

# Has the Effect of Monetary Policy Announcements on Asset Prices Changed?

*By Taeyoung Doh and Michael Connolly*

The Federal Reserve has relied increasingly on communication to implement monetary policy. In addition to setting an intermeeting target for the federal funds rate, the Federal Open Market Committee (FOMC)—the Federal Reserve’s principal policy-making body—conveys information about the likely future path of the federal funds rate. As the target funds rate reached its effective lower bound during the recent financial crisis—limiting its usefulness as a policy tool—the FOMC began to increase its use of forward guidance about the likely path of the federal funds rate.

The greater use of forward guidance as a policy tool has focused attention on its effectiveness in influencing the real economy. A key gauge of the usefulness of policy guidance is the response of asset prices, the channel through which monetary policy is transmitted to the real economy. Changes in policy guidance affect the private sector’s expectations about the future path of the federal funds rate, and those expectations in turn affect bond yields, stock prices, and other asset values. Changes in asset values influence real activity through their effects on spending by consumers and businesses. Researchers have found that communication

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about the future path of the policy rate does affect asset prices but that the magnitude of the effect has changed since the crisis.

This article first examines whether the increased use of policy guidance since the recent financial crisis has affected the response of asset prices to monetary policy guidance. Examining daily changes in asset prices on dates when there were major monetary policy announcements, the analysis finds, in line with the findings of previous literature, a weakening in the response of both stock prices and bond yields.

In addition, the analysis suggests that the reasons for the weaker response of bond yields have differed from the reasons for the weaker response of stock prices. For bond yields, the change may have stemmed from greater stability in medium-term policy expectations, an effect of the prolonged period in which the federal funds rate is likely to be at the effective lower bound. In contrast, the response of stock prices to policy guidance appears to have weakened because, during the post-crisis period, investors often revised down their economic outlook when the FOMC indicated it would take a more accommodative policy. As a result, the stimulus from such policy announcements was weakened.

Section I examines changes over time in the FOMC's communication of future monetary policy decisions. Section II describes how forward guidance on monetary policy is quantified statistically and estimates changes in market expectations of the future path of monetary policy due to announcements. Section III analyzes the response of asset prices to policy guidance, using data before and after the recent financial crisis.

## **I. CHANGES IN THE FOMC'S COMMUNICATIONS OF MONETARY POLICY**

The FOMC over time has increased its public communications of monetary policy decisions, believing that increased transparency would make monetary policy more effective by making it more predictable (Woodford 2005). These communication efforts started with explaining changes in the federal funds target rate following FOMC meetings and evolved into adding information on the rate's likely future path. The FOMC's public communications about the future path of the federal funds rate were intended to guide the private sector's expectations of future short-term interest rates. Because investors are forward looking, they incorporate revised expectations

about future policy into their investments, moving asset prices in line with the FOMC's objectives.

Since 1994, several milestones mark the FOMC's move to convey more information about changes in the federal funds rate target. In 1994, the FOMC implemented a policy of releasing a statement after meetings. At first, a statement was issued only if there was a change in the federal funds rate target. In 2000, the FOMC began issuing statements following all regularly scheduled meetings. In 2005, the schedule to release FOMC minutes was shortened to three weeks after each meeting. Previously, minutes were released only after the next meeting.

Along with efforts to make previous monetary policy decisionmaking more transparent, the FOMC increasingly has used guidance on the likely future path of the federal funds rate as a policy tool. The FOMC first indicated a direction of future monetary policy in mid-1999 by mentioning a possible firmer stance of monetary policy in its statement. Over time, such an expression has been used more frequently to describe future monetary policy. For example, following its January 2004 meeting, the FOMC replaced the phrase "policy accommodation can be maintained for a considerable period" with "the Committee believes that it can be patient in removing its policy accommodation" to signal that when it came time to remove policy accommodation, it would do so gradually.

The FOMC has changed its forward guidance more frequently and made it more explicit since December 2008 when the federal funds rate target reached the effective lower bound. For example, the statement after the FOMC's March 2009 meeting noted that the federal funds rate would remain at its effective lower bound "for an extended period." The language changed in August 2011 to "at least through mid-2013" and subsequently changed several more times, including in September 2012 to "mid-2015." Finally, the FOMC statement in December 2012 expressed a set of quantitative economic conditions, rather than a calendar date, under which the funds rate would remain at its effective lower bound:

"In particular, the Committee decided to keep the target range for the federal funds rate at 0 to  $\frac{1}{4}$  percent and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation

between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored."<sup>1</sup>

Increased communication efforts may help the FOMC achieve its objectives but only if the communications affect asset prices as expected. The following sections examine the response of market expectations and asset prices to the FOMC's monetary policy announcements about the future path of the federal funds rate.

## II. MEASURING GUIDANCE OF FUTURE MONETARY POLICY

One challenge in studying the effect of forward guidance is measuring the quantitative magnitude of the effect. Policy guidance is typically communicated through qualitative statements and does not necessarily indicate a definite, numerical path of the federal funds rate. Even the more explicit information included in recent FOMC statements about the expected future path of the funds rate is qualified by less explicit language that suggests future policy will depend on such factors as "readings on financial developments." Such conditions make it difficult to quantify the nature of the information in the statements about the future policy path.

Given the difficulties, researchers have relied on changes in the price of interest rate futures contracts to quantify information conveyed by policy announcements. These prices are determined by market participants' expectations of short-term interest rates, such as the federal funds rate averaged over a contract period. For example, the price of the three-month ahead federal funds futures contract in September is determined by the expected average federal funds rate in December. Revisions in expectations of the rate's future path due to policy announcements can be detected by changes in the prices of federal funds futures contracts or Eurodollar futures contracts during a short window surrounding each policy announcement (Gürkaynak and others; Bernanke and others).<sup>2</sup> The use of a short time span may eliminate the effect of other economic news that, along with policy announcements, may affect the price of futures contracts.

Another advantage of using the price of futures contracts is that they are mostly driven by the private sector's policy expectations,

making changes in these prices a good indicator of the *surprise* component in policy guidance. Identifying the surprise component is important because monetary policy affects the real economy mainly through changes in asset prices. And asset price changes are induced by actions that convey new information about the future path of policy. In contrast, asset prices do not respond to what financial markets have already anticipated (Bernanke and Kuttner).

Following past literature, this article uses the price of federal futures contracts and Eurodollar futures contracts to measure changes in market expectations of future monetary policy due to the FOMC's announcements. The remainder of this section first describes how policy guidance is measured from futures data. It then identifies event dates when policy guidance moved market expectations substantially and examines these dates to determine whether they are consistent with other narrative evidence.

#### *Data and methodology for measuring policy guidance*

The influence of policy guidance on both near-term and medium-term expectations can be measured using the prices of multiple futures contracts. While a single futures contract may extend one month (federal funds futures) or three months (Eurodollar futures) ahead, previous studies have identified common factors that can explain price variation in multiple futures contracts.<sup>3</sup>

These common factors may be influenced by both *words* in policy announcements and policy *actions* that change the current target of the federal funds rate. Because policy guidance reflects the FOMC's intention for future monetary policy, it would be useful to separate the effects of *words* from those of *actions*, especially when they move in opposite directions. For example, the FOMC might lower the current federal funds rate target but suggest that further easing is less likely with the words it uses in statements.

Imposing economic restrictions on the first two common factors separates policy guidance from policy actions. For example, a weighted average of common factors may be constructed so that the correlation between this average and the current monetary policy stance becomes zero at the chosen weights. This combination of common factors is called "the path factor," while another combination of common factors that is correlated with the current monetary policy stance is called "the

target factor” (Gürkaynak and others). The path factor is a quantitative measure of policy guidance. It measures changes in market expectations of the future path of the federal funds rate that are associated, on average, with no change in the current-month federal funds futures rate. Appendix I provides more information about the construction of the quantitative measure of policy guidance used in this article.

The measure of policy guidance in this article follows Gürkaynak and others (2005) but with three differences. First, this article uses daily data rather than intradaily data. Although using daily data may result in other information affecting asset prices during the daily window, the analysis in the next section does a robustness check that excludes outliers.<sup>4</sup> Market commentaries suggest these outliers may indicate significant daily movements in asset prices and intraday movements following policy announcements. Second, Eurodollar futures contracts are used in addition to federal funds futures to reflect market expectations of monetary policy up to 10 quarters ahead.<sup>5</sup> Third, this article includes the release of FOMC minutes and statements in the set of policy announcements. The minutes provide more detailed information about the FOMC’s view on the economic outlook, possibly revealing previously undisclosed information to the private sector. In addition to the regular releases of the FOMC statements and minutes, policy announcements include intermeeting announcements from January 1990 to January 2013. The date and type of each announcement is described in Appendix II together with other macroeconomic data released on each respective day.<sup>6</sup>

### *Policy announcements and shifts in expectations of future monetary policy*

To verify that the path factor measures the effects of policy announcements on market expectations, this article examines financial market news commentaries and other macroeconomic data releases on the dates of policy announcements. The analysis indicates that most large realizations of the path factor are associated with policy announcements (Table 1).

As shown in Table 1, four of the six largest realizations of the path factor occurred during the recent financial crisis from August 2007 to February 2010. The associated announcements led to substantial changes in market expectations of the Federal Reserve’s crisis

Table 1

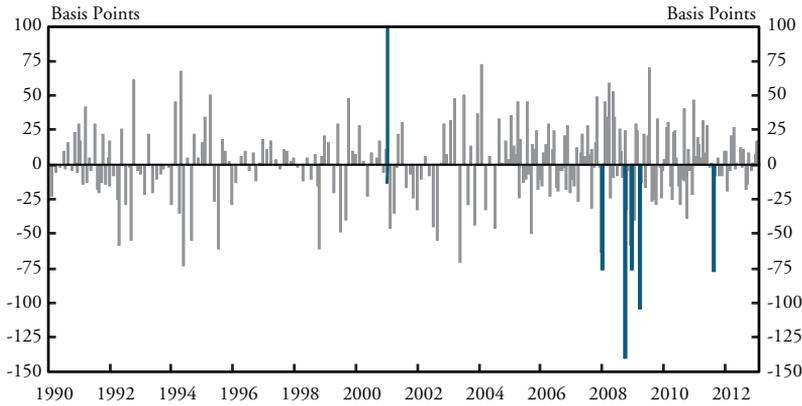
## SIX LARGEST OBSERVATIONS OF THE PATH FACTOR

Date	Target Factor	Path Factor	Meeting Statement	Financial Market Commentary
Sep. 29, 2008	-9.10	-138.67		Fed's expansion of liquidity facilities was the biggest since credit markets seized up in 2007. (Bloomberg)
Jan. 3, 2001	-34.11	112.23		The action was perceived as an insurance policy against a recession, lowering the chances of such of a downturn. (CNN)
Mar. 18, 2009	-2.38	-103.06	Y	The first announcement of longer-term Treasury purchases, coupled with the expansion of MBS purchases, indicated that the FOMC became more aggressive in fighting the crisis. (Bloomberg)
Aug. 9, 2011	9.48	-76.61	Y	The first time that the Fed put a time frame on the target range hinted at a stronger easing move. (CNN)
Dec. 16, 2008	-13.01	-75.76	Y	The Fed cut the main interest rate to as low as zero for the first time to revive credit and end the longest slump in a quarter-century. (Bloomberg)
Jan. 2, 2008	2.68	-75.41	Y (minutes)	Fed officials lowered growth outlook at last meeting. (Bloomberg)

Sources: Bloomberg LP, CNN, and authors' calculations.

management or economic outlook.<sup>7</sup> The largest negative realization of the path factor was on September 29, 2008, when the Federal Reserve announced an expansion of dollar liquidity facilities (term auction facility, central bank liquidity swaps) in coordination with other central banks. At the time, the expansion of liquidity was the largest since the crisis began and substantially reduced market expectations of the future path of the federal funds rate. The second largest occurred March 18, 2009, when the Federal Reserve's then ongoing asset purchase program was expanded and the language describing the duration of the rate's effective lower bound changed from "for some time" to "for an extended period." The third largest was associated with the emergency responses to the crisis as the federal funds rate was first lowered to the effective lower bound on December 16, 2008. The fourth largest negative realization of the path factor occurred January 2, 2008, when the minutes of the December 2007 FOMC meeting led to a substantial drop in the expected future path of the funds rate by revealing that the FOMC's growth outlook was worse than its initial forecast.<sup>8</sup>

Chart 1  
THE PATH FACTOR



Notes: The vertical lines in the chart show the path factor realizations associated with all of the monetary policy announcements listed in Appendix I. Blue lines highlight the six largest path factor realizations on dates listed in Table 1.

Sources: Bloomberg LP and authors' calculations.

Two other dates with large realizations of the path factor were outside the financial crisis period and were associated with changes in market expectations of the future likelihood of a recession or the likely duration of the effective lower bound of the federal funds rate. The first date was January 3, 2001, when a large positive realization of the path factor suggested that investors raised their expectations of the rate's future path. Although the announcement on that day accompanied a surprising intermeeting rate cut of half a percentage point, the rate cut reduced concern about an impending recession. Hence, markets expected there might be less need to ease later.<sup>9</sup> The second date was August 9, 2011, when the FOMC changed its description of the expected duration of exceptionally low rates from "an extended period" to "at least through mid-2013." Before August, financial markets did not expect rates to remain at their effective lower bound for more than a few quarters (Swanson and Williams). Hence, this change in the language suggested that the FOMC would adopt a more accommodative policy path.

Chart 1 shows changes in the path factor for all FOMC policy announcements since 1990, with blue lines indicating the especially

large realizations. Interestingly, since August 2011, there have been no large realizations. Neither the shift in the liftoff date of the funds rate target nor the move to threshold-based guidance—which linked the liftoff of the federal funds rate target with the specific level of the unemployment rate (6.5 percent)—significantly increased market expectations of a lower future path for the funds rate. While the shift to threshold-based guidance was regarded as a major change in the conduct of forward guidance, it did not surprise the market as much as the August 2011 FOMC statement. One reason is that the FOMC emphasized the consistency of these thresholds with earlier date-based guidance. In addition, enhanced public communications of monetary policy in recent years may have reduced the surprise component in policy announcements.

This moderation of the surprise component of policy announcements, despite substantial changes in the way forward guidance was implemented, may raise concerns that the estimated path factor is not capturing more recent changes in market expectations for the future path of the policy rate. If the path factor does not capture post-crisis changes in market expectations, the share of the variance of interest rate futures shown by the path factor would likely have declined. However, as shown in Table 2, there has been no significant change over time in the share of the variance of interest rate futures as determined by the two factors. The target and path factors, together, capture most of the time variation of 11 interest rate futures in both the pre-crisis and post-crisis periods. In addition, the path factor accounts for at least 74 percent of variances for interest rate futures at horizons longer than one year (ed5 through ed10) for both sample periods. These results suggest that the path factor reasonably represents changes in market expectations of the future path of the policy rate.

### **III. THE RESPONSE OF ASSET PRICES TO MONETARY POLICY GUIDANCE**

The effect of policy guidance on asset prices generally weakened after the financial crisis. The weakened effect may stem from shifts in investors' expectations about the overall outlook for the economy based on FOMC policy announcements. Investors may also assume that other

Table 2

### VARIANCE SHARES OF FUTURES CONTRACTS EXPLAINED BY THE TARGET FACTOR AND THE PATH FACTOR

	Pre-Crisis (January 1990 to July 2007)			Post-Crisis (August 2007 to January 2013)		
	Target	Path	Total	Target	Path	Total
Monetary Policy Surprise Components						
mp1	0.76	0.00	0.76	0.87	0.00	0.87
mp2	0.39	0.00	0.39	0.11	0.24	0.35
Eurodollar Futures Contract Rates						
ed2	0.57	0.35	0.92	0.56	0.29	0.85
ed3	0.43	0.52	0.95	0.45	0.47	0.92
ed4	0.30	0.67	0.97	0.34	0.62	0.96
ed5	0.24	0.75	0.99	0.23	0.74	0.97
ed6	0.20	0.79	0.99	0.15	0.83	0.98
ed7	0.18	0.81	0.99	0.11	0.87	0.98
ed8	0.16	0.82	0.98	0.09	0.87	0.96
ed9	0.15	0.82	0.97	0.09	0.84	0.93
ed10	0.14	0.82	0.96	0.08	0.80	0.88

Notes: mp1 is the unanticipated change in the target policy rate of the current FOMC meeting; mp2 is the unanticipated change in the target policy rate of the next FOMC meeting; mp1 and mp2 are constructed from daily changes in the federal funds futures contract rate as explained in Appendix I; ed2 through ed10 is the Eurodollar futures contract rate for the second through the 10th contracts (two through 10 quarters ahead).

Sources: Bloomberg LP and authors' calculations.

investors will adjust their expectations as a result of the announcements, leading to a coordinating effect on financial market expectations.

#### *Has the effect of policy guidance on asset prices changed?*

Policy announcements can affect asset prices through two channels. A modern asset pricing theory implies that an asset's price should equal the expected discounted value of its payoff (Cochrane). Hence, asset prices respond to announcements about the future path of monetary policy depending on their correlation with news about the asset's payoff or the discount rate used in the asset's valuation.

Because the nominal payoff from holding Treasury securities is fixed at the time of issuance, policy announcements affect Treasury prices only through their correlation with news about the discount rate. The discount rate expresses investors' preferences for income streams

across time and is highly correlated with current and expected future short-term interest rates. Hence, lowering the expected future path of the federal funds rate typically reduces long-term Treasury bond yields by boosting bond prices through a lower discount rate.

In contrast, the payoffs of corporate bonds and equities can be time-varying. Unlike Treasury bonds, corporate bonds are subject to default risk, making payoffs sensitive to economic conditions. Dividends from corporate equities also can be time-varying because profits are sensitive to economic conditions. Therefore, both the discount rate and payoff channels are relevant for the response of corporate securities to policy announcements.

Regressing changes in asset prices on the two factors suggests that the response of Treasury and corporate bond yields to policy announcements was similar before and after the recent financial crisis. At the same time, there has been noticeable change in the response of stock prices (Table 3). In particular, announcements indicating a more accommodative policy depressed stock prices in the post-crisis sample on average while they boosted stock prices in the pre-crisis sample. Using a different methodology, Kiley (2013a) also found evidence of the weakened response of stock prices to policy announcements. This finding implies that monetary policy has become *less* effective in stimulating activity because the pass-through of policy-induced changes in Treasury yields to stock prices—which might be more relevant to consumer and business spending—is smaller.

One concern about the regression analysis is that changes in regression coefficients may have been driven by a few outliers in the post-crisis sample. The outlier issue becomes more serious with daily data because the daily frequency occasionally prevents sharp identification of the effects of monetary policy announcements on stock prices. Outliers are detected by selecting the five most influential observations in determining the regression coefficients (Table 4). The analysis of financial market commentaries on these five dates suggests that three dates are outliers. For example, stock prices fell sharply on September 29, 2008, when the Federal Reserve and other central banks announced expansions of their liquidity facilities. However, the large decline in stock prices more likely was due mainly to the reluctance of Congress to pass a bank bailout plan than central bank actions.<sup>10</sup> Similar discrepancies between intraday

*Table 3*  
RESPONSE OF ASSET PRICES TO THE TARGET AND PATH FACTORS

	February 1990 to July 2007			August 2007 to January 2013			<i>R</i> <sup>2</sup>
	<i>Constant</i> ( <i>std. err.</i> )	<i>Target Factor</i> ( <i>std. err.</i> )	<i>Path Factor</i> ( <i>std. err.</i> )	<i>Constant</i> ( <i>std. err.</i> )	<i>Target Factor</i> ( <i>std. err.</i> )	<i>Path Factor</i> ( <i>std. err.</i> )	
<i>Two-Year Note</i>	-1.57*** (0.19)	0.64*** (0.03)	0.32*** (0.01)	-0.86*** (0.32)	0.51*** (0.04)	0.24*** (0.01)	0.85
<i>Five-Year Note</i>	-1.21*** (0.17)	0.46*** (0.024)	0.35*** (0.009)	-0.35 (0.45)	0.38*** (0.05)	0.32*** (0.02)	0.81
<i>10-Year Note</i>	-0.70*** (0.20)	0.26*** (0.03)	0.29*** (0.01)	0.23 (0.56)	0.25*** (0.07)	0.29*** (0.02)	0.67
<i>Sc&amp;P 500</i>	21.58*** (7.28)	-4.31*** (0.98)	-0.60 (0.377)	23.68 (18.71)	-0.64 (2.25)	2.73*** (0.67)	0.14
<i>Aaa Rated Bond Yield</i>	-0.69*** (0.22)	0.12*** (0.03)	0.16*** (0.012)	1.20** (0.58)	0.08 (0.07)	0.19*** (0.02)	0.45
<i>Baa Rated Bond Yield</i>	-0.46** (0.20)	0.13*** (0.03)	0.16*** (0.01)	0.84 (0.60)	0.13* (0.07)	0.18*** (0.02)	0.42

Notes: Numbers in parentheses are heteroskedasticity-robust standard errors. \*, \*\*, and \*\*\* denote significance at 10 percent, 5 percent, and 1 percent, respectively. Sources: Bloomberg LP and authors' calculations.

*Table 4*  
REGRESSION COEFFICIENTS, EXCLUDING KEY DATES

Date Excluded	Constant Factor Coefficient	Target Factor Coefficient	Path Factor Coefficient	Difference in Target Factor Coefficient	Difference in Path Factor Coefficient	Announcement Type
Sep. 29, 2008	33.180	-2.991	1.094	-2.349	-1.633	Intermeeting
Mar. 18, 2008	19.466	-1.545	2.130	-0.903	-0.597	Meeting
Oct. 07, 2008	29.970	2.011	2.302	2.653	-0.425	Intermeeting/ Minutes
Aug. 17, 2007	21.344	-1.194	2.567	-0.552	-0.160	Intermeeting
Nov. 19, 2008	30.367	-0.206	2.588	0.436	-0.139	Minutes

Notes: Each regression is over the sample from August 2007 to January 2013, excluding the observation of the date in the left column.

Sources: Bloomberg LP and authors' calculations.

changes in stock prices around policy announcements and daily changes are observed on March 18, 2008, and October 7, 2008.<sup>11</sup>

Excluding these three outliers did not materially change the attenuation of the response of stock prices to announcements of policy easing (Table 5). However, when the three outliers were excluded, even bond yields showed a weakened response to policy announcements, consistent with Kiley (2013b). The magnitude is economically significant. For example, in the pre-crisis sample, the 10-year Treasury yield declined by roughly 29 basis points in response to a drop in the path factor of 100 basis points. In the post-crisis sample, the yield declined only 19 basis points.<sup>12</sup>

The statistical significance of the weakening of the response can be determined by computing rolling sample estimates of the regression coefficient of asset prices on the path factor (Chart 2). The samples start before the crisis and incrementally add one new observation in the post-crisis period to replace the oldest observation in the previous sample. The gray line denotes the regression coefficient based on the pre-crisis sample. The black line describes rolling sample estimates as data from the crisis period is added. The two blue lines show two-standard-error confidence bands. These results suggest a weakened response of asset prices to policy announcements, especially since mid-2009.

#### *Why has the response of asset prices to policy announcements changed?*

A prolonged period at the effective lower bound of the federal funds rate may explain the weakened response of bond yields. The longest

*Table 5*  
RESPONSE OF ASSET PRICES TO THE TARGET AND PATH FACTORS

	February 1990 to July 2007				August 2007 to January 2013 (ex outliers)				RR2
	Constant (std. err.)	Target Factor (std. err.)	Path Factor (std. err.)	R <sup>2</sup>	Constant (std. err.)	Target Factor (std. err.)	Path Factor (std. err.)	RR2	
<i>Two-Year Note</i>	-1.57*** (0.19)	0.64*** (0.03)	0.32*** (0.01)	0.90	-0.74** (0.33)	0.45*** (0.04)	0.12*** (0.01)	0.79	
<i>Five-Year Note</i>	-1.21*** (0.17)	0.46*** (0.024)	0.35*** (0.009)	0.91	-0.19 (0.44)	0.30*** (0.06)	0.20*** (0.01)	0.80	
<i>10-Year Note</i>	-0.70*** (0.20)	0.26*** (0.03)	0.29*** (0.01)	0.82	0.32 (0.53)	0.17** (0.07)	0.19*** (0.01)	0.69	
<i>Sept 500</i>	21.58*** (7.28)	-4.31*** (0.98)	-0.60 (0.377)	0.12	35.51** (15.90)	-1.83 (2.25)	0.48 (0.40)	0.03	
<i>Aaa Rated Bond Yield</i>	-0.69*** (0.22)	0.12*** (0.03)	0.16*** (0.012)	0.50	1.28** (0.53)	-0.01 (0.07)	0.13*** (0.01)	0.51	
<i>Baa Rated Bond Yield</i>	-0.46** (0.20)	0.13*** (0.03)	0.16*** (0.01)	0.57	0.81 (0.51)	0.02 (0.07)	0.13*** (0.01)	0.51	

Note: Numbers in parentheses are heteroskedasticity-robust standard errors. \*\*, \* and \*\*\* denote significance at 10 percent, 5 percent, and 1 percent, respectively. Post-crisis regressions (August 2007 to January 2013) exclude the following outliers: March 18, 2008; September 29, 2008; October 7, 2008.

Sources: Bloomberg LP and authors' calculations.

Chart 2

ROLLING SAMPLE ESTIMATES OF REGRESSION COEFFICIENTS OF ASSET PRICES ON THE PATH FACTOR

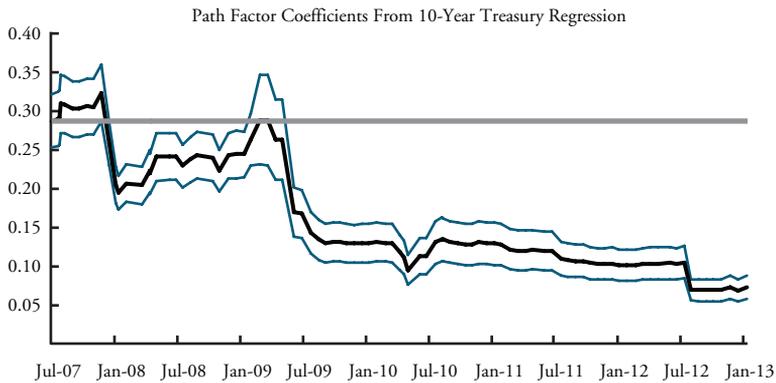
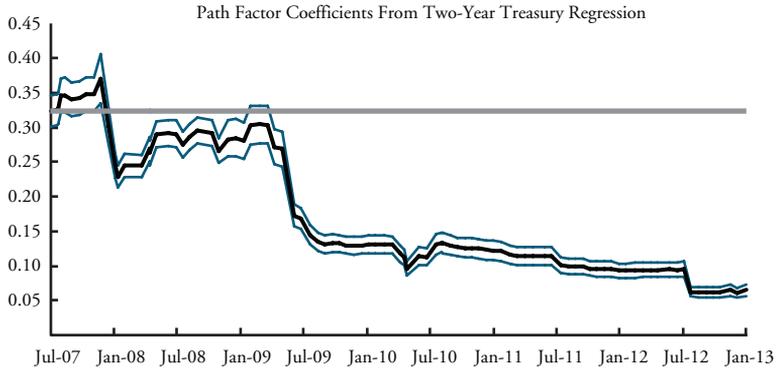
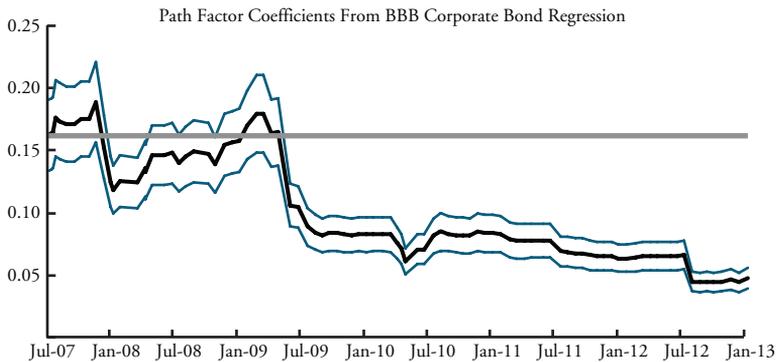
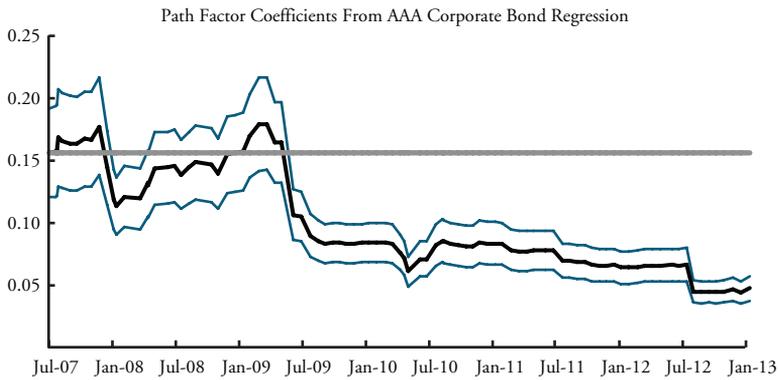
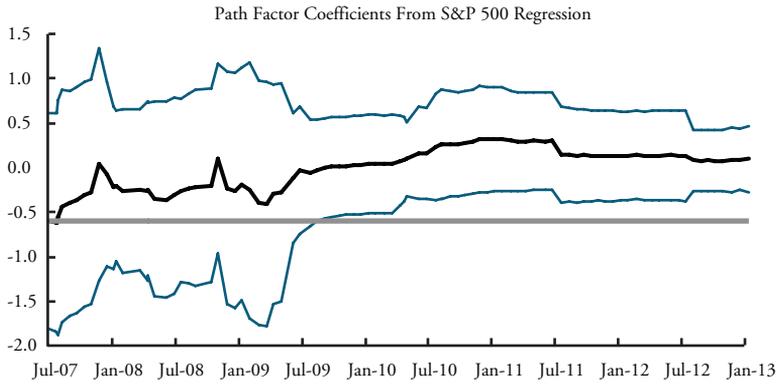


Chart 2 Continued



Notes: The regressions are changes in various asset prices or interest rates on a constant, target factor, and path factor. The gray line is the coefficient of the path factor from the initial regression from January 1990 to July 2007. The black line is the coefficient of the path factor from the rolling sample regression, which subtracts the first data point and adds the subsequent data point so that the sample size is the same. The blue lines are the two standard-error bands of the regression coefficient on the path factor.

Sources: Bloomberg LP and authors' calculations.

maturity of futures contracts used in this article to construct the surprise component in policy announcements was 10 quarters. When investors believe that the effective lower bound for the funds rate is likely to be binding at that horizon, movements in longer-term (five-year or 10-year) Treasury bond yields will be driven by market expectations of monetary policy beyond that horizon.<sup>13</sup> The same logic may be applied to corporate bonds, which typically have a maturity of 20 years.

The explanation for the weakened response of stock prices is less obvious. One explanation is that the declines in long-term interest rates that stem from the Federal Reserve's asset purchase programs in the post-crisis period may be less effective in stimulating spending than the declines in such rates that stem from lower expectations about the path of short-term interest rates (Kiley 2013a). However, this explanation does not account for the rise in stock prices after policy announcements that were unrelated to asset purchases and perceived as less accommodative than expected. For example, stock prices rose on August 17, 2007, in response to an announcement that the federal funds rate would be held steady, when financial markets had expected a rate cut (Chart 3).

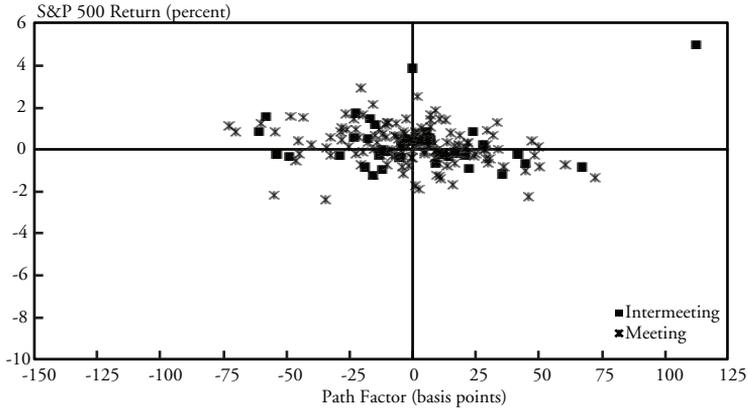
A second, more promising explanation is that the surprise component in monetary policy announcements actually accompanied news about the economic outlook. This association between policy announcements and the economic outlook may arise because the FOMC's forward guidance about the future policy path is contingent on the economic outlook and is not a promise (Campbell and others; Woodford 2012). Hence, financial markets could perceive the unexpected announcement of a more accommodative policy path as coming from a worsening in the economic outlook that depressed stock prices. The analysis in this article is more consistent with this explanation than the smaller effect on spending from quantitative easing.

Why do financial markets update their economic outlook following the FOMC's announcements? Investors may revise their assessment of the future path of output and inflation after the FOMC announcements because they may think the Federal Reserve has an informational advantage (Romer and Romer). However, an extensive analysis of forecasts for output and inflation, produced by research staff at the Board of Governors before each FOMC meeting show that these forecasts are superior only for the current quarter in the case of output growth (Faust and Wright).<sup>14</sup> Beyond that horizon, Board staff forecasts are no better

Chart 3

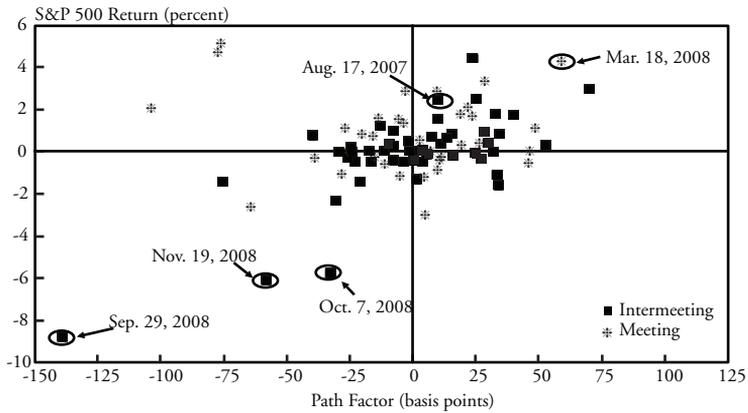
RETURN ON THE S&P 500 VERSUS THE PATH FACTOR

*Pre-Crisis (February 1990 to July 2007)*



Notes: Vertical axis is the percentage return in the S&P 500. Horizontal axis is the path factor.

*Post-Crisis (August 2007 to January 2013)*



Notes: Vertical axis is the percentage return in the S&P 500. Horizontal axis is the path factor. Circled observations correspond to the five outliers listed in Table 4.

Sources: Bloomberg LP, Haver Analytics, and authors' calculations.

than simple statistical models in predicting output growth. This finding calls into question the explanation based on a Federal Reserve informational advantage.<sup>15</sup>

A third explanation is that the central bank's public judgment about economic conditions may have a disproportionate impact because it coordinates beliefs of investors with imperfect and private information (Amato and others).<sup>16</sup> According to this explanation, investors pay more attention to the FOMC's forecasts because they believe other investors will do the same. Whether or not these forecasts have more predictive power, investors know that these forecasts guide monetary policy decisions and are more likely to be adopted by other investors.

While this coordinating power of the central bank's communication may make monetary policy a more effective driver of private-sector expectations, conversely, it may lead to a bad equilibrium if the central bank's assessment is based on noisy or faulty signals. Hence, correctly characterizing uncertainty surrounding the central bank's forecasts may be as important as providing more information on the likely path of the economy.

#### IV. CONCLUSION

Since the recent financial crisis, the FOMC has enhanced its use of forward guidance about the future path of the federal funds rate. The effectiveness of this guidance as a policy tool depends on the response of asset prices—a predominant channel through which monetary policy is transmitted to the real economy. This article examines whether the response of asset prices to FOMC forward guidance has changed since the crisis.

A statistical analysis shows that the response of asset prices to policy accommodation has generally weakened in the post-crisis period. In particular, stock prices often have declined after the FOMC has indicated a more accommodative future policy path. For bond yields, the weakening may be explained by the prolonged period of an effectively zero federal funds rate, which reduced the sensitivity of longer-term interest rates to changes in medium-term expectations of monetary policy. For stock prices, the weakening is in line with the view that some policy announcements accompanied new information about the FOMC's economic outlook. Despite the lack of clear evidence of an informational advantage of the Federal Reserve in predicting future economic conditions, investors with imperfect and private information

may have revised their economic outlook following policy announcements on the belief that other investors would also adopt the economic outlook implied in these announcements.

## APPENDIX I

This article follows Gürkaynak and others in construction of the path factor. The data set consists of monetary policy surprises and changes in Eurodollar futures contract rates on policy announcement days. The monetary policy surprise for current policy ( $mp_1$ ) is captured by the difference in the implied rates of current-month federal funds futures contracts. Federal funds futures contracts are structured so that the average effective federal funds rate over the calendar month is used at settlement. So if  $d_1$  is the day of the policy announcement and  $D_1$  is the number of days in the month, only  $\frac{D_1 - d_1}{D_1}$  portion of the surprise component of the change in the federal funds rate is reflected in the daily change in the federal funds future contract in the current month ( $ff_1$ ).

$$\frac{D_1 - d_1}{D_1} mp_{1,t} = (ff_{1,t} - ff_{1,t-1}) \quad (A 1)$$

The monetary policy surprise for future policy ( $mp_2$ ) is the change in expectations about the federal funds rate after the next policy announcement happens. This measure can be similarly constructed after taking into account the day of the month of the policy announcement and the impact of mp1.  $d_2$  is the day of the next policy announcement and  $D_2$  is the number of days in that month.

$$\frac{D_2 - d_2}{D_2} mp_{2,t} = \left[ (ff_{2,t} - ff_{2,t-1}) - \frac{d_2}{D_2} mp_{1,t} \right] \quad (A 2)$$

Daily changes in Eurodollar futures rates out two to 10 quarters ( $ed_2, \dots, ed_{10}$ ) are added to the above monetary policy surprises. The raw data input ( $X$ ) used in the analysis contains 11 observed variables. The target factor and the path factor are estimated from the raw data input using the following steps.

First, the principal component analysis transforms possibly correlated variables in the data set into uncorrelated components that explain the variation of the data. The first and second components ( $F_1, F_2$ ) are normalized to have unit variances.

Second, the two principle components are rotated and rescaled to generate the target factor ( $Z_1$ ) and the path factor ( $Z_2$ ).

$$Z_1 = \alpha_1 F_1 + \beta_1 F_2, Z_2 = \alpha_2 F_1 + \beta_2 F_2 \quad (\text{A } 3)$$

The rotation imposes the following three restrictions.

1. Each factor is normalized to have unit variance.
2. Two factors remain orthogonal to each other.
3. Only the target factor is correlated with  $mp_1$ .

Under rescaling, a 1-percentage-point surprise in the target factor moves the federal funds rate target by 1 percentage point. Also, the path factor moves the 10-quarter ahead Eurodollar futures contract rate by the same magnitude as the target factor on that rate.

*Appendix II*

## MONETARY POLICY ANNOUNCEMENTS

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Feb. 08, 1990	11:30 a.m.	Open Market Operation		
Mar. 28, 1990	11:30 a.m.	Open Market Operation		GNP and NIPAs, New Home Sales
May 16, 1990	11:30 a.m.	Open Market Operation		CPI, Housing Starts and Permits
Jul. 05, 1990	11:30 a.m.	Open Market Operation		Auto Sales
Jul. 13, 1990	11:30 a.m.	Open Market Operation	Y	PPI, Retail Sales
Aug. 22, 1990	11:30 a.m.	Open Market Operation		
Oct. 03, 1990	11:30 a.m.	Open Market Operation		Auto Sales, Factory Orders
Oct. 29, 1990	11:30 a.m.	Open Market Operation	Y	
Nov. 14, 1990	11:30 a.m.	Open Market Operation		Retail Sales
Dec. 07, 1990	11:30 a.m.	Open Market Operation	Y	Employment Report
Dec. 18, 1990	3:30 p.m.	Discount Rate Change Press Release		CPI, Merchandise Trade
Jan. 08, 1991	11:30 a.m.	Open Market Operation	Y	
Feb. 01, 1991	9:15 a.m.	Discount Rate Change Press Release	Y	Employment Report, NAPM Survey
Feb. 07, 1991	11:30 a.m.	Open Market Operation		
Mar. 08, 1991	11:30 a.m.	Open Market Operation	Y	Employment Report
Mar. 27, 1991	11:30 a.m.	Open Market Operation		GNP and NIPAs
Apr. 30, 1991	9:30 a.m.	Discount Rate Change Press Release	Y	Consumer Confidence, ECI, Factory Orders
May 15, 1991	11:30 a.m.	Open Market Operation		Business Inventories
Jul. 05, 1991	11:30 a.m.	Open Market Operation		Employment Report
Aug. 06, 1991	11:30 a.m.	Open Market Operation	Y	
Aug. 21, 1991	11:30 a.m.	Open Market Operation		U.S. Budget Deficit
Sep. 13, 1991	9:10 a.m.	Discount Rate Change Press Release	Y	CPI, Retail Sales
Oct. 02, 1991	11:30 a.m.	Open Market Operation		New Home Sales
Oct. 30, 1991	11:30 a.m.	Open Market Operation	Y	New Home Sales, PCE, Personal Income
Nov. 06, 1991	8:45 a.m.	Discount Rate Change Press Release		
Dec. 06, 1991	11:30 a.m.	Open Market Operation	Y	Employment Report
Dec. 18, 1991	11:30 a.m.	Open Market Operation		
Dec. 20, 1991	8:30 a.m.	Discount Rate Change Press Release	Y	GDP and NIPAs, U.S. Budget Deficit
Feb. 06, 1992	11:30 a.m.	Open Market Operation		Factory Orders
Apr. 01, 1992	11:30 a.m.	Open Market Operation		NAPM Survey

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Apr. 09, 1992	11:30 a.m.	Open Market Operation	Y	PPI
May 20, 1992	11:30 a.m.	Open Market Operation		Merchandise Trade
Jul. 02, 1992	9:15 a.m.	Discount Rate Change Press Release	Y	Employment Report, Factory Orders
Aug. 19, 1992	11:30 a.m.	Open Market Operation		Merchandise Trade
Sep. 04, 1992	11:30 a.m.	Open Market Operation	Y	Employment Report
Oct. 07, 1992	11:30 a.m.	Open Market Operation		
Nov. 18, 1992	11:30 a.m.	Open Market Operation		Merchandise Trade
Dec. 23, 1992	11:30 a.m.	Open Market Operation		Consumer Confidence, Durable Goods Orders, PCE
Feb. 04, 1993	11:30 a.m.	Open Market Operation		Factory Orders
Mar. 24, 1993	11:30 a.m.	Open Market Operation		Durable Goods Orders
May 19, 1993	11:30 a.m.	Open Market Operation		Merchandise Trade
Jul. 08, 1993	11:30 a.m.	Open Market Operation		
Aug. 18, 1993	11:30 a.m.	Open Market Operation		
Sep. 22, 1993	11:30 a.m.	Open Market Operation		U.S. Budget Deficit
Nov. 17, 1993	11:30 a.m.	Open Market Operation		Housing Starts and Permits
Dec. 22, 1993	11:30 a.m.	Open Market Operation		GDP and NIPAs
Feb. 04, 1994	11:05 a.m.	Post-Meeting Press Release		Employment Report
Mar. 22, 1994	2:20 p.m.	Post-Meeting Press Release		Merchandise Trade
Apr. 18, 1994	10:06 a.m.	Post-Meeting Press Release	Y	
May 17, 1994	2:26 p.m.	Post-Meeting Press Release		Housing Starts and Permits
Jul. 06, 1994	2:18 p.m.	Post-Meeting Press Release		Auto Sales
Aug. 16, 1994	1:18 p.m.	Post-Meeting Press Release		Housing Starts and Permits
Sep. 27, 1994	2:18 p.m.	Post-Meeting Press Release		Consumer Confidence
Nov. 15, 1994	2:20 p.m.	Post-Meeting Press Release		Ind Production, Cap Utilization, International Trade
Dec. 20, 1994	2:17 p.m.	Post-Meeting Press Release		International Trade
Feb. 01, 1995	2:15 p.m.	Post-Meeting Press Release		Leading Indicators, Auto Sales
Mar. 28, 1995	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence
May 23, 1995	2:15 p.m.	Post-Meeting Press Release		
Jul. 06, 1995	2:15 p.m.	Post-Meeting Press Release		Leading Indicators, Auto Sales
Aug. 22, 1995	2:15 p.m.	Post-Meeting Press Release		
Sep. 26, 1995	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence
Nov. 15, 1995	2:15 p.m.	Post-Meeting Press Release		CPI, Ind. Prod., Cap. Util, Business Inventories
Dec. 19, 1995	2:15 p.m.	Post-Meeting Press Release		GDP and NIPAs, Housing Starts and Permits
Jan. 31, 1996	2:15 p.m.	Post-Meeting Press Release		PPI, Purchasing Managers Survey

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Mar. 26, 1996	11:39 a.m.	Post-Meeting Press Release		Consumer Confidence
May 21, 1996	2:15 p.m.	Post-Meeting Press Release		U.S. Budget Deficit
Jul. 03, 1996	2:15 p.m.	Post-Meeting Press Release		Factory Orders, Auto Sales
Aug. 20, 1996	2:15 p.m.	Post-Meeting Press Release		International Trade
Sep. 24, 1996	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence
Nov. 13, 1996	2:15 p.m.	Post-Meeting Press Release		PPI
Dec. 17, 1996	2:15 p.m.	Post-Meeting Press Release		Housing Starts and Permits
Feb. 05, 1997	2:15 p.m.	Post-Meeting Press Release		Factory Orders, Auto Sales
Mar. 25, 1997	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence, Existing Home Sales
May 20, 1997	2:15 p.m.	Post-Meeting Press Release		
Jul. 02, 1997	2:15 p.m.	Post-Meeting Press Release		Factory Orders
Aug. 19, 1997	2:15 p.m.	Post-Meeting Press Release		Housing Starts and Permits
Sep. 30, 1997	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence, New Home Sales
Nov. 12, 1997	2:15 p.m.	Post-Meeting Press Release		
Dec. 16, 1997	2:15 p.m.	Post-Meeting Press Release		CPI, Housing Starts and Permits
Feb. 04, 1998	2:12 p.m.	Post-Meeting Press Release		
Mar. 31, 1998	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence
May 19, 1998	2:15 p.m.	Post-Meeting Press Release		Housing Starts and Permits
Jul. 01, 1998	2:15 p.m.	Post-Meeting Press Release		NAPM Survey, Leading Indicators, Auto Sales
Aug. 18, 1998	2:15 p.m.	Post-Meeting Press Release		CPI, International Trade
Sep. 29, 1998	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence
Oct. 15, 1998	3:15 p.m.	Intermeeting Press Release	Y	PPI, Business Inventories
Nov. 17, 1998	2:15 p.m.	Post-Meeting Press Release		CPI, Business Inventories
Dec. 22, 1998	2:15 p.m.	Post-Meeting Press Release		
Feb. 03, 1999	2:12 p.m.	Post-Meeting Press Release		Auto Sales
Mar. 30, 1999	2:12 p.m.	Post-Meeting Press Release		Consumer Confidence
May 18, 1999	2:11 p.m.	Post-Meeting Press Release		Housing Starts and Permits
Jun. 30, 1999	2:15 p.m.	Post-Meeting Press Release		Leading Indicators
Aug. 24, 1999	2:15 p.m.	Post-Meeting Press Release		
Oct. 05, 1999	2:12 p.m.	Post-Meeting Press Release		Leading Indicators
Nov. 16, 1999	2:15 p.m.	Post-Meeting Press Release		Industrial Production, Capacity Utilization
Dec. 21, 1999	2:15 p.m.	Post-Meeting Press Release		U.S. Budget Deficit
Feb. 02, 2000	2:15 p.m.	Post-Meeting Press Release		New Home Sales, Leading Indicators, Auto Sales
Mar. 21, 2000	2:15 p.m.	Post-Meeting Press Release		International Trade
May 16, 2000	2:15 p.m.	Post-Meeting Press Release		CPI, Housing Starts and Permits

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Jun. 28, 2000	2:15 p.m.	Post-Meeting Press Release		Durable Goods Orders
Aug. 22, 2000	2:15 p.m.	Post-Meeting Press Release		
Oct. 03, 2000	2:12 p.m.	Post-Meeting Press Release		New Home Sales, Leading Indicators
Nov. 15, 2000	2:12 p.m.	Post-Meeting Press Release		Ind. Prod., Cap. Util., Business Inventories
Dec. 19, 2000	2:15 p.m.	Post-Meeting Press Release		International Trade
Jan. 03, 2001	1:13 p.m.	Intermeeting Press Release	Y	
Jan. 31, 2001	2:15 p.m.	Post-Meeting Press Release		GDP and NIPAs, New Home Sales
Mar. 20, 2001	2:15 p.m.	Post-Meeting Press Release		International Trade, U.S. Budget Deficit
Apr. 18, 2001	10:54 a.m.	Intermeeting Press Release	Y	Leading Indicators, International Trade
May 15, 2001	2:15 p.m.	Post-Meeting Press Release		
Jun. 27, 2001	2:12 p.m.	Post-Meeting Press Release		
Aug. 21, 2001	2:15 p.m.	Post-Meeting Press Release		
Sep. 17, 2001	8:20 a.m.	Intermeeting Press Release	Y	
Oct. 02, 2001	2:15 p.m.	Post-Meeting Press Release		
Nov. 06, 2001	2:20 p.m.	Post-Meeting Press Release		
Dec. 11, 2001	2:15 p.m.	Post-Meeting Press Release		
Jan. 30, 2002	2:15 p.m.	Post-Meeting Press Release		GDP and NIPAs
Mar. 19, 2002	2:15 p.m.	Post-Meeting Press Release		International Trade
May 07, 2002	2:15 p.m.	Post-Meeting Press Release		
Jun. 26, 2002	2:15 p.m.	Post-Meeting Press Release		Durable Goods Orders, New Home Sales
Aug. 13, 2002	2:15 p.m.	Post-Meeting Press Release		Retail Sales
Sep. 24, 2002	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence
Nov. 06, 2002	2:15 p.m.	Post-Meeting Press Release		
Dec. 10, 2002	2:15 p.m.	Post-Meeting Press Release		
Jan. 29, 2003	2:15 p.m.	Post-Meeting Press Release		
Mar. 18, 2003	2:15 p.m.	Post-Meeting Press Release		Housing Starts and Permits
May 06, 2003	2:15 p.m.	Post-Meeting Press Release		
Jun. 25, 2003	2:15 p.m.	Post-Meeting Press Release		Durable Goods Orders, New Home Sales, Exist. Home Sales
Aug. 12, 2003	2:15 p.m.	Post-Meeting Press Release		
Sep. 16, 2003	2:15 p.m.	Post-Meeting Press Release		CPI
Oct. 28, 2003	2:15 p.m.	Post-Meeting Press Release		Durable Goods Orders, Consumer Confidence
Dec. 09, 2003	2:15 p.m.	Post-Meeting Press Release		

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Jan. 28, 2004	2:15 p.m.	Post-Meeting Press Release		Durable Goods Orders, New Home Sales
Mar. 16, 2004	2:15 p.m.	Post-Meeting Press Release		Housing Starts and Permits
May 04, 2004	2:15 p.m.	Post-Meeting Press Release		Factory Orders
Jun. 30, 2004	2:15 p.m.	Post-Meeting Press Release		
Aug. 10, 2004	2:15 p.m.	Post-Meeting Press Release		
Sep. 21, 2004	2:15 p.m.	Post-Meeting Press Release		Housing Starts and Permits
Nov. 10, 2004	2:15 p.m.	Post-Meeting Press Release		U.S. Budget, International Trade
Dec. 14, 2004	2:15 p.m.	Post-Meeting Press Release		Industrial Prod., Capacity Util., International Trade
Jan. 04, 2005	2:00 p.m.	FOMC Minutes		Factory Orders, Auto Sales
Feb. 02, 2005	2:15 p.m.	Post-Meeting Press Release		
Feb. 23, 2005	2:00 p.m.	FOMC Minutes		Factory Orders, CPI
Mar. 22, 2005	2:15 p.m.	Post-Meeting Press Release		PPI
Apr. 12, 2005	2:00 p.m.	FOMC Minutes		International Trade, U.S. Budget Deficit
May 03, 2005	2:15 p.m.	Post-Meeting Press Release		Factory Orders, Auto Sales
May 24, 2005	2:00 p.m.	FOMC Minutes		Existing Home Sales
Jun. 30, 2005	2:15 p.m.	Post-Meeting Press Release		PCE
Jul. 21, 2005	2:00 p.m.	FOMC Minutes		Leading Indicators
Aug. 09, 2005	2:15 p.m.	Post-Meeting Press Release		
Aug. 30, 2005	2:00 p.m.	FOMC Minutes		Consumer Confidence, Factory Orders
Sep. 20, 2005	2:15 p.m.	Post-Meeting Press Release		Housing Starts and Permits
Oct. 11, 2005	2:00 p.m.	FOMC Minutes		
Nov. 01, 2005	2:15 p.m.	Post-Meeting Press Release		NAPM Survey, Construction Spending, Auto Sales
Nov. 22, 2005	2:00 p.m.	FOMC Minutes		
Dec. 13, 2005	2:15 p.m.	Post-Meeting Press Release		Retail Sales, Business Inventories
Jan. 03, 2005	2:00 p.m.	FOMC Minutes		NAPM Survey, Construction Spending
Jan. 31, 2006	2:15 p.m.	Post-Meeting Press Release		ECI, Consumer Confidence
Feb. 21, 2006	2:00 p.m.	FOMC Minutes		Leading Indicators
Mar. 28, 2006	2:15 p.m.	Post-Meeting Press Release		Consumer Confidence
Apr. 18, 2006	2:00 p.m.	FOMC Minutes		PPI, Housing Starts
May 10, 2006	2:15 p.m.	Post-Meeting Press Release		U.S. Budget Deficit
May 31, 2006	2:00 p.m.	FOMC Minutes		PPI, Housing Starts
Jun. 29, 2006	2:15 p.m.	Post-Meeting Press Release		GDP and NIPAs,

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Jul. 20, 2006	2:00 p.m.	FOMC Minutes		Leading Indicators
Aug. 08, 2006	2:15 p.m.	Post-Meeting Press Release		
Aug. 29, 2006	2:00 p.m.	FOMC Minutes		Consumer Confidence
Sep. 20, 2006	2:15 p.m.	Post-Meeting Press Release		
Oct. 11, 2006	2:00 p.m.	FOMC Minutes		
Oct. 25, 2006	2:15 p.m.	Post-Meeting Press Release		Existing Home Sales
Nov. 15, 2006	2:00 p.m.	FOMC Minutes		
Dec. 12, 2006	2:15 p.m.	Post-Meeting Press Release		International Trade, U.S. Budget Deficit
Jan. 03, 2007	2:00 p.m.	FOMC Minutes		NAPM Survey, Construction Spending, Auto Sales
Jan. 31, 2007	2:15 p.m.	Post-Meeting Press Release		ECI, GDP and NIPAs, Construction Spending
Feb. 21, 2007	2:00 p.m.	FOMC Minutes		CPI, Leading Indicators
Mar. 21, 2007	2:15 p.m.	Post-Meeting Press Release		
Apr. 11, 2007	2:00 p.m.	FOMC Minutes		U.S. Budget Deficit
May 09, 2007	2:15 p.m.	Post-Meeting Press Release		
May 30, 2007	2:00 p.m.	FOMC Minutes		
Jun. 28, 2007	2:15 p.m.	Post-Meeting Press Release		GDP and NIPAs
Jul. 19, 2007	2:00 p.m.	FOMC Minutes		Leading Indicators
Aug. 07, 2007	2:15 p.m.	Post-Meeting Press Release		Productivity
Aug. 10, 2007	2:00 p.m.	Intermeeting Press Release	Y	U.S. Budget Deficit
Aug. 17, 2007	2:00 p.m.	Intermeeting Press Release	Y	Michigan Sentiment
Aug. 17, 2007	2:00 p.m.	Discount Rate Change Press Release	Y	Michigan Sentiment
Aug. 28, 2007	2:00 p.m.	FOMC Minutes		Consumer Confidence
Sep. 18, 2007	2:15 p.m.	Post-Meeting Press Release		PPI
Oct. 09, 2007	2:00 p.m.	FOMC Minutes		
Oct. 31, 2007	2:15 p.m.	Post-Meeting Press Release		ECI, GDP and NIPAs, Construction Spending
Nov. 20, 2007	2:00 p.m.	FOMC Minutes		Housing Starts
Dec. 11, 2007	2:15 p.m.	Post-Meeting Press Release		
Jan. 02, 2008	2:00 p.m.	FOMC Minutes		Construction Spending
Jan. 22, 2008	2:00 p.m.	Intermeeting Press Release	Y	
Jan. 30, 2008	2:15 p.m.	Post-Meeting Press Release		GDP and NIPAs
Feb. 20, 2008	2:00 p.m.	FOMC Minutes		CPI, Housing Starts
Mar. 16, 2008	2:00 p.m.	Intermeeting Press Release	Y	
Mar. 18, 2008	2:15 p.m.	Post-Meeting Press Release		PPI, Housing Starts
Apr. 08, 2008	2:00 p.m.	FOMC Minutes		

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Apr. 30, 2008	2:15 p.m.	Post-Meeting Press Release		ECI, GDP and NIPAs
May 02, 2008	2:00 p.m.	Intermeeting Press Release	Y	Employment Report, Factory Orders
May 21, 2008	2:00 p.m.	FOMC Minutes		
Jun. 25, 2008	2:15 p.m.	Post-Meeting Press Release		Durable Goods Orders, New Home Sales
Jul. 16, 2008	2:00 p.m.	FOMC Minutes		CPI, Industrial Production
Aug. 05, 2008	2:15 p.m.	Post-Meeting Press Release		ISM Survey
Aug. 26, 2008	2:00 p.m.	FOMC Minutes		Consumer Confidence, New Home Sales
Sep. 16, 2008	2:15 p.m.	Post-Meeting Press Release		CPI
Sep. 29, 2008	10:00 a.m.	Intermeeting Press Release	Y	PCE
Oct. 07, 2008	2:00 p.m.	FOMC Minutes/Press Release	Y	
Oct. 29, 2008	2:15 p.m.	Post-Meeting Press Release		Durable Goods Orders
Nov. 19, 2008	2:00 p.m.	FOMC Minutes		CPI, Housing Starts
Dec. 16, 2008	2:15 p.m.	Post-Meeting Press Release		CPI, Housing Starts
Jan. 06, 2009	2:00 p.m.	FOMC Minutes		ISM Survey, Factory Orders
Jan. 28, 2009	2:15 p.m.	Post-Meeting Press Release		
Feb. 18, 2009	2:00 p.m.	FOMC Minutes		Housing Starts, Industrial Production
Mar. 18, 2009	2:15 p.m.	Post-Meeting Press Release		CPI
Apr. 08, 2009	2:00 p.m.	FOMC Minutes		
Apr. 29, 2009	2:15 p.m.	Post-Meeting Press Release		GDP and NIPAs
May 20, 2009	2:00 p.m.	FOMC Minutes		
Jun. 24, 2009	2:15 p.m.	Post-Meeting Press Release		Durable Goods Orders, New Home Sales
Jul. 15, 2009	2:00 p.m.	FOMC Minutes		CPI, Industrial Production
Aug. 12, 2009	2:15 p.m.	Post-Meeting Press Release		International Trade, U.S. Budget Deficit
Sep. 02, 2009	2:00 p.m.	FOMC Minutes		Factory Orders, Productivity
Sep. 23, 2009	2:15 p.m.	Post-Meeting Press Release		
Oct. 14, 2009	2:00 p.m.	FOMC Minutes		Retail Sales, Business Inventories
Nov. 04, 2009	2:15 p.m.	Post-Meeting Press Release		ISM Survey
Nov. 24, 2009	2:00 p.m.	FOMC Minutes		GDP and NIPAs, Consumer Confidence
Dec. 16, 2009	2:15 p.m.	Post-Meeting Press Release		CPI, Housing Starts
Jan. 06, 2010	2:00 p.m.	FOMC Minutes		ISM Survey
Jan. 27, 2010	2:15 p.m.	Post-Meeting Press Release		New Home Sales

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Feb. 17, 2010	2:00 p.m.	FOMC Minutes		Housing Starts, Industrial Production, U.S. Budget Deficit
Mar. 16, 2010	2:15 p.m.	Post-Meeting Press Release		Housing Starts
Apr. 06, 2010	2:00 p.m.	FOMC Minutes		
Apr. 28, 2010	2:15 p.m.	Post-Meeting Press Release		
May 10, 2010	12:00 p.m.	Intermeeting Press Release	Y	
May 19, 2010	2:00 p.m.	FOMC Minutes		CPI
Jun. 23, 2010	2:15 p.m.	Post-Meeting Press Release		New Home Sales
Jul. 14, 2010	2:00 p.m.	FOMC Minutes		Retail Sales, Business Inventories
Aug. 10, 2010	2:15 p.m.	Post-Meeting Press Release		Productivity
Aug. 27, 2010	10:00 a.m.	Jackson Hole Speech		
Aug. 31, 2010	2:00 p.m.	FOMC Minutes		Consumer Confidence
Sep. 21, 2010	2:15 p.m.	Post-Meeting Press Release		Housing Starts
Oct. 12, 2010	2:00 p.m.	FOMC Minutes		
Nov. 03, 2010	2:15 p.m.	Post-Meeting Press Release		ISM Survey, Factory Orders, Auto Sales
Nov. 23, 2010	2:00 p.m.	FOMC Minutes		GDP and NIPAs, Existing Home Sales
Dec. 14, 2010	2:15 p.m.	Post-Meeting Press Release		Retail Sales, PPI, Business Inventories
Jan. 04, 2011	2:00 p.m.	FOMC Minutes		Factory Orders, Auto Sales
Jan. 26, 2011	2:15 p.m.	Post-Meeting Press Release		New Home Sales
Feb. 16, 2011	2:00 p.m.	FOMC Minutes		PPI, Housing Starts, Industrial Production
Mar. 15, 2011	2:15 p.m.	Post-Meeting Press Release		
Apr. 05, 2011	2:00 p.m.	FOMC Minutes		ISM Survey
Apr. 27, 2011	12:30 p.m.	Post-Meeting Press Release		Durable Goods Orders
May 18, 2011	2:00 p.m.	FOMC Minutes		
Jun. 22, 2011	12:30 p.m.	Post-Meeting Press Release		
Jul. 12, 2011	2:00 p.m.	FOMC Minutes		International Trade
Aug. 09, 2011	12:30 p.m.	Post-Meeting Press Release		
Aug. 30, 2011	2:00 p.m.	FOMC Minutes		Consumer Confidence
Sep. 21, 2011	2:15 p.m.	Post-Meeting Press Release		Existing Home Sales
Oct. 12, 2011	2:00 p.m.	FOMC Minutes		
Nov. 02, 2011	12:30 p.m.	Post-Meeting Press Release		
Nov. 22, 2011	2:00 p.m.	FOMC Minutes		GDP and NIPAs
Dec. 13, 2011	2:15 p.m.	Post-Meeting Press Release		Retail Sales, Business Inventories

Date	Time	Method of Announcement	Intermeeting Move?	Other Macroeconomic Data Releases That Day
Jan. 03, 2012	2:00 p.m.	FOMC Minutes		ISM Survey, Construction Spending
Jan. 25, 2012	12:30 p.m.	Post-Meeting Press Release		
Feb. 15, 2012	2:00 p.m.	FOMC Minutes		Industrial Production
Mar. 13, 2012	2:15 p.m.	Post-Meeting Press Release		Retail Sales, Business Inventories
Apr. 03, 2012	2:00 p.m.	FOMC Minutes		Factory Orders, Auto Sales
Apr. 25, 2012	12:30 p.m.	Post-Meeting Press Release		Durable Goods Orders
May 16, 2012	2:00 p.m.	FOMC Minutes		Housing Starts, Industrial Production
Jun. 20, 2012	12:30 p.m.	Post-Meeting Press Release		
Jul. 11, 2012	2:00 p.m.	FOMC Minutes		International Trade
Aug. 01, 2012	2:15 p.m.	Post-Meeting Press Release		ISM Survey, Construction Spending, Auto Sales
Aug. 22, 2012	2:00 p.m.	FOMC Minutes		Existing Home Sales
Sep. 13, 2012	12:30 p.m.	Post-Meeting Press Release		PPI, U.S. Budget Deficit
Oct. 04, 2012	2:00 p.m.	FOMC Minutes		Factory Orders
Oct. 24, 2012	2:15 p.m.	Post-Meeting Press Release		New Home Sales
Nov. 14, 2012	2:00 p.m.	FOMC Minutes		Retail Sales, PPI, Business Inventories
Dec. 12, 2012	12:30 p.m.	Post-Meeting Press Release		U.S. Budget Deficit
Jan. 03, 2013	2:00 p.m.	FOMC Minutes		Auto Sales
Jan. 30, 2013	2:15 p.m.	Post-Meeting Press Release		GDP

Sources: Gürkaynak, Sack, and Swanson (2005); Board of Governors of the Federal Reserve System.

## ENDNOTES

<sup>1</sup>There have been other important developments, such as the statement of longer-run goals and monetary policy strategy released after the January 2012 FOMC meeting. Although not signaling a change in the conduct of monetary policy, it explains how the FOMC interprets its statutory mandate of price stability and maximum employment (Rudebusch).

<sup>2</sup>Federal funds futures contracts are known to provide reliable information on market expectations of the funds rate out to six months (Hamilton and others). Beyond that horizon, Eurodollar futures contracts have been widely used to proxy market expectations of the future policy path.

<sup>3</sup>These common factors are linear combinations of the prices of different futures contracts and are uncorrelated by construction. Selected combination weights are used to explain the common variation in the prices of multiple futures contracts.

<sup>4</sup>Gürkaynak and others note that the FOMC has sometimes changed its target for the federal funds rate hours after (and in response to) the release of employment report data, making the FOMC's actions partially anticipated. However, such moves are limited to a few cases in the early 1990s.

<sup>5</sup>For example, the FOMC statement released after its August 2011 meeting says "The Committee currently anticipates that economic conditions—including low rates of resource utilization and a subdued outlook for inflation over the medium run—are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013." One issue with the use of longer-term futures contracts is the existence of time-varying risk premia as shown in Sack. However, the potential distortion from time-varying risk premia becomes substantial when futures contracts at different business cycle points are compared because risk premia are countercyclical. Given this article's focus on daily changes in futures prices, the issue should not pose a serious problem in the analysis. On the other hand, since the federal funds rate target reached its effective lower bound in December 2008, the variation in the surprise component in federal funds future contracts may not reflect policy-induced changes. Indeed, the estimated target factor extracted using only post-2008 data is distorted considerably by the presence of the zero lower bound. The distortion shows up by a strongly negative correlation between the target factor and Treasury yields. However, adding observations in late 2007 and 2008 eliminates the distortion. In addition, the interpretation of the path factor seems to be robust, because movements in the path factor are driven by long-horizon Eurodollar futures contracts.

<sup>6</sup>While there were no explicit press releases prior to 1994, policy decisions could be communicated to financial markets through open market operations. This article follows Gürkaynak and others in including these dates in the policy announcement days. Campbell and others show that the analysis does not change substantially whether or not the sample starts from 1990 or 1994, although the relative importance of the path factor increases in the second sample.

<sup>7</sup>This is the period when the Kansas City Fed Financial Stress Index stayed above the historical average. For details of the Financial Stress Index, see Hakkio and Keeton.

<sup>8</sup>This finding is consistent with Boukus and Rosenberg, who show that market participants can extract a signal about future monetary policy from the minutes.

<sup>9</sup>The target factor exhibited a big negative realization, indicating that the size of the rate cut was bigger than financial markets anticipated.

<sup>10</sup>A financial market commentary on that day suggests that stock prices reacted positively to the monetary policy announcement (CNN Money).

<sup>11</sup>On March 18, 2008, stocks initially fell on the Federal Reserve's announcement that it cut the discount rate by less than markets expected, but stocks gained later that day. On October 7, 2008, stock prices increased after the Federal Reserve announced a special fund to buy commercial paper but plunged later that day.

<sup>12</sup>A drop of 100 basis points in the path factor is associated with a drop of about 77 basis points in the 10th quarter ahead Eurodollar futures rate.

<sup>13</sup>In a related study, Swanson and Williams find that the prolonged period at the effective lower bound of the funds rate reduced the sensitivity of longer-term Treasury bond yields to macroeconomic news after late 2011.

<sup>14</sup>These staff forecasts were presented in the so-called "Greenbook" and made public roughly five years after the associated FOMC meeting.

<sup>15</sup>The finding of no informational advantage is based on Board staff forecasts, not FOMC members' projections.

<sup>16</sup>This coordinating power will be amplified when the uncertainty surrounding private information increases, as is likely during crisis periods.

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