0.38

Table IA-5. Predicting target changes with financial conditions and stock market phrases

This table extends the regression specification from Table IV, predicting FFR target changes with financial conditions phrases in addition to stock market phrases. The sample period is 1994–2008. The counts are obtained by algorithm-based coding of FOMC minutes.

	(1)	(2)	(3)	(4)	(5)	(6)
			Algo for #Stocks		Manual for #Stocks	
	1994-2008	1994-2007	1994-2008	1994-2007	1994-2008	1994-2007
ΔFFR$_{m-1}$	0.25***	0.24**	0.16*	0.15*	0.17*	0.15
	(2.63)	(2.20)	(1.87)	(1.68)	(1.84)	(1.53)
ΔFFR$_{m-2}$	0.34***	0.44***	0.24*	0.31**	0.29**	0.37***
	(2.67)	(3.68)	(1.81)	(2.04)	(2.47)	(2.94)
#Fin.cond.$^{-}_{m}$	-0.011*	-0.005	-0.007	-0.005	-0.009	-0.007
	(-1.67)	(-0.54)	(-1.07)	(-0.61)	(-1.29)	(-0.80)
#Fin.cond.$^{-}_{m-1}$	-0.038***	-0.035***	-0.029**	-0.018	-0.029**	-0.011
	(-3.87)	(-2.92)	(-2.43)	(-1.27)	(-2.52)	(-0.84)
#Fin.cond.$^{+}_{m}$	0.052*	0.019	0.027	-0.0037	0.030	-0.006
	(1.74)	(0.96)	(0.93)	(-0.24)	(1.06)	(-0.36)
#Fin.cond.$^{+}_{m-1}$	0.050**	0.044**	0.026	0.012	0.032	0.019
	(2.57)	(2.40)	(1.16)	(0.64)	(1.49)	(1.01)
#Stocks$^{-}_{m}$			-0.014	-0.002	-0.013	-0.010
			(-1.21)	(-0.20)	(-1.53)	(-0.97)
#Stocks$^{-}_{m-1}$			-0.040*	-0.057***	-0.031**	-0.040***
			(-1.79)	(-4.05)	(-2.24)	(-3.62)
#Stocks$^{+}_{m}$			-0.016	-0.012	-0.015	-0.015
			(-1.00)	(-0.86)	(-1.26)	(-1.41)
#Stocks$^{+}_{m-1}$			0.002	-0.003	-0.007	-0.007
			(0.18)	(-0.30)	(-0.51)	(-0.50)
Constant	-0.008	-0.003	0.093*	0.11**	0.11**	0.12**
	(-0.27)	(-0.11)	(1.87)	(2.35)	(2.12)	(2.41)
N (meetings)	119	111	119	111	119	111
R^2	0.51	0.43	0.56	0.54	0.56	0.53