

Fedspeak: Who Moves U.S. Asset Prices?*

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This paper examines the financial market impact of different types of Federal Reserve communications on several U.S. asset prices (Treasury rates, stock prices, and the euro–U.S. dollar exchange rate) using an intraday event-study analysis. I construct a new database of over 2,200 Federal Reserve events for the period 2001–12. I document that some Federal Reserve events, such as the release of FOMC statements and minutes, the Chairman’s semi-annual Monetary Policy Report to Congress, and his speeches, significantly increase both the volatility of U.S. asset prices and their trading volume. In contrast, speeches by the other members of the Board of Governors (including the Vice Chair) and by regional Federal Reserve Bank presidents do not significantly move U.S. asset prices. Finally, I find that, with the notable exception of FOMC statements, no other Federal Reserve event is associated with positive and statistically significant pre-announcement returns.

JEL Codes: C1, E5.

1. Introduction

Federal Reserve Chairman Bernanke’s testimony to the Joint Economic Committee on the economic outlook on May 22, 2013 led to a large reaction in the Treasury market, with ten-year yields increasing roughly 10 basis points in the one hour bracketing the event. Market

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participants attributed this outsized market reaction to the Chairman's remark that "if we see continued improvement . . . in the next few meetings we could take a step down in our pace of purchases." Investors interpreted this comment as suggesting that the Federal Reserve might start to taper its monthly asset purchases sooner than expected. More generally, over the last decade central bank communication has become a key aspect of the Federal Reserve monetary policy. For instance, both Chairman Bernanke (2004a, 2004b) and Federal Reserve Vice Chair Yellen (2011, 2012, 2013) have said on a number of occasions that clear communication increases the effectiveness of monetary policy. Indeed, modern monetary theory (Woodford 2005) has highlighted the central role that the management of expectations about future interest rates has to enhance the effectiveness of policy. More recently, with short-term interest rates near the zero lower bound, communication about the future path of the target federal funds rate, so-called forward guidance, has become an essential part of unconventional policy (Woodford 2012).

The Federal Reserve uses many communication channels, including post-meeting statements, press conferences, minutes, testimonies, reports, and speeches. Extensive studies have documented the effect of the Federal Reserve's unanticipated target rate decisions on U.S. asset prices.¹ A recent strand of literature has also looked at the asset price response to the release of the Federal Open Market Committee (FOMC) statements.² Despite the vast and growing empirical evidence on the financial market effect of monetary news released on FOMC meeting days, little is known about the real-time (intraday) response of U.S. asset prices to other types of Federal Reserve communications, such as the information originating from Federal Reserve officials' speeches.³ This article fills

¹Some important studies include Kuttner (2001) and Fleming and Piazzesi (2005) for Treasury rates, Bernanke and Kuttner (2005) and Wongswan (2006) for stock prices, and Fatum and Scholnick (2008) for exchange rates.

²Gurkaynak, Sack, and Swanson (2005), Wongswan (2009), and Rosa (2011a, 2011b) document that both the surprise component of policy decisions and post-meeting statements have statistically significant and economically relevant effects on U.S. asset prices.

³Three recent contributions also look at the financial market impact of Federal Reserve communications, as I do in this paper. Ehrmann and Fratzscher

the gap by comparing the effectiveness of different types of Federal Reserve communications. Given the recent trend toward greater transparency (see, *inter alia*, Rudebusch and Williams 2008 and Middeldorp 2011, and the references therein), speeches by members of the Board of Governors (including the Chairman and the Vice Chair) and by regional Federal Reserve Bank presidents may provide salient insights into their views of the economic outlook and the likely course of future U.S. monetary policy. The extent to which market participants monitor, and respond to, these speeches to gain additional information beyond what is contained in the post-meeting statement is a question to be answered empirically. A challenge in addressing this question is, however, the large volume of FOMC talk. For instance, Federal Reserve officials gave 185 speeches in 2012 alone.

The contribution of this paper is twofold. First, a new database of over 2,200 (time-stamped) Federal Reserve events for the period 2001–12 is compiled. The database covers different types of Federal Reserve communications, including post-meeting statements, FOMC minutes, the Chairman's semi-annual monetary policy testimony, and Federal Reserve officials' speeches. Second, this study examines the financial market impact of different types of Federal Reserve communications on U.S. asset prices (two-year and ten-year Treasury rates, stock prices, and the euro–U.S. dollar exchange rate) using a high-frequency (five-minute) event-study analysis. The use of intraday data has the advantage of decreasing the likelihood that other market-relevant information is released during the narrow

(2007) and Hayo, Kutan, and Neuenkirch (2015) construct indicators of the tone in speeches and statements made by FOMC members. Then, they use a GARCH model with daily data to estimate the financial market impact of speeches delivered by FOMC announcements. Given the difficulty of quantifying the surprise component of central bank communications, Kohn and Sack (2004) study the effects of central bank communication events on the volatility of asset prices. This paper complements the findings of these works by using intraday, rather than daily, data. As discussed in the main text of the paper, the use of intraday data is important to precisely estimate the effect of Federal Reserve announcements. Moreover, this paper considers a more up-to-date sample period (from 2001 to 2012). This allows us to study not only the effect of new types of communication, such as the Chairman's press conference, but also the impact of Federal Reserve communication during the financial crisis (as opposed to normal times).

interval around the Federal Reserve event, thus increasing the confidence that any observed movement in asset prices is induced by the monetary policy news.

The main findings of the paper can be summarized as follows. First, I show that the Federal Reserve Chairman's speeches, as well as his semi-annual monetary policy testimony to Congress, induce "higher-than-normal" volatility across different asset classes. For instance, the volatility of two-year Treasury yields is roughly twice as large for the Chairman's speeches (four times as large for the testimony) at the time of the release compared with a period free of such an event. The magnitude of these effects is economically and statistically significant, and it is similar to the financial market impact of the FOMC minutes release, though smaller than the market impact induced by the release of the FOMC "balance-of-risks" statement. This finding implies that at least some part of the Chairman's speech or testimony carries an unanticipated component that affects asset prices. Second, other communications, such as speeches by the other members of the Board of Governors (including the Vice Chair) and by regional Federal Reserve Bank presidents, do not significantly move U.S. asset prices. Third, I examine the robustness of the above results along several dimensions. For instance, I carry out the analysis using trading volumes, and I redo the computations on different subsamples. This sensitivity analysis corroborates the core finding that the Chairman's speeches contain market-relevant information, especially for fixed-income securities. Finally, I test whether the pre-FOMC announcement drift documented by Lucca and Moench (2015), i.e., large average excess returns on U.S. equities in anticipation of monetary policy decisions made at scheduled FOMC meetings, holds for other types of Federal Reserve communications that also lead to increased volatility. I find that, with the notable exception of FOMC statements, none of the Federal Reserve events (including speeches by the Federal Reserve Chair) are associated with positive, large, and statistically significant pre-announcement returns.

The rest of the paper is organized as follows. Section 2 starts by describing the data set. Section 3 contains the discussion of the empirical results of the stock market reaction to the Federal Reserve's monetary policy. Section 4 examines the robustness of the results. Finally, section 5 concludes.

2. Data

I proceed by outlining the data for asset prices and Federal Reserve events—including FOMC statements, minutes, and Federal Reserve officials' speeches.

2.1 *Asset Price Data*

The high-frequency U.S. asset prices consist of quotes measured at five-minute intervals of on-the-run two-year and ten-year Treasury yields, futures prices on the S&P 500 stock index, and the euro–U.S. dollar exchange rate, covering the period 2001–12. Midpoints of bid/ask indicative quotes, observed at the end of each five-minute interval, are used to generate the series of (equally spaced) five-minute continuously compounded asset price returns.⁴ If no indicative quote occurs in a given five-minute interval, I use the price from the previous interval (so-called previous tick rule in calendar time), as long as the previous price is quoted within the last thirty minutes. The Treasury bond yields are provided by Tradeweb and are based on indicative prices rather than transaction prices.⁵ Hence, there is no associated volume data available. The S&P 500 futures data refer to the E-Mini S&P, a stock market index futures contract traded on the Chicago Mercantile Exchange's Globex electronic trading platform, and consist of both prices and trading volumes. A continuous series is constructed by considering the front-month contract and rolling over to the next contract on the expiration date. The front-month futures contract is defined as the nearest unexpired futures contract in the contract sequence (i.e., the shortest duration contract

⁴As noted by Andersen, Bollerslev, and Diebold (2007), the choice of five-minute sampling frequency is based on the balance between confounding market microstructure effects, such as the bid-ask bounce, staleness, and price discreteness, when sampling as finely as possible, and the loss of important information concerning fundamental price movements when sampling more coarsely. Note that Tradeweb data on Treasury yields start on November 13, 2001.

⁵When the quote is indicative, market participants are not obliged to trade at the price stated in the quote. The existing literature on exchange rates (e.g., Danielsson and Payne 2002 and Phylaktis and Chen 2009) has documented that indicative data bear no qualitative difference from those of transaction quotes. Reputation considerations tend to preclude the posting of prices at which a dealer would subsequently refuse to trade.

Table 1. Summary Statistics

	Two-Year Treasury	Ten-Year Treasury	S&P 500	EUR/\$
Mean	0.00	0.00	0.00	0.00
Median	0.00	0.00	0.00	0.00
Maximum	0.24	0.23	4.32	1.70
Minimum	-0.44	-0.31	-2.95	-2.22
Std. Dev.	0.01	0.00	0.08	0.04
Skewness	-1.33	-1.36	0.39	-0.24
Kurtosis	214	164	58	71
Jarque-Bera p-value	0.00	0.00	0.00	0.00
Observations	353,489	496,919	752,484	865,823

Notes: The table reports the summary statistics for the variables used in the econometric analysis. The sample period is January 2001–December 2012, excluding all weekend days. The asset price return is either the five-minute change in Treasury yields (measured in percentage terms), or the five-minute percentage change in the S&P 500 price, or the euro–U.S. dollar exchange rate. The euro–U.S. dollar exchange rate is defined as the U.S. dollar price of one euro such that a negative change implies an appreciation of the U.S. dollar.

that could be purchased in the futures market). The euro–U.S. dollar exchange rate data are provided by Electronic Broking System (in short EBS, now part of ICAP), and include trading volume in the global interdealer spot market (see Chaboud et al. 2004 for a detailed description of these data).⁶ As noted by Chaboud, Chernenko, and Wright (2008), EBS and Reuters are two electronic broking systems that are used globally for interdealer spot trading. Trading in the euro–dollar and dollar–yen currency pairs is concentrated primarily on EBS. Throughout this paper, the euro–U.S. dollar exchange rate is defined as the U.S. dollar price of one euro such that a negative change implies an appreciation of the U.S. dollar.

Table 1 presents a selection of descriptive statistics for all the asset prices used in this paper, and reveals that the mean and the median of the five-minute Treasury yield changes, stock,

⁶The foreign exchange trading volume data are proprietary, and to preserve data confidentiality I show only relative volumes expressed in ratio form rather than as actual amounts of base currency.

and exchange rate returns is very close to zero. All returns are approximately symmetric, and all of them display excess kurtosis. The Jarque-Bera statistics strongly reject the null hypothesis that returns are normally distributed.

2.2 *Federal Reserve Events*

I create a database of over 2,200 Federal Reserve events for the sample period January 2001 to December 2012. The set of Federal Reserve events includes the release of FOMC statements, FOMC minutes, the Chairman's semi-annual monetary policy testimony before Congress (also known as the Monetary Policy Report, MPR), and speeches from members of the Board of Governors of the Federal Reserve and regional Federal Reserve Bank presidents. The list of these Federal Reserve events is obtained from the websites of the Federal Reserve Board (FRB) and the regional Federal Reserve Banks. I use Bloomberg to retrieve the time stamp of each Federal Reserve event.⁷ To avoid double-counting, when an event is reported multiple times, I assign as release time its first occurrence. Then I apply a number of filters to clean the data. Specifically, I exclude an observation if (i) a speech occurs on weekends or outside standard U.S. trading hours (i.e., before 8 a.m. Eastern time, ET, or after 6 p.m. ET)⁸ or (ii) a Federal Reserve event occurs at the same time as another Federal Reserve event. Federal Reserve Board members, as well as regional Federal Reserve Bank presidents, are often asked to testify to Congress on a number of topics, and give media interviews and academic presentations. The analysis of the financial market effect of these types of communications goes beyond the scope of this paper and is left for future research.

⁷In some occasions, Bloomberg does not report speeches by members of the Board of Governors and regional Federal Reserve Bank presidents. Since this study is primarily interested in estimating the financial market impact of the information that market participants receive, I am not very concerned about excluding speeches judged to be unnewsworthy by the newswire services.

⁸Since many important macroeconomic announcements are released at 8:30 a.m. ET (see, for instance, Faust and Wright 2011), to estimate the genuine effect of Federal Reserve events without any contamination from other sources, as a robustness check I also apply a stricter filter that excludes all Federal Reserve events that take place before 9 a.m. ET, rather than 8 a.m. ET. Importantly, all the results discussed below continue to hold.

Table 2 presents the distribution of Federal Reserve events over time. First, the FOMC schedules eight meetings per year, roughly every six weeks. These dates are set far in advance, and thus they can be viewed as exogenous and widely known. There are also additional unscheduled FOMC meetings, the timing of which arises endogenously. Since in the latter case the context of the rate decision is different, I analyze only scheduled meetings. The FOMC issues a policy statement following each regular meeting that summarizes the Committee's economic outlook and the policy decision at that meeting. Second, the FOMC minutes contain a more complete and nuanced discussion of the rationale for the Committee's decision and view of the risks to the outlook than was possible in the post-meeting announcement. Third, the Federal Reserve Act requires the Federal Reserve Board to submit semi-annually the Monetary Policy Report to the U.S. Congress. The report consists of two sections: the first summarizes past policy decisions, whereas the second describes recent financial and economic developments. Fourth, speeches by members of the Federal Reserve Board, as well as regional Federal Reserve Bank presidents, convey information about the current economic outlook and may serve to educate the public on a range of topics, including the central bank monetary policy strategy and the monetary transmission mechanism. In contrast to the FOMC statement, the content of the speeches is released to the media with an embargo time. In these occasions, newswire services can draft a set of news headlines that are released to the public simultaneously as soon as the embargo time has expired.

3. Results

3.1 Top Five Largest Moves in U.S. Asset Price around Federal Reserve Events

As a preliminary illustration of the relative importance of different types of Federal Reserve communications, I follow Fair (2002), and I review the largest asset price changes in a narrow window around each Federal Reserve event. The choice of the length of the window involves a trade-off. On the one side, using a narrow window decreases the likelihood that other relevant information is released in the market during the interval around the Federal Reserve event.

Table 2. Number of Monetary Policy Speeches per Year

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Count	Percent
FOMC Statement	8	8	8	8	8	8	8	8	8	8	8	8	96	4.3
FOMC Minutes	8	8	8	8	8	8	8	8	8	8	8	8	96	4.3
Testimony	2	2	2	2	2	2	2	2	2	2	2	2	24	1.1
Chairman	18	17	12	22	22	22	22	22	22	25	18	15	237	10.7
FRB Vice Chair	13	14	12	11	10	10	8	15	10	7	9	4	123	5.5
FRB Governors	23	32	34	60	45	37	36	30	18	23	19	19	376	16.9
Pres. Atlanta	4	3	7	5	6	5	4	14	12	12	22	13	107	4.8
Pres. Boston	4	5	6	1	2	3	4	10	10	7	12	10	74	3.3
Pres. Chicago	14	19	12	15	14	18	13	8	11	13	8	10	155	7.0
Pres. Cleveland	8	0	1	6	8	10	6	5	5	6	8	11	74	3.3
Pres. Dallas	8	5	2	4	7	20	18	13	15	11	16	11	130	5.8
Pres. Kansas City	3	0	3	2	3	4	2	4	11	9	7	2	50	2.2
Pres. Minneapolis	1	2	1	0	1	0	1	7	9	16	19	14	71	3.2
Pres. New York	3	6	2	8	9	10	9	3	9	14	19	16	108	4.9
Pres. Philadelphia	12	12	7	10	11	2	8	11	8	11	13	14	119	5.4
Pres. Richmond	3	0	9	3	8	10	9	8	13	13	12	10	98	4.4
Pres. S. Francisco	8	11	12	6	11	11	12	13	13	3	9	19	128	5.8
Pres. St. Louis	10	11	13	10	14	13	15	10	11	17	17	17	158	7.1
Total	150	155	151	181	189	193	185	191	195	205	226	203	2,224	100

Notes: The table reports the number of monetary policy speeches that have been included in the econometric analysis. The sample period is January 2001–December 2012. The column “Count” is the sum of the number of monetary events, and “Percent” is the ratio of that specific event over the total number of events.

On the other side, the cost is that the length of the window is not sufficient to capture the full effect of the Federal Reserve announcement. Considering this trade-off, to identify the top five largest price moves I choose a window that starts at the time of the release and ends ten minutes after.

Table 3 lists the top five largest moves in two-year and ten-year Treasury yields, S&P 500, and the euro–U.S. dollar exchange rate for the sample period 2001–12. Basis points are used to measure fixed-income moves, whereas percentage changes are used to gauge the scale of market moves in the equity and foreign exchange market. A number of interesting facts are apparent from the table. First, the FOMC rate decision and the related post-meeting statement cause most of the largest asset price changes (more than 80 percent of the changes). Moreover, the largest asset price responses are associated with the March 18, 2009 FOMC meeting, when the Federal Reserve announced multiple policy changes at the same time, including both its intention to keep the federal funds rate low “for an extended period” and its plans to extend asset purchases. The FOMC post-meeting statement released on January 28, 2004 also led to large changes in asset prices, with the two-year and ten-year Treasury yields jumping 23 and 19 basis points, respectively, in the ten minutes surrounding the release, and the U.S. dollar appreciating 0.7 percent against the euro. This large market response was induced not by an immediate change in the policy rate, but rather by an unanticipated change in the guidance regarding the target federal funds rate. On that day, in line with expectations, the FOMC left the target federal funds rate unchanged at 1 percent. Market participants were surprised, however, by changes to the wording of the statement with the removal of the “considerable period” phrase and the Committee stating instead that it could “be patient in removing its policy accommodation.” The responses of asset prices suggest that market participants viewed the changing in the wording as steps toward the beginning of an eventual tightening cycle. This finding is consistent with the results of Gurkaynak, Sack, and Swanson (2005) and Rosa (2011a, 2011b) that both the surprise component of policy actions and official communication are important drivers of U.S. asset prices.

Second, roughly half of the largest asset price responses to Federal Reserve events took place between December 2007 and June

Table 3. Top Five Largest Changes in U.S. Asset Price Changes

<i>A. Two-Year Treasury Rate</i>				
Date	Basis Point Change	Change in σ Units	Event	
01/28/2004 02:15 p.m.	23	38	FOMC Statement	
01/11/2002 01:45 p.m.	-13	-15	Federal Reserve's Greenspan Speaks on U.S. Economy in San Francisco	
03/21/2007 02:15 p.m.	-12	-14	FOMC Statement	
12/16/2008 02:20 p.m.	-11	-9	FOMC Statement	
09/18/2007 02:15 p.m.	-11	-13	FOMC Statement	
<i>B. Ten-Year Treasury Rate</i>				
Date	Basis Point Change	Change in σ Units	Event	
03/18/2009 02:15 p.m.	-30	-33	FOMC Statement	
01/28/2004 02:15 p.m.	19	32	FOMC Statement	
06/24/2009 02:15 p.m.	10	11	FOMC Statement	
03/16/2004 02:15 p.m.	-9	-15	FOMC Statement	
12/16/2008 02:20 p.m.	-8	-8	FOMC Statement	
<i>C. S&P 500</i>				
Date	% Change	Change in σ Units	Event	
03/18/2009 02:15 p.m.	2.4	12	FOMC Statement	
12/11/2007 02:15 p.m.	-1.8	-15	FOMC Statement	
10/03/2002 10:00 a.m.	1.2	6	Federal Reserve's Ferguson Speaks at SWIFT World Forum in Switzerland	
01/30/2008 02:10 p.m.	1.2	4	FOMC Statement	
10/29/2008 02:15 p.m.	-1.2	-4	FOMC Statement	

(continued)

Table 3. (Continued)

<i>D. EUR/\$ Exchange Rate</i>					
Date	% Change	Change in σ	Units	Event	
03/18/2009 02:15 p.m.	1.4	18		FOMC Statement	
12/16/2008 02:20 p.m.	0.7	8		FOMC Statement	
01/28/2009 02:15 p.m.	-0.7	-9		FOMC Statement	
02/11/2004 11:00 a.m.	0.7	12		Monetary Policy Report	
01/28/2004 02:15 p.m.	-0.7	-12		FOMC Statement	
<i>E. Ten-Minute Volatility by Year</i>					
	Two-Year Treasury	Ten-Year Treasury	S&P 500	EUR/\$	
2001	1.3	1.2	0.18	0.07	
2002	0.9	0.8	0.21	0.06	
2003	0.7	0.8	0.14	0.07	
2004	0.6	0.6	0.09	0.06	
2005	0.5	0.5	0.09	0.05	
2006	0.4	0.4	0.08	0.05	
2007	0.9	0.6	0.12	0.04	
2008	1.3	1.0	0.31	0.09	
2009	0.7	0.9	0.20	0.08	
2010	0.5	0.7	0.14	0.07	
2011	0.5	0.8	0.16	0.07	
2012	0.3	0.5	0.10	0.05	

Notes: The table reports the top five largest asset price changes in a narrow window around the release of a Federal Reserve event. The sample period is January 2001–December 2012. The asset price return is either the ten-minute change in the bond yields (measured in basis points), or the ten-minute percentage change in the stock price, or the euro–U.S. dollar exchange rate. The event window starts at the time of the release and ends ten minutes after. The euro–U.S. dollar exchange rate is defined as the U.S. dollar price of one euro such that a negative change implies an appreciation of the U.S. dollar. The column “Change in σ Units” normalizes the asset price return by the respective year volatility. For completeness, panel E reports the volatility of ten-minute asset returns (between 9 a.m. and 4 p.m. ET, weekdays only) by year. Volatility is measured in basis points for Treasury rates and in percentage points for the S&P 500 and the euro–dollar exchange rate.

2009. Higher asset price volatility observed during the recent financial turbulence that started in August 2007 may explain part of this finding. In particular, panel E of table 3 displays the ten-minute volatility by calendar year, and indicates a higher-than-normal volatility in 2008. To allow meaningful comparisons across years, and thus to take into account the heteroskedasticity of asset returns, I normalize asset price moves by the corresponding ten-minute yearly volatility. The third column of panels A–D in table 3 shows that even in 2008 the largest price moves are between four and nine standard deviations away from the mean, suggesting that monetary news has remained an important driver of asset prices also during the financial crisis. A possible interpretation of this result is that in an environment of exceptional uncertainty, market participants may monitor even more closely the Federal Reserve monetary policy to gain additional insight into the future economic outlook and near-term interest rate decisions, and perhaps about the introduction of extraordinary liquidity facilities and the future asset purchases. Finally, among the top market movers, an important role seems to be played by the Federal Reserve Chairman through both speeches and his semi-annual testimony to Congress.

These examples underscore the importance of Federal Reserve communications in steering U.S. asset prices. In the next section, I turn to a more systematic analysis of the financial market impact of Federal Reserve events.

3.2 Volatility

A major challenge in estimating the financial market impact of central bank communications consists of quantifying the surprise component of the announcement, since there are no direct measures about market participants' expectations of the tone of Federal Reserve communications. Several authors (see, *inter alia*, Guthrie and Wright 2000; Romer and Romer 2004; Hayo, Kutan, and Neuenkirch 2015; and the references therein) have applied a narrative approach to overcome this issue. This procedure may, however, present some shortcomings, such as the inherent subjectivity of the classification of the tone of the announcement and the maintained assumption that central banks use code words in a consistent way. In this paper I follow Kohn and Sack (2004), and get around this

difficulty by looking at the volatility of asset prices in a narrow window bracketing the Federal Reserve's release compared to non-event days. The underlying idea is that as long as some part of the policy release carries an unanticipated component, market participants revise to some extent their expectations, and the volatility of asset prices will be higher on announcement days than it would be otherwise. The reason to focus on volatility, rather than the level, of asset prices is that some speeches increase and others decrease prices, leaving the total net effect small relative to the absolute effect.

To gauge the extent to which Federal Reserve communications induce elevated price fluctuations, I look at (i) the standard deviation of the five-minute returns on release days, and (ii) the standard deviation of the five-minute returns on the same weekdays (of the previous and following week of the release day) and hours but on non-announcement days.⁹ By doing so, I control for both intraday patterns and day-of-the-week effects, and thus I take into consideration that asset price volatility may be time varying. I consider the financial market impact induced by the release of the FOMC balance-of-risks statement, including the post-FOMC press conference, the FOMC minutes, and the semi-annual Monetary Policy Report to the U.S. Congress. I also consider speeches made by the Federal Reserve Chairman; the Vice Chair of the Federal Reserve Board; FRB Governors; the president of the Federal Reserve Bank of New York, who also serves as the vice chairman of the FOMC; and presidents of all the other regional Federal Reserve Banks.

Since asset price returns are not normally distributed, I use the Brown and Forsythe (1974) statistics to test the null hypothesis of equal variances in each subgroup. This statistical test is based on the absolute median difference and is robust under non-normality in the data, including the presence of fat tails, while retaining good statistical power. The sample period for all these events is January

⁹As a robustness check, I also consider the square root of the mean of squared returns, i.e., $\sqrt{(\sum_{t=1}^T r_t^2)/(T-1)}$, where r_t is the five-minute return, T is the number of observations in the sample, and the results (available upon request) remain extremely similar. As a further robustness check, I also compute the standard deviation of the five-minute returns on non-announcement days by using the previous and following day of the release date, rather than the same weekdays of the previous and following week of the release day. It is reassuring that the results reported in the paper continue to hold.

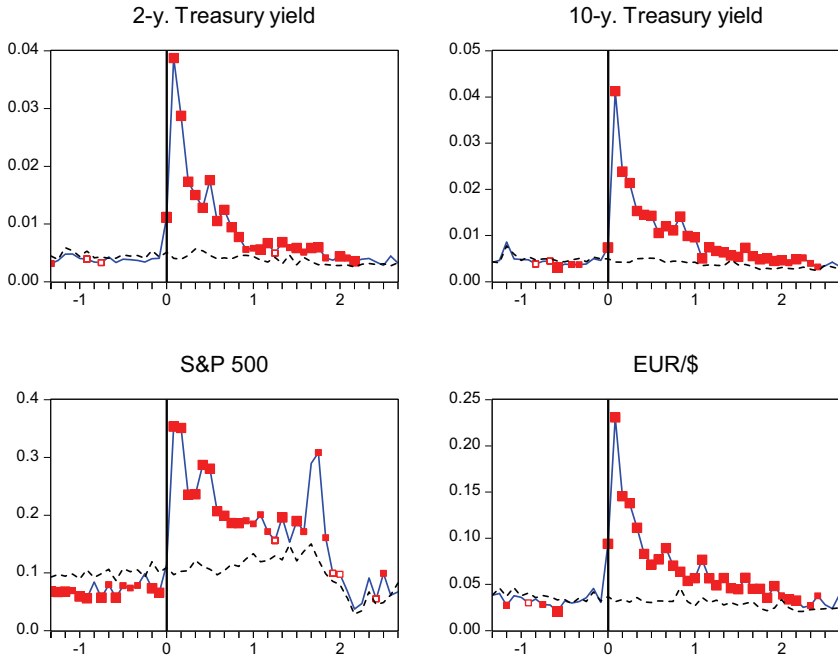
2001–December 2012, except for the FOMC minutes where, for institutional reasons explained below, I use the sample January 2005–December 2012. In the interest of space, most of these results can be found in a supplemental appendix at <http://www.ijcb.org>.¹⁰

Figure 1 displays the asset price volatilities on FOMC meeting days with a solid line from one hour before to two hours after the statement release time, indicated by a vertical line. A dashed line displays asset price volatilities on control days. Squares indicate the rejection of the null hypothesis: large and small filled squares denote significance at the two-sided 1 percent and 5 percent level, respectively, whereas a small hollow square denotes significance at the 10 percent level. The release of the FOMC post-meeting statement induces significantly higher-than-normal volatility on asset prices. For instance, the volatility of two-year Treasury yields suddenly jumps at the time of the release to about 4 basis points, roughly eight times larger on event days compared with a period free of such an event, and remains significantly higher up to around two hours after the event. Fixed-income assets are the most affected asset class, followed by the euro–U.S. dollar exchange rate and the S&P 500 stock prices. This result highlights the importance of FOMC announcements in driving U.S. asset prices.¹¹ Of note, the volatility of the S&P 500 is statistically lower in all of the five-minute periods leading up to the release of the FOMC statement. In other words, equity traders take a “wait-and-see” approach and restrain from transacting before the release of the statement. This *intra-day* pre-announcement effect is consistent with the *daily* evidence documented by Bomfim (2003) that the stock market tends to be

¹⁰In future work, it would be interesting to separate speeches into those that focus on forward-looking monetary policy inclinations and the U.S. economic outlook as opposed to speeches that cover other topics, such as the regional economy, regulatory reforms, and commencement ceremonies.

¹¹Chaboud et al. (2004), Fleming and Piazzesi (2005), and Rosa (2013), among others, report very similar results for the sample periods 1999–2004, 1994–2004, and 2005–11, respectively. Compared with those studies, this paper considers a more up-to-date sample period (2001–12). In contrast to Rosa (2013), this paper excludes unscheduled FOMC meetings in the set of event days. The timing of unscheduled meetings arises endogenously, instead of being set far in advance. Hence, the context of the rate decision is different compared with scheduled meetings. Note that the inclusion of unscheduled FOMC meetings tends to be associated with large asset price responses, especially for U.S. stock returns.

Figure 1. Volatility of Asset Prices around the Release of the FOMC Statement



Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the release of the FOMC statement on FOMC meeting days with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the FOMC meeting day) with a dashed line. Returns are five-minute yield changes for Treasury rates and five-minute percentage changes for the S&P 500 and the euro-dollar exchange rate. The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time of the FOMC minutes, i.e., 2 p.m. ET. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level respectively, whereas small hollow squares denote significance at the 10 percent level.

relatively quiet (i.e., conditional volatility is abnormally low) on days preceding regularly scheduled FOMC policy announcements.¹²

In April 2011 the Federal Reserve enhanced the transparency of its communication policy along two dimensions. First, the FOMC decided to release the Summary of Economic Projections (SEP) within hours of the meeting, rather than three weeks later with the release of the FOMC minutes. The economic projections are collected from each member of the Board of Governors and each Federal Reserve Bank president, and provide the policymakers' forecasts for a few economic variables (economic growth, unemployment, and headline and core inflation). The SEP has also included the projections for the future path of the target federal funds rate since January 2012. Second, the Federal Reserve joined several other central banks, such as the European Central Bank, the Bank of Japan, Sveriges Riksbank, and Norges Bank, in holding a post-FOMC meeting press conference. The goal of the press conference is to provide additional information to market participants beyond that contained in the monetary policy decision and post-FOMC statement. It comprises two elements: a prepared opening statement that typically contains a summary of the background considerations for the monetary policy decision, and a question-and-answer session, where financial journalists are given the opportunity to ask questions to the Chairman. To date, the entire press conference has lasted on average about one hour, of which roughly ten minutes have been devoted to the prepared remarks. Between June 2011 and December 2012, the timing of the events was as follows: the policy decision and the statement were released at 12:30 p.m. ET, the SEP was released at 2 p.m., and the press conference began at 2:15 p.m. Since the start of 2013, the Federal Reserve has changed the schedule of the events by releasing the statement and the SEP at 2 p.m. and starting the press conference at 2:30 p.m. The gap between the release of the decision from the release of the SEP and the accompanying press conference allows researchers to disentangle the financial market effect of each announcement separately. In other words, this work represents a first evaluation of the informational content of the SEP and the

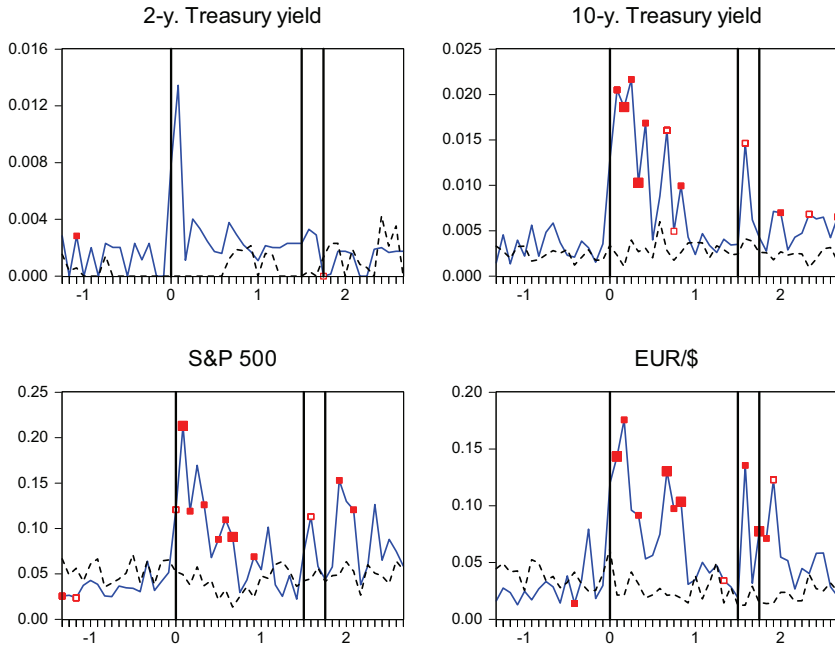
¹²Jones, Lamont, and Lumsdaine (1998) use daily data on Treasury securities for the sample 1979 to 1995, and document a similar "calm-before-the-storm" effect on days prior to important macroeconomic announcements.

Chairman's press conference as perceived by market participants.¹³ Figure 2 displays the asset price volatilities on FOMC meeting days with a solid line and on control days with a dashed line. The vertical lines are placed at 12:30 p.m. (statement release time), 2 p.m. (SEP release time), and 2:15 p.m. (press conference start time). The sample period is January 2012–December 2012, since before 2012 the SEP did not contain the projections of the future path of the target federal funds rate. Given the small sample of press conferences that are analyzed (only five), the empirical results below should be interpreted cautiously. Consistent with the findings of figure 1, the release of the FOMC statement exerts an economically large and highly significant impact on U.S. asset prices, though its magnitude is roughly half the magnitude displayed in the period 2001–12. For instance, the average volatility at the time of the release of the ten-year Treasury yield is roughly 4 basis points in the whole sample period, and only 2 basis points in 2012. This finding is particularly accentuated for the two-year Treasury yields, which were strongly affected by the binding constraint of the zero lower bound (see also Swanson and Williams 2014 for a similar result). The novel feature of figure 2, however, is the assessment of the financial market impact of the release of the SEP and the press conference. The release of the SEP induces significantly higher-than-normal volatility on asset prices, especially on the ten-year Treasury yield and on the euro–dollar exchange rate. The press conference also adds additional information to the release of the FOMC statement and SEP, though to a lesser extent. These empirical findings confirm that the release of the SEP and the press conference are effective additional tools together with the statement in communicating in real time the Federal Reserve's views on the economic outlook and on the future path of the federal funds target rate.

Figure 3 displays the asset price volatilities on the release dates of the FOMC minutes. In this exercise the sample period starts in 2005; prior to that year, the minutes were released only after

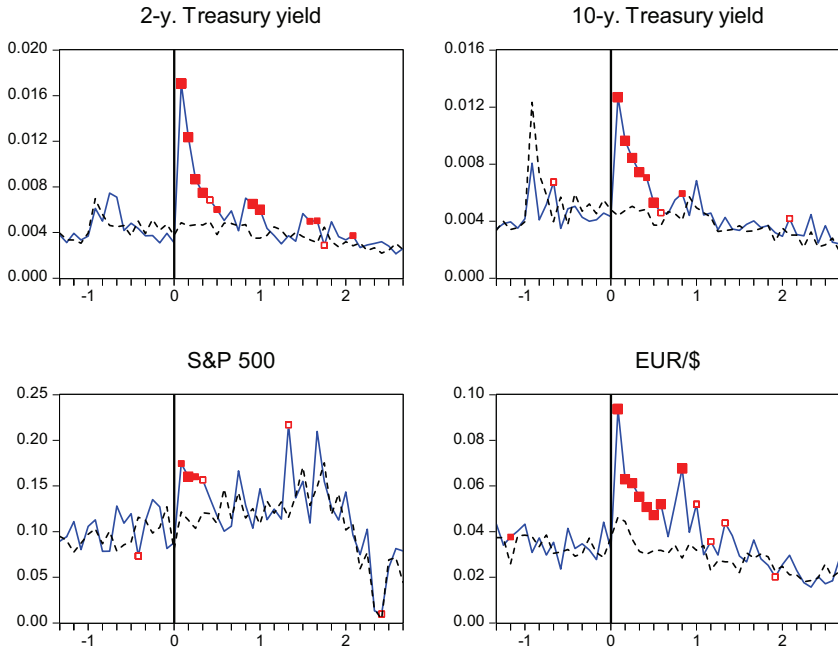
¹³A number of studies (Musard-Gies 2006; Rosa and Verga 2008; Ehrmann and Fratzscher 2009; Brand, Buncic, and Turunen 2010; and Conrad and Lamla 2010) have analyzed the impact of the European Central Bank's press conference on the European term structure and euro exchange rates, and document that the unexpected component of ECB communications has a significant and sizable impact on European asset prices.

Figure 2. Volatility of Asset Prices around the Release of the FOMC Statement, SEP, and the Chairman's Press Conference



Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the FOMC statement release with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the FOMC minutes release day) with a dashed line. Returns are five-minute yield changes for Treasury rates and five-minute percentage changes for the S&P 500 and the euro-dollar exchange rate. The sample period is January 2012–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The first vertical line is placed at the release time of the FOMC statement (12:30 p.m. ET); the second vertical line is placed at the release time of the Summary of Economic Projections (2 p.m. ET); and the third vertical line is placed at the start of the Chairman's press conference (2:15 p.m. ET). Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

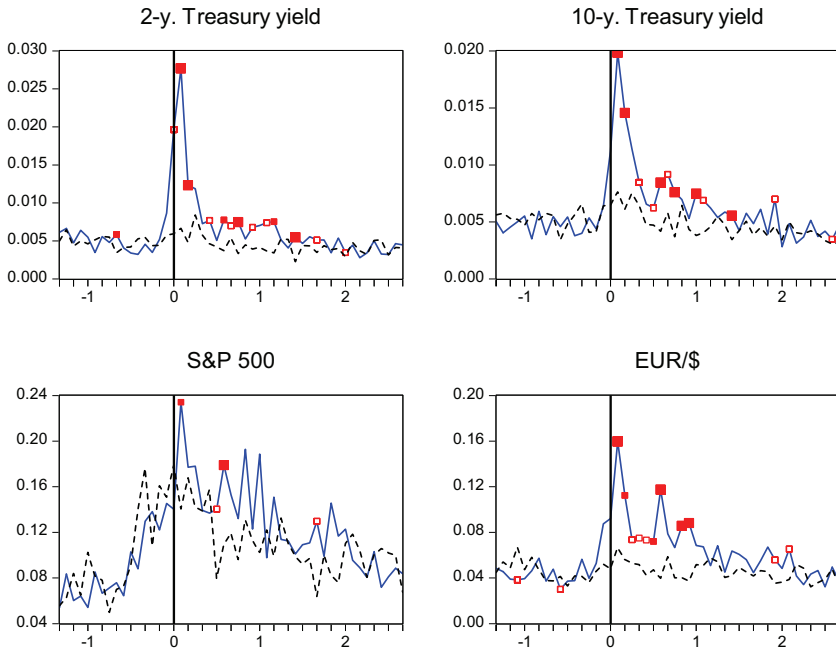
Figure 3. Volatility of Asset Prices around the Release of FOMC Minutes



Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the FOMC minutes release with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the FOMC minutes release day) with a dashed line. Returns are five-minute yield changes for Treasury rates and five-minute percentage changes for the S&P 500 and the euro-dollar exchange rate. The sample period is January 2005–March 2011. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time of the FOMC minutes, i.e., 2 p.m. ET. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

the next meeting had already finished, rendering them largely of historical interest. As documented in Rosa (2013), the release of the FOMC minutes increases volatility, especially for fixed-income assets. The reaction of asset prices is, however, less pronounced and

Figure 4. Volatility of Asset Prices around the Chairman's Testimony to Congress



Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the release time of the semi-annual Monetary Policy Report to Congress with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the release day) with a dashed line. Returns are five-minute yield changes for Treasury rates and five-minute percentage changes for the S&P 500 and the euro-dollar exchange rate. The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

shorter lived than the market impact induced by the release of the FOMC statement.

Figure 4 displays the effect induced by the release of the Monetary Policy Report. The volatility of all asset prices, except stock

prices, peaks at the time of the release and remains higher than normal for roughly one hour after the event. The economic importance of the MPR is similar to that of the minutes. For instance, the volatility of the ten-year Treasury yields around the release of the MPR and minutes is 2 and 1.6 basis points, respectively, versus a non-event volatility of half a basis point.

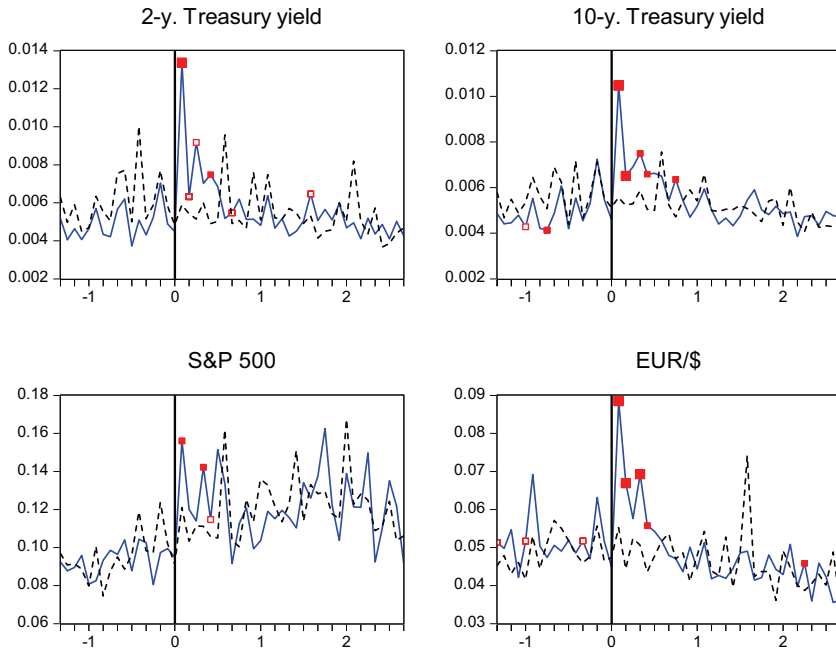
Another market-relevant Federal Reserve event is represented by the release of the Chairman's speeches. Figure 5 shows that the volatility of asset prices jumps at the time of the release and remains higher than normal for roughly thirty minutes after the event. Specifically, the volatility of Treasury yields becomes twice as large at the time of the release compared with non-announcement days. This finding indicates that the market effects of the Chairman's speeches are smaller than those induced by the minutes and the MPR.

Speeches by other Federal Reserve officials, including the Vice Chair of the Federal Reserve Board, FRB Governors, and presidents of the regional Federal Reserve Banks, are important as well, yet they do not as significantly affect the volatility of U.S. asset prices as those delivered by the Chairman (see figures 6–8). In other words, there are some notable speeches that seemed to substantially move asset prices (e.g., on November 27, 2001, the two-year Treasury yield decreased roughly 20 basis points surrounding Governor Meyer's speech). However, on average the volatility of asset returns around the release of these speeches is not significantly different from the volatility on non-event days.

Finally, I look at the impact of speeches made by regional Reserve Bank presidents, distinguishing between voting and non-voting members of the FOMC. Figure 9 and figure 10 show that on average the speeches of the regional Reserve Bank presidents seem to be significantly more effective in moving asset prices, and especially the two-year Treasury rate, when they serve as voting members, though the evidence is overall weak.

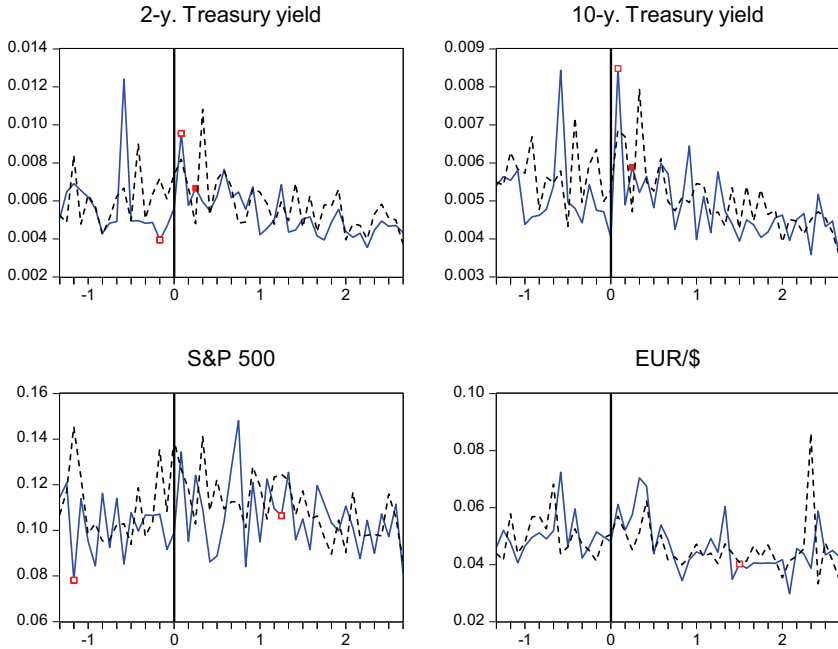
To sum up, this section shows that some Federal Reserve events, such as the release of FOMC statements and minutes, the Chairman's semi-annual Monetary Policy Report to Congress, and his speeches, significantly increase the volatility of U.S. asset prices. In contrast, speeches by the other members of the Board of Governors (including the Vice Chair) and by regional Federal Reserve Bank presidents do not significantly move U.S. asset prices.

Figure 5. Volatility of Asset Prices around the Federal Reserve Chairman’s Speeches



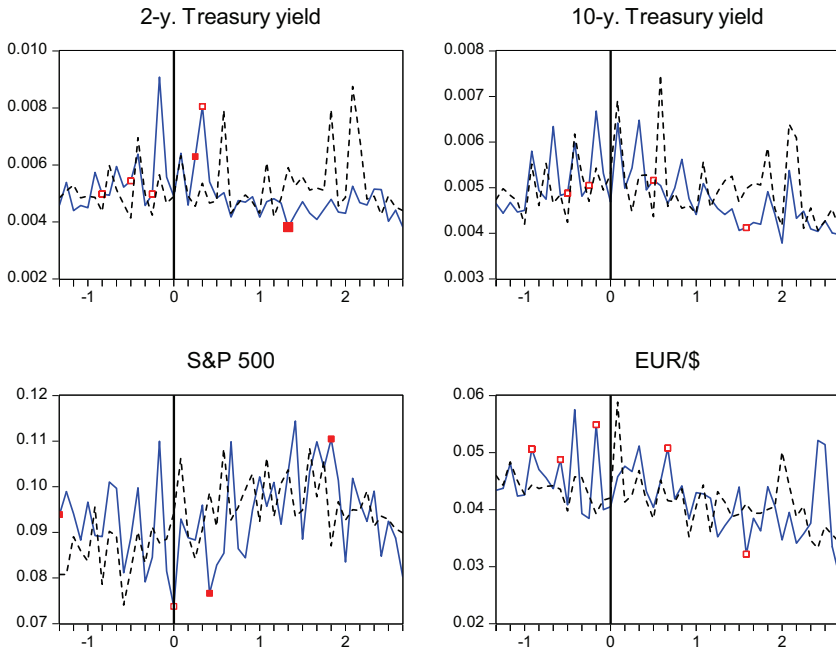
Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the release time of the speeches of the Federal Reserve Chairman with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the release day) with a dashed line. Returns are five-minute yield changes for Treasury rates and five-minute percentage changes for the S&P 500 and the euro–dollar exchange rate. The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

Figure 6. Volatility of Asset Prices around the FRB Vice Chair Speeches



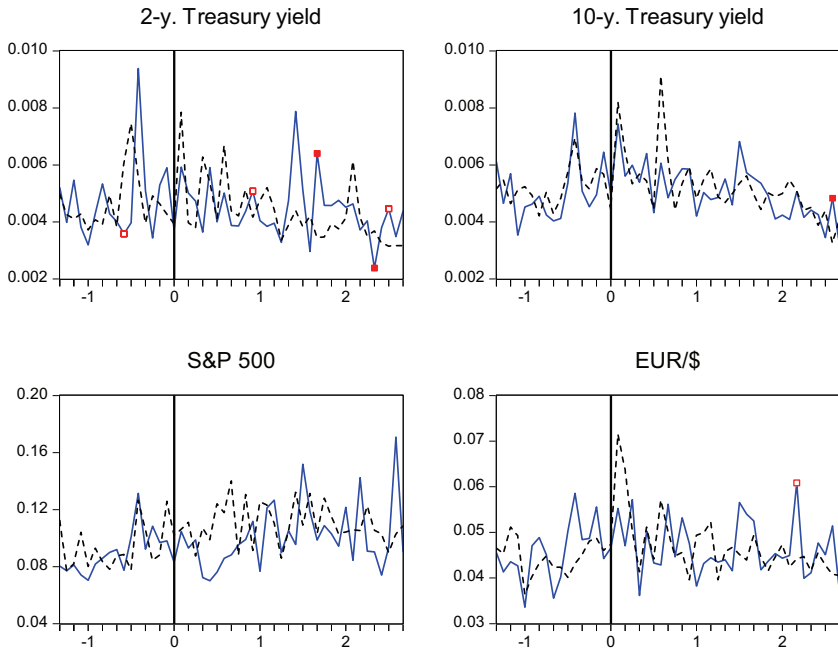
Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the release time of the speeches of the Federal Reserve Vice Chair with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the release day) with a dashed line. The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

Figure 7. Volatility of Asset Prices around the FRB Governors' Speeches



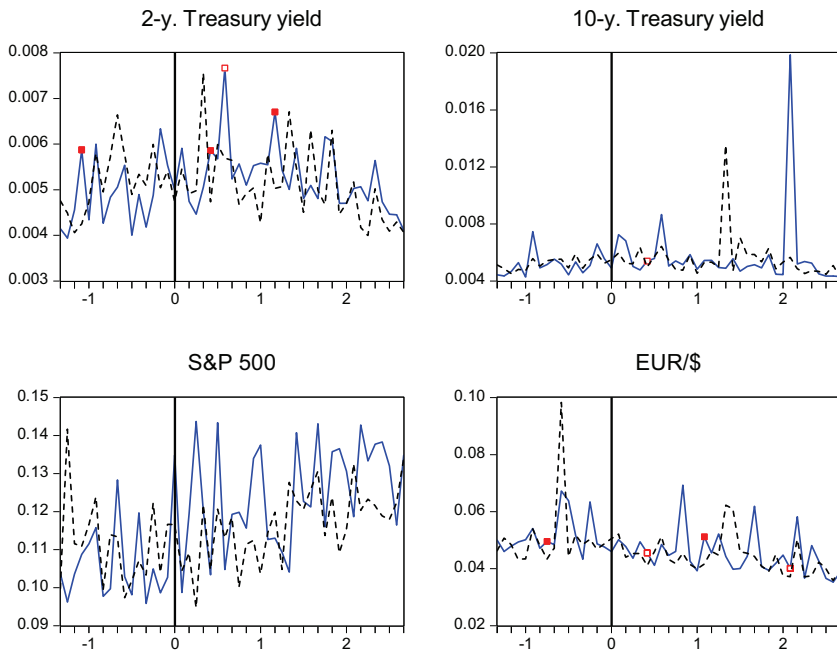
Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the release time of the speeches of the Federal Reserve Board Governors with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the release day) with a dashed line. The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

Figure 8. Volatility of Asset Prices around the Federal Reserve Bank of New York President's Speeches



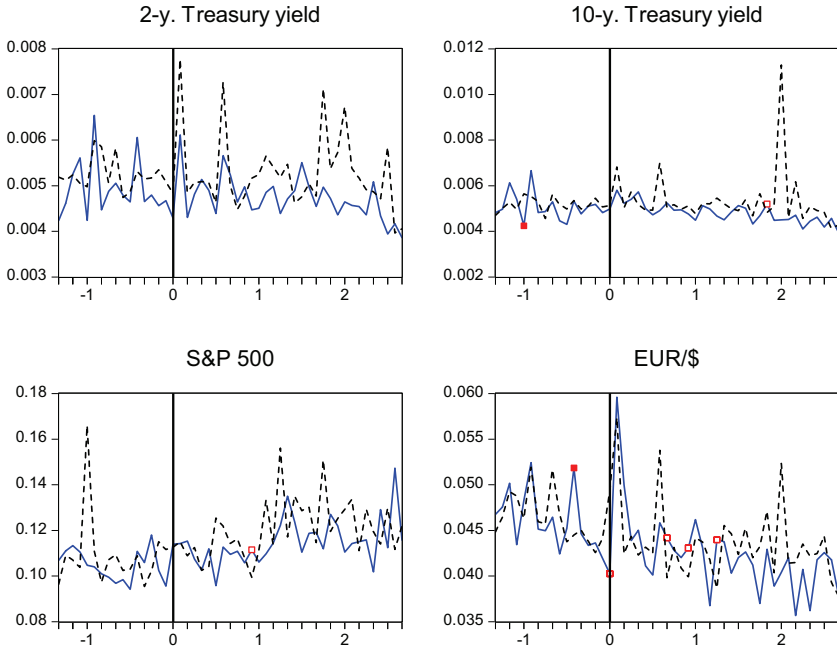
Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the release time of the speeches of the Federal Reserve Bank of New York president with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the release day) with a dashed line. The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

Figure 9. Volatility of Asset Prices around the Voting Regional Federal Reserve Bank Presidents' Speeches



Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the release time of the speeches of the voting presidents of the twelve District Federal Reserve Banks with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the release day) with a dashed line. The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

Figure 10. Volatility of Asset Prices around Speeches by Non-Voting Regional Federal Reserve Bank Presidents



Notes: This figure plots (i) the standard deviation of five-minute asset price returns around the release time of the speeches of the non-voting regional Federal Reserve Bank presidents, who are also attend FOMC meetings, with a solid line, and (ii) the standard deviation of five-minute asset price returns on control days (the same weekdays and hours of the previous and following week of the release day) with a dashed line. The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time. Brown and Forsythe (1974) statistics are employed to test the null hypothesis of equal variances in each subgroup. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

3.3 Pre-announcement Drifts for Different Types of Federal Communications

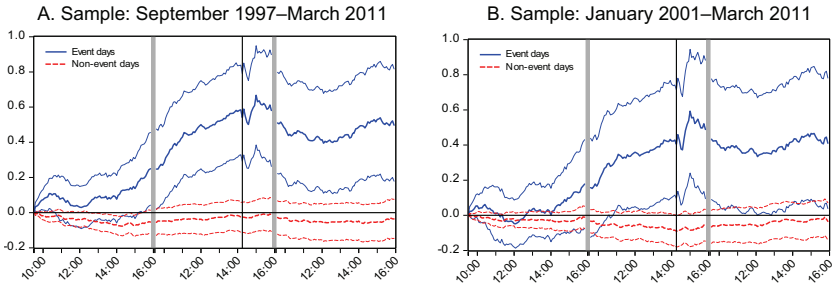
In this section, I test whether pre-announcement drifts are present not only for the release of FOMC statements but also for the release of other types of Federal Reserve communications.¹⁴

Savor and Wilson (2013) find positive and significant excess equity returns on days of inflation, labor market, and FOMC releases. Lucca and Moench (2015) extend this study by examining returns ahead of scheduled announcements, rather than unconditional returns on announcement days. They show that post-1994 stock returns have averaged about 0.5 percent from 2 p.m. of the day before to 2 p.m. ET of the day of scheduled FOMC announcements. Moreover, since 1994, more than 80 percent of the equity premium on U.S. stocks has been earned ahead of the FOMC announcement, and so it is not related to monetary policy decisions. I investigate whether the striking finding documented by Lucca and Moench (2015) holds (i) for the January 2001 to March 2011 period studied here, and (ii) for other types of Federal Reserve communications that lead to higher volatility. Figure 11 displays the average cumulative intraday returns on the S&P 500 stock prices over a three-day window from the market open of the day before to the day after FOMC meetings. The vertical line is set at 2:15 p.m. ET, when FOMC statements for scheduled meetings are released. The thick dashed line shows average cumulative returns on all other three-day windows that do not include FOMC announcements, whereas the thin (solid and dashed) lines represent 95 percent confidence bands around the average cumulative returns. Consistent with the findings of Lucca and Moench (2015), the figure displays a large and significant upward drift in the hours ahead of scheduled FOMC announcements over the sample September 1997 to March 2011 (chart in the left panel) and over January 2001 to March 2011 (chart in the right panel).¹⁵ However, this pre-FOMC announcement drift is not present in other asset classes, such as the two-year and ten-year

¹⁴I thank an anonymous referee for suggesting this exercise.

¹⁵Since April 2011, the time of the release of the statement has varied between 12:30 p.m., 2 p.m., or 2:15 p.m., depending on whether the FOMC chairman holds a press conference.

Figure 11. Cumulative S&P 500 Returns: FOMC Statement (different samples)



Notes: Panel A displays the average cumulative returns on the S&P 500 stock prices on three-day windows. The five-minute asset return is the five-minute percentage changes for stock prices and the euro-dollar exchange rate. The five-minute returns are centered at zero. The sample period is from September 1997 to March 2011 (left panel) and January 2001 to March 2011 (right panel), and it includes only scheduled FOMC meetings. The thick solid line is the average cumulative return from 9:30 a.m. ET on days prior to 4 p.m. ET on days after scheduled FOMC announcements. The thick dashed line shows average cumulative returns on all other three-day windows that do not include FOMC announcements. The gray shaded areas are the end of the trading day. The thin lines represent 95 percent confidence bands around the average cumulative returns. The vertical line is set at 2:15 p.m. ET, when FOMC statements are typically released in this sample period.

Treasury rates and the euro-dollar exchange rate (results reported in a separate appendix).¹⁶

I further investigate whether U.S. asset prices feature abnormal returns ahead of other major Federal Reserve announcements. I consider scheduled Federal Reserve news, such as the release of the FOMC minutes and the release of the Monetary Policy Report, and speeches by Federal Reserve officials. For the FOMC minutes and the MPR, which are usually released at 2 p.m. ET and 10 a.m. ET, respectively, I compute average cumulative intraday returns from the market open of the day before to the day after the release of the Federal Reserve news. None of these two releases features statistically

¹⁶This pre-announcement drift is not present for other major central banks. Brusa, Savor, and Wilson (2015) find no significant effect for the policy announcements made by the Bank of England, the European Central Bank, and the Bank of Japan, either in their domestic stock market or in the U.S. stock market.

significant pre-announcement abnormal returns in the 2001–12 sample. Since the speeches by the Chairman, the Vice Chair, FRB Governors, and regional Federal Reserve Bank presidents may take place when U.S. financial markets are closed, I consider only speeches that occur between 8 a.m. and 5 p.m. ET. To assess the presence of abnormal returns I estimate the following regression:

$$R_t = \beta_0 + \beta_1 \mathbf{1}(\text{pre-Fed event}_t) + \varepsilon_t, \quad (1)$$

where the dependent variable R_t stands for the twenty-four-hour U.S. Treasury yield changes, and the twenty-four-hour percentage change in the S&P 500 stock price and the euro–U.S. dollar exchange rate ending fifteen minutes before the event. The explanatory variable $\mathbf{1}(\text{pre-Fed event}_t)$ is a dummy variable that equals one on pre-Federal Reserve announcement windows and zero otherwise. The error term represents other factors that affect asset prices on event times. The coefficient β_0 measures the unconditional average daily return earned outside of the pre-Federal Reserve event window, whereas the coefficient β_1 measures the unconditional average daily return differential earned on pre-Federal Reserve event days compared with other days. Estimation results (available in a separate appendix on the IJCB website) indicate that no Federal Reserve event other than the FOMC statement is associated with large and statistically significant pre-announcement returns.

4. Robustness Checks and Extensions

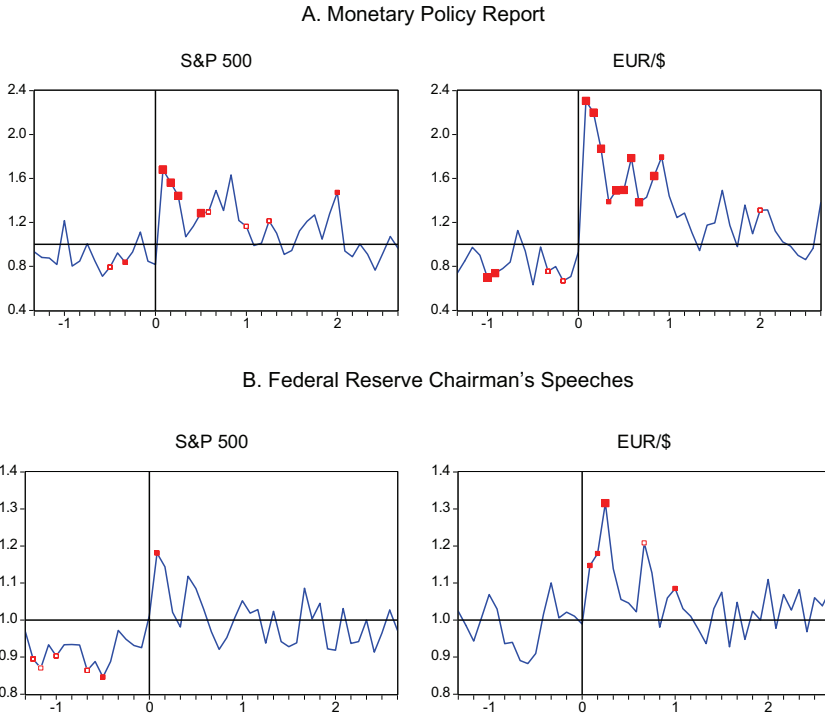
To assess the robustness of the baseline results of the previous section, I also carry out the analysis using trading volumes for the S&P 500 stock index and the euro–U.S. dollar exchange rate, and I redo the estimations about the effect of the Chairman’s speeches on different subsamples.

First, I look at the relationship between trading volumes and the arrival of Federal Reserve events. Since volumes have grown over time, to avoid overweighting the most recent years, I compute the ratio between (i) the five-minute volumes on release days, and the average of (ii) the five-minute volumes on the same weekdays (of the previous and following week of the release day) and hours but on non-announcement days. Then I test the null hypothesis that

the median ratio equals one, i.e., the trading activity is the same on Federal Reserve event days and non-event days. The Wilcoxon signed-ranks test (see Newbold 1988) is employed to account for the possibility that the ratio is not normally distributed. Since the existing literature documents a positive contemporaneous relation between volume and volatility (see Karpoff 1987 and, more recently, Galati 2000), I expect that volumes are higher than normal around the release of Federal Reserve events. In the interest of brevity, I analyze only the market impact induced by the release of the Monetary Policy Report and the Chairman's speeches. Figure 12 (panel A) displays the effect induced by the release of the Monetary Policy Report. Trading activity is lower than normal before the release of the MPR, becomes twice as large as non-event days at the time of the release, and then gradually returns to its normal level. The response is more pronounced in terms of both magnitude and length for the euro-dollar exchange rates (at the peak 2.4 times as large as non-event days and the ratio is significantly different from one for roughly one hour after the event) than for the S&P 500 stock index (1.7 times as large and significantly different from one for about thirty minutes). Figure 12 (panel B) displays the effect induced by the release of the Chairman's speeches. On average, market activity is roughly 25 percent higher at the release time than non-event days for the S&P 500 and 20 percent higher for the euro-dollar exchange rates. To sum up, trading volumes around the release of the MPR and the Chairman's speeches follow a similar pattern exhibited by return volatilities. Specifically, trading volumes are higher on event days, and the difference of trading volumes between event and non-event dates peaks at announcement times.

Second, given the market impact of the Chairman's speeches, I investigate whether their effectiveness is affected by the identity of the Chairman by splitting the sample into two subsamples: January 2001–January 2006 (Chairman Greenspan) and February 2006–December 2012 (Chairman Bernanke). I find (results available in a separate appendix) that both Greenspan's and Bernanke's speeches move U.S. asset prices. However, speeches by Greenspan on average led to larger price movements in fixed-income assets than speeches by Bernanke. On average, the two-year and ten-year Treasury yields are roughly twice as volatile at the time of the release of a Greenspan speech compared with non-announcement

Figure 12. Trading Volumes around the Release of the Monetary Policy Report and the Federal Reserve Chairman’s Speeches



Notes: This figure plots the median ratio between (i) volumes around the releases of the Monetary Policy Report and the Federal Reserve Chairman’s speeches, and (ii) volumes on control days (the same weekdays and hours of the previous and following week of the event days). The sample period is January 2001–December 2012. The interval spans from one hour and twenty minutes before to two hours and forty minutes after the event time. The vertical line is placed at the release time. The sign test based on the normal approximation to the binomial distribution (Newbold 1988) is employed to test the null hypothesis that the median ratio between five-minute volumes in the two subgroups equals one. Large and small filled squares denote significance of the differences at the two-sided 1 and 5 percent level, respectively, whereas small hollow squares denote significance at the 10 percent level.

days, whereas they are just 1.3 times as volatile at the release time of a Bernanke speech. Stock prices react relatively more to speeches by Bernanke than to speeches by Greenspan, whereas the response of the euro-dollar exchange rate is similar across the speeches by either Chairman.

Third, I investigate whether the recent financial crisis has changed the importance of Chairman Bernanke's speeches by splitting the sample into two subsamples, February 2006–December 2007 (pre-crisis) and January 2008–December 2012 (during the crisis). The financial market turmoil that erupted in August 2007 led to the most severe financial crisis since the Great Depression. The financial turbulence in the subprime mortgage market rapidly spread to money markets. The Federal Reserve responded aggressively by using conventional and unconventional policies. On the one hand, the Federal Reserve implemented a number of programs designed to support the liquidity of financial institutions and foster improved conditions in financial markets. On the other hand, the Federal Reserve also lowered the target federal funds rate from 5.25 percent to effectively zero in the midst of the worst recession since the Great Depression. Despite reaching the zero lower bound on its main operating instrument, the Federal Reserve was able to further ease financial conditions by implementing large-scale asset purchase programs. In this rapidly changing environment, characterized by heightened uncertainty and where extreme tail risks have become elevated, I expect that market participants pay more attention to any central bank announcement compared with a pre-crisis period. Estimation results (available in a separate appendix) confirm that Bernanke's speeches are much more important in the period 2008–12 than in the earlier 2006–07 period. More specifically, Bernanke's speeches do not induce higher-than-normal volatility in the pre-crisis period, whereas they strongly move U.S. asset prices during the crisis. For instance, at the time of the release, both the ten-year Treasury yield and the euro-dollar exchange rate are roughly twice as volatile as on non-event days in the latter sample period.

5. Conclusions

This paper examines and compares the financial market impact of different types of Federal Reserve communications on U.S. asset

prices using an intraday event-study analysis. This relationship is an important topic for several reasons. From a central banking perspective, this line of research sheds further light on the monetary policy transmission mechanism. The large amount of private-sector resources devoted to monitoring and forecasting U.S. monetary policy suggests that market participants are equally interested in this topic, and in particular in determining which of the Federal Reserve officials has on average the largest impact on U.S. asset prices. As stated above, while the impact of monetary policy decisions and post-meeting statements on asset prices has been well documented, relatively little is known about the effect of a broader set of Federal Reserve announcements. This paper fills this gap by constructing a new database of over 2,200 (time-stamped) Federal Reserve events for the period 2001–12. This study documents that some Federal Reserve events, such as the release of FOMC statements and minutes, the Chairman's speeches, and his semi-annual Monetary Policy Report to Congress, significantly affect both the volatility of U.S. asset prices and their trading volume. In contrast, speeches by the other members of the Board of Governors (including the Vice Chair) and by regional Federal Reserve Bank presidents do not significantly move U.S. asset prices. Finally, I find that, with the notable exception of FOMC statements, no other Federal Reserve event is associated with positive and statistically significant pre-announcement returns.

The findings of this paper have important implications. Central banks may use these results to identify the best approaches in designing their communication strategy. For instance, since most of the price action takes place at the time of the release of the speech, particular care should be taken in drafting the executive summary of the Federal Reserve officials' speeches. From the perspective of financial market participants, it is important to identify the set of events that systematically move asset prices. Having estimates of the responsiveness of U.S. asset prices to some monetary policy events, such as the Chairman's speeches and his semi-annual monetary policy testimony to Congress, is an important input in formulating effective trading and hedging strategies and portfolio allocation decisions.

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