

Does Economic News Affect Asset Prices Through Expected Changes in Monetary Policy?

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“...asset prices will also respond to revisions in *expectations* about future policy, which in turn may be driven by news about changing economic conditions.” Bernanke and Kuttner (2005)

In this paper we test the Bernanke/Kuttner conjecture by studying the effects of “news about changing economic conditions” on prices in the federal funds futures market. This conjecture bears on the question of why economic news affects asset prices generally. The main prediction of the efficient markets hypothesis is that short-run asset price changes are the result of new information arriving in the market and thus are unpredictable. Asset-pricing theories specify what news should matter and why. Empirical work largely supports the prediction that asset prices quickly respond to news events, although identified news events typically explain only a small fraction of asset price changes. For the U.S., the most common finding is that news that is assumed to signal a stronger economy raises interest rates, causes an appreciation of the dollar, and has effects on the stock market that depend on the state of the economy.¹ It is harder to find evidence that news on inflation has substantial effects on exchange rates or stock prices but higher than expected inflation is associated with higher nominal interest rates.² While there are many studies of the effects of news on asset prices, there is still no consensus on why the news causes such changes.

Researchers generally assume that the news causes agents to revise their expectations of the future values of the fundamental variables. For example, news that inflation was higher than expected is thought to raise the expected inflation rate, which should cause nominal interest rates

¹ The literature in this area is large. Recent papers include Faust *et al.* (2007), Anderson *et al.* (2007), and Balducci *et al.* (2001). Neeley and Dey (2010) give a comprehensive review of exchange rate reactions to news. Papers by Dominguez and Panthaki (2006) and Evans and Lyons (2008) find that broadening the measures of news and allowing for order-flow effects increase the explanatory power of news.

² Flannery and Protopapdakis (2002) report evidence that stock returns fall when unexpected inflation is announced. Adams *et al.* (2004) find evidence that stock prices fall after an announcement that inflation was higher than expected but only if high frequency data are used. They also find that the response depends on the state of the economy.

to rise via the Fisher effect and the dollar to depreciate via purchasing power parity.³ But as Faust *et al.* (2007) point out, agents may also factor in the likely response of the Federal Reserve. They note that an unexpectedly low inflation announcement may be interpreted as a drop in demand that will cause the Federal Reserve to loosen monetary policy or it could be interpreted as evidence of an unexpected increase in productivity. These alternative interpretations would generally imply opposite movements in the exchange rate. Similarly, Andersen *et al.* (2003, p. 59) note that

A positive U.S. inflation surprise would tend to produce dollar depreciation (e.g. when the U.S. central bank reaction function assigns relatively low weight to the level of inflation), whereas in other interpretations it would produce dollar appreciation (e.g. when the U.S. central bank reaction function shows strong preference for low inflation, as in Taylor, 1993)

Balducci *et al.* (2001) attribute the increase in interest rates of various maturities after an announcement of stronger than expected economic growth to an increase in expected inflation via a Phillips curve relationship rather than to an expectation of tighter monetary policy.

In this paper we isolate the influence of news on expected changes in monetary policy by investigating how news changes the market's expectation of the federal funds rate target. Previous work has shown that short-run changes in federal funds rate futures prices are an appropriate measure of the market's short-run expectations of Fed policy moves.⁴ We use these data as our dependent variable and estimate models relating changes in federal funds futures prices to standard measures of economic news. Since the data provide strong evidence that economic news affects expected monetary policy we explore various aspects of the effects. We

³ The response of stock prices should be zero if inflation is neutral since nominal cash flows should grow at the new inflation rate and the nominal discount factor should rise just enough to have no immediate effect on stock prices. Tax laws and other effects may result in a non-neutral effect..

⁴ See Bundick (2007) and Hamilton (2008). Piazzesi and Swanson (2008), on the other hand, argue that some adjustment to the change in futures prices must be made.

consider how rapidly news affects federal funds futures prices, the symmetry of responses to positive and negative news events, the possible dependency of the effects on the state of the economy, and the stability of the relationships over time.

The paper is organized as follows. Section 1 briefly reviews past work on news and asset prices. Section 2 describes our data and develops our empirical specification. Section 3 presents our estimated results and section 4 concludes.

1. Past Work on News and Asset Prices

Much of the empirical work connecting economic news to asset price changes arose from the availability of survey data on market forecasts of economic announcements. Initially this work focused on the response of interest rates to the unexpected component of weekly money supply announcements. Immediately after an announcement of a higher than expected money supply, interest rates rose. This led to speculation about whether this was due to an increase in expected inflation or an increase in expected real interest rates. When it was found that the dollar generally appreciated after an announcement of higher than expected money growth, this was interpreted to mean that such announcements raised expected real rates. There was still uncertainty, however, as to whether the expected higher real rates reflected an expectation of a tighter monetary policy or an inference that higher than expected money growth meant that real money demand was higher than expected.⁵

Subsequent studies looked at the response of a variety of asset prices to a large number of news events.⁶ These studies generally find that asset prices respond very quickly to news and that high frequency data on asset price changes are often required to find significant effects for

⁵ See Engel and Frankel (1984).

⁶ Studies include Pearce and Roley (1985) on stock prices, Balduzzi *et al.* (2001) on interest rates, Anderson *et al.* (2003) on exchange rates. Faust *et al.* (2007) investigate both interest rates and exchange rates.

most announcements, given the noise in asset price changes. Anderson *et al.* (2003), report evidence of asymmetric responses to positive and negative news while Faust *et al.* (2007) find that the effect of some news events changes over time.⁷ Papers have also examined whether the state of the economy affected the impact of news on asset prices. McQueen and Roley (1993), Adams *et al.* (2004), Boyd *et al.* (2005), and Anderson *et al.* (2007) report evidence that stock price responses to news depend on whether the economy is in an expansion or contraction. The latter paper attributes the negative response of stock prices to news that the economy is stronger than expected, when the economy is already in an expansion, to an expectation that monetary policy will raise real rates and hence the rate of discount of future cash flows.

Several papers find that changes in expected monetary policy, as measured by the change in fed funds futures, affect asset prices. Anderson *et al.* (2003) find that the dollar appreciates after the FOMC announces an increase in its target rate while Faust *et al.* (2007) report that a positive change in the fed funds futures interest rate is followed by an appreciation of the dollar. Hamilton (2008) reviews and updates work showing that nominal interest rates are positively related to daily changes in the fed funds futures rate. Two papers investigate the same issue we examine. Burger (2004), using daily data, finds that the response of U.S. interest rates to many news announcements appears to be a reflection of the response of expected monetary policy to such news events, where the response of the fed funds futures rate measures the change in expected monetary policy. More recently, Taylor (2010) looks at how higher frequency fed funds futures data react to news. Our approach differs from these papers primarily by taking account of the timing of FOMC meetings. For example, we would not expect a news event to affect the current month's fed funds futures contract price if the event took place in a month in

⁷ Aggarwal and Schirm (1998) and Sheehan and Wohar (1995) also report evidence of asymmetric responses of asset prices to news.

which there was no scheduled FOMC meeting or if the event occurred after that month's FOMC meeting. Burger (2004) and Taylor (2010) assume that surprises have the same effects on futures prices regardless of the timing of FOMC meetings.

2. Data and model specification

a. Measuring expected changes in monetary policy

We use daily and higher frequency fed funds futures prices to extract our measure of expected monetary policy. These futures contracts are based on the average daily effective funds rate for all calendar days in the month, using the previous day's observation for weekend days and holidays. We consider three futures contracts: the current month's contract, the one-month ahead contract, and the two-months ahead contract. That is for all business days in, say, October, we use the prices of the fed funds futures contracts that are based on the averages for all days in October (current month), in November (one-month ahead), and in December (two-months ahead). We are interested in the effect that news announcements have on the changes in these prices, which we assume are noisy measures of the market's expected change in the Fed's target for the funds rate for FOMC meetings occurring over this horizon.

Our approach follows Hamilton's (2008). We assume that the fed funds futures rate for day d of the current month for the current month's contract, denoted $f_{0,d}$, is the market's expectation of the average daily effective funds rate, for the current month, with $f_{1,d}$ and $f_{2,d}$ denoting similar expectations for the contracts for one- and two-months ahead:⁸

$$f_{0,d} = E_d (ff_0) \tag{1}$$

$$f_{1,d} = E_d (ff_1) \tag{2}$$

⁸ The quoted futures price can be converted into an interest rate measure as follows:
 $f = (100 - \text{price})$ so that a price of 96.2 implies an average daily effective funds rate of 3.8%.

$$f_{2,d} = E_d (ff_2) \quad (3)$$

where ff_m is the average effective funds rate in month m :

$$ff_0 = M0^{-1} \sum_{i=1}^{M0} eff_{0,i} \quad (4)$$

$$ff_1 = M1^{-1} \sum_{i=1}^{M1} eff_{1,i} \quad (5)$$

$$ff_2 = M2^{-1} \sum_{i=1}^{M2} eff_{2,i} \quad (6)$$

$M0$, $M1$, and $M2$ are the number of days in the current month, one-month ahead, and two-months ahead and $eff_{m,i}$ is the actual effective funds rate for day i in month m .

We assume that the observed funds rate on any day i is the sum of the Fed's target for that day (FF) plus a random error (u), which we assume is serially uncorrelated and has an expected value of zero:

$$eff_{m,i} = FF_{m,i} + u_{m,i} \quad (7)$$

We also assume that market participants believe that the Fed's target for the funds rate will only be changed at scheduled FOMC meetings.⁹ Therefore,

$$ff_{0,d} = M0^{-1} \sum_{i=1}^{M0} E_d(FF_{0,i})$$

$$ff_{1,d} = M1^{-1} \sum_{i=1}^{M1} E_d(FF_{1,i})$$

$$ff_{2,d} = M2^{-1} \sum_{i=1}^{M2} E_d(FF_{2,i})$$

Given the above assumptions, the effects of news on the fed funds futures rates should depend on the timing of the FOMC meetings. Take the current month's contract for example. If there is no FOMC meeting in the current month or if the news happens after the FOMC meeting has occurred, the news should have no effect on the futures rate because the news cannot affect the Fed's target for the remainder of the current month. If there is a meeting on, say, the 16th of a

⁹ Of the 50 changes in the fed funds rate target over our sample period, 5 occurred between formal FOMC meetings when the FOMC conducted a conference call. Conference calls are not usually known ahead of time. Data on changes in the Fed's target for the funds rate are from the St. Louis Fed's web site.

30-day month and the news happens prior to the meeting, then the change in the futures rate will reflect the expected effect on the target divided by 2. Note that we cannot identify separately the effect of news on the probability of a change in the target and the effect on the size of the change in the target. If our results imply that the news event increases the expected target by 2.5 basis points, this would be consistent with the news raising the probability of a change by 10 percent along with an expected change in the target of 25 basis points or with the news raising the probability by 5 percent along with an expected change in the target of 50 basis points.

Because we are investigating the effects on the current month's contract, the one-month ahead contract, and the two-months ahead contract, we need to consider the possible patterns of FOMC meetings over any three-month horizon. There are five possible meeting patterns:¹⁰

1. meeting this month, meeting next month, meeting two-months ahead
2. meeting, meeting, no meeting
3. meeting, no meeting, meeting
4. no meeting, meeting, meeting
5. no meeting, meeting, no meeting

The effect of news may be spread over the current and future contracts, as posited by models using a partial-adjustment version of the Taylor rule. This requires an additional assumption for our approach, namely that the effect of news on future target changes does not depend on the sequence of FOMC meetings. For example, suppose news on inflation causes the FOMC to raise its target by 75 basis points. We assume that the FOMC spreads the changes over the next three meetings independently of the timing of those meetings. If it wants to spread the increase evenly, it will raise the target 25 basis points at each meeting even if this takes four

¹⁰ Over our sample, there is never a case where two months go by without a scheduled meeting.

months, that is that the next three meetings occur over the next four months. We assume that this would not change if the meetings were over the next three months.

Given our assumptions, we can now model how news should affect the fed funds futures rate on different contracts depending on the timing of meetings. We have derived the effect of news on each contract month's futures rate as follows:¹¹

Let N_d be the news announced on day d and let D_0 , D_1 , and D_2 be the dates of the FOMC meetings, if scheduled, in the current month, one-month ahead, and two-months ahead.¹²

$$\Delta f_{0,d} = \beta_0 X_{0,d} + u_{0,d} \quad (8)$$

$$\text{where } X_{0,d} = [(M_0 - D_0 + 1) / M_0] I_0 N_d \quad (8a)$$

$$I_0 = 1 \text{ if } d \leq D_0 \text{ and } I_0 = 0 \text{ if } d > D_0 \text{ (} D_0 = 0 \text{ if no meeting in the month).}$$

β_0 is the effect of a unit change in N on the expected fed funds target announced at the meeting to be held on D_0 .

Similarly,

$$\Delta f_{1,d} = \beta_0 X_{0,d} + \beta_1 X_{1,d} + u_{1,d} \quad (9)$$

$$\text{where } X_{0,d} = I_0 N_d \quad (9a)$$

$$X_{1,d} = [(M_1 - D_1 + 1) / M_1] I_1 N_d \text{ and } I_1 = 1 \text{ if } D_1 > 0 \quad (9b)$$

$$= 0 \text{ if there is no meeting in the month ahead}$$

β_1 is the effect of a unit change in N on the expected fed funds target announced at the meeting to be held on D_1 .

$$\Delta f_{2,d} = \beta_0 X_{0,d} + \beta_1 X_{1,d} + \beta_2 X_{2,d} + u_{2,d} \quad (10)$$

$$\text{where } X_{0,d} = I_0 N_d \quad (10a)$$

¹¹ Appendix A gives the derivations.

¹² All news announcements are in the morning while the FOMC decisions are announced in the afternoon.

$$X_{1,d} = I_1 N_d \quad (10b)$$

$$X_{2,d} = [(M2-D2+1)/M2] I_2 N_d \text{ and } I_2 = 1 \text{ if } D2 > 0 \quad (10c)$$

= 0 if there is no meeting in two months ahead

β_2 is the effect of a unit change in N on the expected fed funds target announced at the meeting to be held on $D2$.

We estimate models similar to equations (8)-(10) but allow for multiple news events on day d .

We start our data on January 2, 1995 and end on March 28, 2008. These dates correspond to the period for which we have daily and higher frequency data on fed funds futures prices.¹³ We now turn to a discussion of these news events.

b. Measuring economic news

We measure news in the same way as many previous studies, namely as the difference between the actual announcements and the median forecasts from a survey of money market participants.¹⁴ Previous work has shown that these survey forecasts appear unbiased and competitive with other forecasts.¹⁵ Moreover, they are usually publicized so that market participants are aware of “average opinion”. The news announcements occur prior to the close of the fed funds futures market. Table 1 gives the announcements we consider, their units and timing, and associated descriptive statistics for the unexpected, or news, components for our sample period.¹⁶

¹³ The futures data were purchased from the Chicago Mercantile Exchange.

¹⁴ Money Market Services initially conducted the surveys. The survey data are currently maintained and sold by Haver Analytics.

¹⁵ See for example, Pearce and Roley (1985).

¹⁶ There is one missing observation for expectations: the January 1996 survey forecast for durable goods orders. The reported estimates set this news event to zero. Assuming that the news was the error from an ARIMA model estimated using prior announcements had no significant effect on the results. There are also two weeks at the end of

3. Investigating how news affects expected monetary policy

A. The basic model

We begin by estimating models based on equations (8) - (10) using end-of-day data for the change in the futures rate. Thirteen news announcements are included in each equation. For the current-month contracts, there is one set of daily weights applied to all news items:

$$\Delta ff_{0,t} = \sum \beta_{0,i} w_{00,t} N_{i,t} + \varepsilon_{0,t} \quad (11)$$

where $\Delta ff_{0,t}$ = the change in the current month fed funds futures rate

$$w_{00,t} = [(M0-D0+1)/M0]I_0 \text{ and } I_0 = 1 \text{ if } d \leq D0 \text{ and } D0 > 0 \text{ and } I_0 = 0 \text{ if } d > D0 \\ \text{or } D0=0 \text{ (i.e. no meeting in the month)}$$

$N_{i,t}$ = the unexpected component of the announced value of economic variable i
measured in standard deviation units.¹⁷

For the one-month ahead contracts the news items appear twice, with different weights as given in equations (9a) and (9b):

$$\Delta ff_{1,t} = \sum \beta_{0,i} w_{01,t} N_{i,t} + \sum \beta_{1,i} w_{11,t} N_{i,t} + \varepsilon_{1,t} \quad (12)$$

where $w_{01,t} = I_0$

$$w_{11,t} = [(M1-D1+1)/M1] I_1 \text{ and } I_1 = 1 \text{ if } D1 > 0, 0 \text{ otherwise (i.e. no meeting that month)}$$

Similarly, for the two-months ahead contracts the news items appear three times, with different weights as given in equations (10a), (10b), and (10c).

$$\Delta ff_{2,t} = \sum \beta_{0,i} w_{02,t} N_{i,t} + \sum \beta_{1,i} w_{12,t} N_{i,t} + \sum \beta_{2,i} w_{22,t} N_{i,t} + \varepsilon_{2,t} \quad (13)$$

where $w_{02,t} = I_0$

1995 without announcements on initial unemployment claims or personal income changes due to the federal government partial closure so we set those events to zero.

¹⁷ Before adjusting for timing we measure the news as
news = (announcement – survey median forecast) / standard deviation of forecast error.

$$w_{12,t} = I_1$$

$$w_{22,t} = [(M2-D2+1)/M2] I_2 \text{ and } I_2 = 1 \text{ if } D2 > 0, 0 \text{ otherwise (i.e. no meeting that month)}$$

We estimate equations (11) - (13) by the seemingly unrelated regressions (SUR) method because unobserved shocks are likely to affect the three contracts contemporaneously and because this allows us to test the cross-equation constraints implied by our model. As formulated, the model assumes that the β_0 coefficients for each news event are equal across the three equations and the β_1 coefficients are equal across the last two equations.

Table 2 presents the SUR estimates of the model for all business days in our sample.¹⁸ For the rates on the current month contract, five news events appear statistically significant with the anticipated signs. A positive, one-standard deviation surprise in core-CPI inflation, assuming a current-month FOMC meeting after this news event, raises the expected target by about 2.4 basis points.¹⁹ A positive, one-standard deviation surprise in non-farm payrolls raises the expected target by about 1.6 basis points while a surprise to industrial production raises the target by about .9 basis points. A one standard deviation decrease in the unemployment rate or in initial unemployment claims increases the target by about .6 and .7 basis points, respectively. The other surprises appear to have no significant effect on the current month's contract. Since a typical change in the target is 25 or 50 basis points, the estimates suggest that these individual news events have, by themselves, only a small effect on the market's probability of target rate changes.

¹⁸ For all the samples, the Breusch-Pagan test indicates that the hypothesis that the error terms across the three equations are independent is strongly rejected.

¹⁹ Core CPI and CPI announcements are made at the same time. We report results using core CPI, but not standard CPI. If we use the standard CPI we get similar results to using the core CPI but when both are included the core CPI surprise is usually significant and the standard CPI surprise is never significant. The simple correlation coefficient for the two surprises is .42, significant at the .001 level.

For the one-month ahead contracts, the results are similar in that the β_0 estimates that were significant for the current-month contracts are still statistically significant, but the effect of the core CPI surprise is smaller and the PPI surprise and the retail sales surprise are now significant. More news events appear significant with respect to their effects on the expected FOMC decision for meetings that occur in the next month, that is the β_1 coefficients from the one-month ahead contracts. The estimates for the one-month ahead contracts imply that, when both are significant, the effects of surprises on the expected change in the funds rate target for a current month FOMC meeting (the β_{0s}) are larger than the effects on the expected target change at the FOMC meeting to be held one-month ahead (the β_{1s}), with the exception of the unemployment rate surprise. Several surprises, however, - durable goods, the trade deficit, leading indicators, and consumer confidence – appear to affect the market’s expectation of the FOMC’s decision one-month ahead but not the current month’s decision.

For the two-months ahead contracts, the results are similar to those for the one-month ahead contract. The most robust finding is that the monthly payroll announcements significantly affect the market’s expectation of target rate changes for meetings that occur in each month. Inflation surprises appear to affect the market’s expectation of rate changes for meetings that occur in the current month and one-month ahead. Table 2 also reports the joint test of all the cross-equation constraints, that is that the β_{0i} ’s and the β_{1i} ’s are identical across contracts. The constraints cannot be rejected at the 5-percent level but would be rejected at the 10 percent level.²⁰

²⁰ We re-estimated the model omitting the 5 days when the FOMC made a target change at an unscheduled meetings. Table B1 in appendix B reports these results. The estimates are very similar to those in Table 2. We also re-estimated the model omitting all days when there was a regularly scheduled FOMC meeting and these results, reported in Table B2 in appendix B, are also very similar to the results of Table 2.

Table 3 gives the total change in the expected FOMC target for the one-month ahead and two-months ahead contracts. The second column gives the total expected change ($\beta_0 + \beta_1$) in the target for a one-standard deviation surprise for each announcement assuming that there are meetings in both the current and next month, using the daily data on one-month ahead contracts. The next four columns give the total estimated changes in the target for one-standard deviation surprises depending on the pattern of meetings, using daily data on the two-months ahead contracts. If there are meetings in the current and both subsequent months, the total effect would be ($\beta_0 + \beta_1 + \beta_2$). If there are meetings only in the current and next month the estimated total effect would be ($\beta_0 + \beta_1$) and so on. For example, a positive one-standard deviation increase in the core CPI is estimated to increase the expected targets implicit in the one-month ahead futures prices by a total of about 1.6 basis points while a positive one-standard deviation surprise in nonfarm payrolls is estimated to increase the targets by a total of about 2.7 basis points. Similarly, a positive one-standard deviation increase in the core CPI (nonfarm payrolls) is estimated to increase the expected targets implicit in the two-months ahead futures prices by a total of about 1.9 (4) basis points if there are meetings in all three months. If there is not a meeting in the current month, the estimated effect is only .25 basis points and is not significant. The effect on the implied funds rate is of the same scale as the effects on market interest rates of news events reported by Balduzzi *et al.* (2001). For example, they found that a positive one-standard deviation surprise in nonfarm payrolls raised the three-month Treasury bill rate by about 6 basis points. While they interpret this to mean that the stronger economy increases inflation expectations, our results suggest that about two-thirds of the effect works through an expectation of tighter monetary policy.²¹

²¹ Balduzzi *et al.* (2001) use the percentage change in the T-bill's price. They find that a one standard-deviation

Comparing our results with those reported in Taylor(2010), who regressed changes in the fed futures contracts from 30 minutes prior to the announcements to 60 minutes after the announcements on the un-weighted surprises, the qualitative results are similar in having the largest effects from payroll and unemployment surprises but we obtain larger point estimates of the effects.²² We also find more evidence of responses to core CPI surprises. These differences are not surprising because we are estimating responses conditional on the timing of the surprise relative to FOMC meetings while Taylor estimates unconditional responses. For example, he finds for the one-month ahead contract that the response in the implied interest rate of a one standard deviation payroll surprise is about .4 basis points while our estimate is about 1.4 basis points if there is a meeting in the current month after the payroll announcement and about 1.7 basis points if there are meetings in both the current and next month. His estimates average this effect and the smaller effect if there were no meeting in the current month and one in the next month that appeared late in the month. In other words we are estimating the market's expectation of changes in the FOMC targets at scheduled meetings while Taylor is estimating the average change disregarding the timing of the announcements. When he uses the four-months ahead contract, he gets estimates of the response to payroll surprises that are similar to our estimates assuming meetings in all three months. Our finding that the core CPI surprises have a substantial effect on the market's expectation of target rate changes while he does not also probably reflects our use of weighted surprises. The CPI is announced rather late in the month. Thus it will often occur after the FOMC meeting and hence should have no effect on the current

surprise in nonfarm payrolls would lower the T-bill rate by about .014 percent which is roughly a decline in the annual yield of about 6 basis points.

²² Taylor's dependent variable is the change from 30 minutes before to sixty minutes after on days when there are announcements less the change over the same time period on days when there are no announcements. We use the more common approach of including all days including those on which no news occurs. Tests for possible heteroskedasticity indicate that we cannot reject the hypothesis of homoskedastic errors.

month's contract or, if it occurs prior to the FOMC meeting, that meeting must be near the end of the month and will have a relatively small effect on the current month's average funds rate. We take this into account and so our conditional estimate will be larger.

Daily changes in the fed funds futures prices may yield imprecise estimates of the effects of news relative to estimates using higher frequency data given all the other information besides our measured news that may affect the market's expectation of Fed policy. In order to evaluate this issue, we also estimated models using changes for 5-minute intervals. Table 4 reports the estimates where the dependent variable is the change in the implied funds rate for the 5 minutes after the announcements. Because the announcements are not at the same time, the tabled results are for three separate regressions: one for the ten 8:30 a.m. ET announcements, one for the 9:15 a.m. ET announcement, and one for the two 10:00 a.m. ET announcements. (See Table 1.)

Comparing the point estimates for this shorter interval to those for the daily changes (Table 2), we find that most of the news events that are significant for the 5-minute intervals are also significant for the daily data. Estimates with daily data generally produce substantially larger effects. For example the immediate impact of a core CPI surprise on the current month contracts is about 10 times larger for daily data, while the effects of labor market surprises are about one and one-half times as large for daily data. Not surprisingly, the standard errors for the short-interval estimated coefficients are substantially smaller. The effects on one-month ahead and two-months ahead contracts are also similar but usually larger for daily data, suggesting that this market takes a little time to respond to surprises.

To see if there were statistically significant responses after the first 15 minutes, we also estimated the model for the change in the implied funds rate for the interval from 15 minutes after the announcements to 6 hours after the announcements. For all three contracts, the joint

hypothesis that the news events do not affect the futures market after 15 minutes is easily rejected. The individually significant coefficients are mainly those for the inflation surprises, consistent with the larger effects using daily data. For the current month contract, the estimated response of the market's expected change in the funds target at the current month's meeting to a one-standard deviation positive surprise in the core CPI, over the interval from 15 minutes after the announcement to 6 hours after the announcement, is about 1.8 basis points. A one-standard deviation positive surprise in the PPI raises the expected target by about 1 basis point. The corresponding amounts for the one-month ahead contracts are .6 and .8 and 1 and .3 (not significant) for the two-months ahead contract. The two-months ahead contract also indicates more evidence of a delayed response to labor market surprises.²³

One reason for the possible lagged response to the news is that the trading in these futures contracts is rather thin, particularly in the early part of our sample. To see if this effect disappears in the later part of the sample, we re-estimated the model for the 15-minute to 6 hour interval for the first and second halves of the data. The lagged effects are, surprisingly, stronger in the later part of the sample so that the low volume of trading does not appear to be the reason for the slow response.²⁴

To sum up the results from the basic model, several surprises that indicate a stronger than expected economy appear to raise the market's expected fed funds target, depending on the timing of the FOMC meetings. There is evidence that inflation surprises raise the market's expected target if the FOMC meets after the surprise but in the same month as the surprise. The

²³ Table B3 presents these results in Appendix B.

²⁴ For the 8:30 announcements and the observations from January 2, 2001 to March 28, 2008, we can reject the joint hypothesis of no responses after 15 minutes at the .01 level. Similar to the whole period, in the later period the inflation surprises have large and significant effects even after 15 minutes.

strongest effects are from labor market surprises, which appear to affect the market's expectations of target changes for any meetings that occur over a three-month horizon.

There is little or no evidence that other surprises such as to housing starts, to personal income, or to the trade deficit affected the market's expectation of target changes. The results of the basic model also provide evidence that futures prices respond slowly to news. Therefore, we use daily closing price changes to investigate how the market's expectation of FOMC target changes is influenced by such surprises in the following section.

4. Extensions

A. Testing for parameter constancy across time

The results reported above are based on the assumption that the market's beliefs about how news affects the FOMC's funds rate target are constant throughout the period. To test this assumption we split our sample roughly in half and re-estimate the model for January 2, 1995 – December 31, 2001 and January 2, 2002 – March 28, 2008.²⁵ A formal test that the 78 parameters were the same across sub-periods rejects the assumption so we present the estimates for each sub-period in Tables 5 and 6.²⁶

Looking first at the results in Table 5 for 1995-2001, we find that surprises to core CPI, nonfarm payrolls, and industrial production affect the market's expectation of the FOMC target change at a meeting in the current month (the β_0 's) across the three contracts, but there is also evidence from data on the one-month and two-months ahead contracts that surprises to retail

²⁵ While one might suspect changes in the market's beliefs when the chairmanship of the Fed changes, we do not have many observations after Bernanke replaced Greenspan.

²⁶ The χ^2 statistic is 132.48 with 78 degrees of freedom, easily significant at the .01 level.

sales and initial unemployment claims also affect this expectation.²⁷ If there is a FOMC meeting in the next month, the market's expectation of changes in the target (the β_1 's) are affected by surprises to unemployment, nonfarm payrolls, industrial production retail sales, the index of leading indicators, and initial unemployment claims but not by inflation surprises. All the coefficients have the expected signs, with news of a stronger economy raising the expected funds rate target and, for the current month's meeting, news of higher inflation raising the expected target.

Table 6 reports the results for the second sub-period, January 2, 2002-March 28, 2008. There are several differences between the results for the two sub-periods. First, core CPI inflation surprises have significantly greater effects on expected target changes in the second sub-period. The results for the current month's contract indicate that a one-standard deviation surprise raises the expected target by about 4 basis points in the second sub-period compared to 1.5 basis points in the first sub-period. Second, PPI inflation surprises are generally significant in the second sub-period, raising the expected target in the current month by about 1.5 basis points, and are never significant in the first sub-period. Third, there is no evidence that surprises to retail sales, industrial production, or the index of leading indicators affects the market's expectation of funds rate target changes at any meeting in the next two months during the second sub-period.

To summarize, in the latter half of our sample, the only news events that have significant effects on expected target changes are direct measures of surprises in the labor market (unemployment, nonfarm payrolls, and initial unemployment claims) and of surprises in inflation (core CPI, and PPI).

²⁷ Retail sales surprises are not significant for the current month's contract but the effect is similar in size but with a p-value of .13.

B. Do positive surprises have the same effects as negative surprises?

So far we have assumed a linear model in which surprises have symmetric effects on the market's expectations of future FOMC decisions. This restricts positive and negative surprises to have the same effects.²⁸ To see if the market responds to surprises depending on their sign we augment the model given by equations (11)-(13) by allowing different coefficients for positive and negative news. Thus the model now has 156 surprise coefficients, double that of the basic model. Given the above results that the market may respond differently in the first and second halves of our data period, we examine the entire period and the two sub-periods.

The SUR estimate of the expanded model for the entire period rejects the joint hypothesis that, for each surprise, the coefficients for positive news equal the coefficients for negative news.²⁹ When we examine each of the equality restrictions separately, the hypothesis that the coefficient on the positive surprise equals the coefficient on the negative surprise is rejected in 12 of the 78 cases. The most consistent findings: a positive retail sales surprise of one standard deviation raises the market's expectation of the funds target, if there is a meeting in the current month, by about 2 basis points but negative surprises have no effect; a one-standard-deviation positive surprise in initial unemployment claims lowers the market's target rate expectation for the current month meeting by about 1.4 basis points with a negative surprise having no effect; and an unexpected increase in the unemployment rate of one standard deviation lowers the expected target for a meeting next month by about 3 basis points while a similarly-sized decrease

²⁸ Aggarwal and Schirm (1998), Anderson *et al.* (2003), and Sheehan and Wohar (1995) find evidence of asymmetric responses to positive and negative news.

²⁹ The χ^2 statistic for the joint hypothesis is 124.33 with 78 degrees of freedom, significant at less than the .01 level.

has no effect. Thus there is some evidence of asymmetry for a few surprises but the effects are symmetric for most of the surprises.³⁰

When we allow for asymmetrical effects in each sub-period, we find more evidence of asymmetry in the first sub-period in that for 11 of the 78 cases we can reject the hypothesis that positive and negative surprises have the same coefficients and we can reject the joint hypothesis that all effects are symmetric.³¹ The most consistent finding of asymmetry is for unemployment surprises and retail sales. An unexpected increase in unemployment is associated with a decrease in the market's expected funds rate target while a decrease has no effect. An unexpected increase in retail sales is associated with an increase in the expected funds rate but an unexpected decrease has no effect.

There is less evidence of asymmetry in the second sub-period. Formal tests of the joint hypothesis that positive and negative surprises have the same coefficients cannot be rejected and there are only 4 out of 78 cases where the individual hypothesis can be rejected.³² Our overall conclusion is that asymmetric effects are relatively minor and appear to have diminished over time.

C. Does the effect of surprises depend on the state of the economy?

It seems plausible that the market would anticipate that the FOMC would respond differently to, say, a surprise decrease in the unemployment rate if the economy is in a recession rather than in an expansion. Previous studies such as McQueen and Roley (1993), Adams *et al.* (2004), and Boyd *et al.* (2005) find evidence of such state dependence for stock prices.

³⁰ The coefficient estimates are given in Table B4 in appendix B. Andersen *et al.* (2003) give graphical evidence of asymmetric responses of exchange rates to news but do not report formal tests.

³¹ The χ^2 statistic is 154.5 with 78 degrees of freedom, significant at the .01 level.

³² For the current month and one-month ahead contracts, negative PPI surprises lower the expected target at the current month's meeting while positive surprises do not raise the expected target.

We examine this issue by again augmenting the basic model, equations (11)-(13), by interacting the surprise variables with dummy variables indicating the state of the economy. We applied the Hodrick-Prescott filter to the unemployment rate over our sample period to obtain a measure of cyclical unemployment. The economy is in the high state if cyclical unemployment is negative and in the lowest quartile, in the low state if cyclical unemployment is positive and in the highest quartile, and in the middle state when cyclical unemployment is in the second and third quartiles. We interact each weighted news variable with three dummy variables for the three states and test whether the coefficients are identical across our measured states.

There is some evidence of state dependence in the market's reactions to news but it is not pervasive. Allowing for separate coefficients for the three states of the economy, we then test the 78 joint hypotheses that the coefficients are equal across states.³³ This hypothesis is rejected in 16 of the 78 cases. The results imply that the market believes the Fed is more likely to raise the target or raise it by more if unexpected inflation occurs or if payroll employment is unexpectedly high when the economy is in the high state. For example, a positive, one-standard-deviation surprise in core CPI inflation raises the expected target for a current month meeting by 3-6 basis points in the high state, but the same surprise has an insignificant effect when the economy is in the low state.³⁴ A positive, one-standard-deviation surprise in nonfarm payrolls increases the expected target for a current month meeting by 3-4 basis points when the economy is in the high state but only by about 2 basis points when the economy is in the low state. Thus there is some evidence of asymmetric effects across states of the economy, with the plausible

³³ In the basic model there are 13 news coefficients for the current month's contract, 26 coefficients for the one-month ahead contracts, and 39 coefficients for the two-months ahead contracts. For each of these 78 coefficients we test whether the two interaction terms are jointly equal to zero. The estimated model is presorted in Table 5B in appendix B.

³⁴ For the current month contract, the estimated effect on the target rate in the high state is 6.1 basis points while the estimated effect using one-month and two-months ahead contracts is 3.2 basis points.

result that market participants expected the Fed to respond more to surprises suggesting higher inflation or a stronger economy when economic activity is relatively high.

5. Conclusions

There is substantial evidence that economic news moves asset prices. It is less clear whether at least part of the response is due to changes in expected monetary policy. Since price changes in fed funds futures contracts are widely thought to reflect changes in the financial market's expectations about future FOMC funds rate targets, we examine whether economic news is related to this measure of expected monetary policy. A novelty of our paper is that we pay attention to the timing of FOMC meetings when estimating the effects of news. Because fed funds futures prices reflect monthly averages of daily funds rates, the effect of any news event depends on if or when the FOMC meets in a particular month.

We find that, as Bernanke and Kuttner (2005) posited, the market does change its expectation of FOMC moves after certain news events. News that inflation was higher than expected or the employment picture was stronger than expected raises the expected change in the fed funds target, consistent with market participants believing the Fed follows some form of Taylor rule. Surprisingly, we find that the federal funds futures market reacts slowly to some news, particularly news on inflation, with significant effects occurring during the period from 15 minutes to six hours after an announcement. Splitting our period of 1995 to 2008 into two periods reveals that the market placed more weight on inflation surprises in the latter half of our sample. There is only weak evidence that the market reacts differently to positive versus negative surprises and somewhat stronger evidence that the reactions depend on the state of the economy.

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Table 1
Descriptive Statistics
January 2, 1995 through March 28, 2008

News Event	Units	Time	Mean Std Dev	Maximum Minimum	N
CPI	Percentage Change	8:30 am	-.021 .129	.3 -.5	159
Core CPI	Percentage Change	8:30 am	-.015 .091	.2 -.3	159
PPI	Percentage Change	8:30 am	.001 .439	1.7 -1.2	159
Civilian Unemployment Rate	Level in percentage points	8:30 am	-.039 .136	.3 -.3	159
Change in Nonfarm Payrolls	Thousands	8:30 am	-19.77 104.76	408 -328	159
Initial Unemployment Claims	Thousands	8:30 am	-.165 18.582	85.00 -167.00	687
Industrial Production	Percentage Change	9:15 am	-.001 .296	.9 -.7	159
Retail Sales	Percentage Change	8:30 am	.000 .605	5.00 -1.80	159
Housing Starts	Millions of units	8:30 am	.010 .088	.246 -.273	158
Durable Goods Orders	Percentage Change	8:30 am	-.090 2.711	10.80 -7.60	159
Personal Income	Percentage Change	8:30 am	.047 .236	1.4 -.60	159
Trade Deficit	\$ Billions	8:30 am	-.112 2.385	7.30 -9.10	159
Index of Leading Indicators	Percentage Change	10:00 am	-.011 .166	.70 -.50	159
Index of Consumer Confidence	Percentage Change	10:00 am	.609 4.782	13.20 -13.00	159

Notes: News events are the unexpected components of announcements measured by the announced value less the expected value taken from the MMS surveys. The percentage changes are for month- over-month changes.

Table 2
SUR Estimates of the Effects of News on the Expected Change in Monetary Policy Using Daily Data

January 2, 1995– March 28, 2008

News Variable	Current Month Contact β_0	One-Month Ahead Contract β_0	One-Month Ahead Contract β_1	Two-Months Ahead Contract β_0	Two-Months Ahead Contract β_1	Two-Months Ahead Contract β_2
Core CPI	.0241 (.0055) ^{***}	.0138 (.0030) ^{***}	.0025 (.0020)	.0164 (.0038) ^{***}	.0025 (.0013) [*]	-.00003 (.0029)
PPI	.0093 (.0061)	.0118 (.0030) ^{***}	.0036 (.0022) [*]	.0096 (.0042) ^{**}	.0017 (.0014)	.0038 (.0040)
Unemployment Rate	-.0061 (.0033) [*]	-.0076 (.0023) ^{***}	-.0111 (.0025) ^{***}	-.0050 (.0031)	-.0117 (.0018) ^{***}	-.0069 (.0027) ^{***}
Nonfarm Payrolls	.0156 (.0034) ^{***}	.0151 (.0023) ^{***}	.0117 (.0024) ^{***}	.0163 (.0031) ^{***}	.0143 (.0017) ^{***}	.0090 (.0030) ^{***}
Unemployment Claims	-.0068 (.0030) ^{**}	-.0047 (.0016) ^{***}	-.0014 (.0008) [*]	-.0042 (.0021) ^{**}	-.0020 (.0008) ^{**}	-.0012 (.0014)
Industrial Production	.0091 (.0053) [*]	.0076 (.0025) ^{***}	.0029 (.0024)	.0072 (.0034) ^{**}	.0030 (.0017) [*]	.0017 (.0033)
Retail Sales	.0078 (.0066)	.0080 (.0036) ^{**}	.0058 (.0021) ^{***}	.0097 (.0047) ^{**}	.0060 (.0017) ^{***}	.00003 (.0038)
Housing Starts	.0047 (.0064)	.0037 (.0029)	.0021 (.0022)	-.0002 (.0039)	.0006 (.0015)	.0058 (.0028) ^{**}
Durable Goods Orders	.0019 (.0426)	-.0055 (.0052)	.0047 (.0022) ^{**}	-.0085 (.0063)	.0043 (.0015) ^{***}	.0038 (.0026)
Personal Income	.0038 (.0046)	.0016 (.0036)	.0002 (.0017)	.0054 (.0045)	.0023 (.0016)	-.0019 (.0027)
Trade Deficit	.0047 (.0059)	.0020 (.0031)	-.0081 (.0024) ^{***}	.0041 (.0042)	-.0002 (.0014)	-.0030 (.0039)
Leading Indicators	.0071 (.0069)	.0017 (.0026)	.0058 (.0025) ^{**}	-.0008 (.0037)	.0018 (.0015)	.0094 (.0034) ^{***}
Consumer Confidence	-.0169 (.0309)	.0011 (.0047)	.0040 (.0022) [*]	.0014 (.0058)	.0035 (.0015) ^{**}	.0047 (.0020) ^{**}
Constant	.0008 (.0003) ^{***}		-.0017 (.0004) ^{***}			-.0019 (.0005) ^{***}
Cross-equation restrictions						$\chi^2(39) = 50.83^*$

Notes: Standard errors are in parentheses.

*, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Number of daily observations = 3310.

Table 3
Estimates of Total Effects of News on the Market's Expected Change in the Fed's Target

News	One-month ahead contracts	Two-months ahead contracts			
		$\beta_0 + \beta_1 + \beta_2$	$\beta_0 + \beta_1$	$\beta_0 + \beta_2$	$\beta_1 + \beta_2$
Core CPI	.0163***	.0189***	.0189***	.0164***	.0025
PPI	.0154***	.0151***	.0113***	.0134***	.0055
Unemployment Rate	-.0187***	-.0236***	-.0167***	-.0119***	.0186***
Nonfarm Payrolls	.0268***	.0396***	.0306***	.0253***	.0233***
Unemployment Claims	-.0061***	-.0074***	-.0060***	-.0054***	-.0032**
Industrial Production	.0105***	.0119***	.0102***	.0089***	.0047
Retail Sales	.0138***	.0157***	.0157***	.0097**	.0060
Housing Starts	.0048	.0062	.0004	.0056	.0064*
Durable Goods Orders	-.0008	-.0004	-.0042	-.0047	.0081***
Personal Income	.0018	.0058	.0077	.0035	.0004
Trade Deficit	-.0061	.0009	.0039	.0011	-.0032
Leading Indicators	.0075**	.0104***	.0010	.0086**	.0112***
Consumer Confidence	.0051	.0096	.0049	.0061	.0082***

Note: *, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Table 4
 SUR Estimates of the Effects of News on the Expected Change in Monetary Policy, 5-minutes
 after Announcements
 January 2, 1995– March 28, 2008

News Variable	Current Month Contact β_0	One-Month Ahead Contract β_0	One-Month Ahead Contract β_1	Two-Months Ahead Contract β_0	Two-Months Ahead Contract β_1	Two-Months Ahead Contract β_2
Core CPI	.0025 (.0015)*	.0057 (.0011)***	.0047 (.0011)***	.0047 (.0015)***	.0021 (.0007)***	.0061 (.0019)***
PPI	.0015 (.0016)	.0020 (.0011)*	.0045 (.0012)***	-.0019 (.0018)	.0024 (.0007)***	.0057 (.0025)**
Unemployment Rate	-.0045 (.0009)***	-.0069 (.0008)***	-.0034 (.0012)***	.0008 (.0013)	-.0029 (.0009)***	.0017 (.0017)
Nonfarm Payrolls	+.0107 (.0009)***	.0148 (.0008)***	.0111 (.0013)***	.0122 (.0013)***	.0129 (.0008)***	-.0069 (.0020)***
Unemployment Claims	-.0022 (.0008)***	-.0022 (.0006)***	-.0007 (.0004)	-.0012 (.0009)	-.0014 (.0004)***	-.0023 (.0010)**
Industrial Production	.0001 (.0006)	.0026 (.0003)***	.0029 (.0004)***	.0017 (.0005)***	.0016 (.0003)***	.00002 (.0008)
Retail Sales	.0078 (.0017)***	.0076 (.0013)***	.0023 (.0010)**	.0038 (.0019)**	.0060 (.0008)***	-.0013 (.0025)
Housing Starts	.0004 (.0017)	.0019 (.0011)*	.0013 (.0011)	-.0003 (.0016)	.0012 (.0008)	.0012 (.0019)
Durable Goods Orders	-.0004 (.0113)	.0016 (.0019)	.0043 (.0012)***	.0035 (.0023)	.0026 (.0008)***	.0029 (.0018)*
Personal Income	-.0001 (.0012)	.0004 (.0013)	.0001 (.0009)	-.0003 (.0017)	.0000 (.0008)	.0003 (.0017)
Trade Deficit	.0010 (.0016)	.0001 (.0011)	-.0007 (.0013)	-.0001 (.0019)	.0005 (.0008)	-.0003 (.0026)
Leading Indicators	.0031 (.0010)***	.00004 (.0005)	.0009 (.0007)	.0006 (.0009)	.0001 (.0004)	.0002 (.0012)
Consumer Confidence	-.0018 (.0045)	.0032 (.0009)***	.0042 (.0006)***	-.0019 (.0012)*	.0016 (.0004)***	.0037 (.0007)***

Notes: Standard errors are in parentheses.

*, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Number of daily observations = 3301

Table 5
SUR Estimates of the Effects of News on the Expected Change in Monetary Policy Using Daily Data

January 2, 1995– December 31, 2001

News Variable	Current Month Contact β_0	One-Month Ahead Contract β_0	One-Month Ahead Contract β_1	Two-Months Ahead Contract β_0	Two-Months Ahead Contract β_1	Two-Months Ahead Contract β_2
Core CPI	.0148 (.0086)*	.0094 (.0042)**	.0017 (.0037)	.0126 (.0056)**	.0010 (.0024)	.0022 (.0053)
PPI	.0016 (.13)	.0094 (.0064)	.0039 (.0049)	.0070 (.0085)	.0001 (.0034)	.0077 (.0073)
Unemployment Rate	-.0050 (.0070)	-.0061 (.0037)*	-.0155 (.0037)***	-.0066 (.0050)	-.0184 (.0028)***	-.0023 (.0041)
Nonfarm Payrolls	.0181 (.0071)***	.0145 (.0034)***	.0089 (.0031)***	.0117 (.0045)***	.0101 (.0022)***	.0151 (.0045)***
Unemployment Claims	-.0093 (.0059)	-.0046 (.0027)*	-.0021 (.0010)**	-.0039 (.0033)	-.0027 (.0010)***	-.0015 (.0022)
Industrial Production	.0182 (.0084)**	.0112 (.0033)***	.0088 (.0040)**	.0081 (.0045)*	.0065 (.0028)**	.0084 (.0049)**
Retail Sales	.0169 (.0112)	.0185 (.0059)***	.0068 (.0028)**	.0224 (.0072)***	.0069 (.0023)***	.0013 (.0053)
Housing Starts	.0066 (.0114)	.0011 (.0052)	.0027 (.0050)	-.0075 (.0069)	.0002 (.0029)	.0115 (.0069)*
Durable Goods Orders	-.0324 (.0682)	-.0090 (.0077)	.0040 (.0031)	-.0147 (.0090)	.0031 (.0022)	.0047 (.0031)
Personal Income	.0028 (.0082)	.0027 (.0064)	-.0054 (.0054)	.0061 (.0078)	.0035 (.0027)	-.0081 (.0057)
Trade Deficit	-.0066 (.0206)	-.0063 (.0067)	-.0279 (.0047)***	-.0015 (.0086)	-.0045 (.0031)	-.0066 (.0065)
Leading Indicators	.0052 (.0096)	.0001 (.0044)	.0217 (.0053)***	-.0027 (.0057)	.0068 (.0031)**	.0197 (.0050)***
Consumer Confidence	-.0153 (.0443)	.0038 (.0059)	.0053 (.0036)	.0012 (.0072)	.0036 (.0023)	.0109 (.0030)***
Constant	-.0015 (.0004)***		-.0024 (.0006)***			-.0027 (.0007)***
Cross-equation restrictions						80.76 (39)***

Notes: Standard errors are in parentheses.

*, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Number of daily observations = 1752

Table 6
SUR Estimates of the Effects of News on the Expected Change in Monetary Policy Using Daily Data

January 2, 2002– March 28, 2008

News Variable	Current Month Contact β_0	One-Month Ahead Contract β_0	One-Month Ahead Contract β_1	Two-Months Ahead Contract β_0	Two-Months Ahead Contract β_1	Two-Months Ahead Contract β_2
Core CPI	.0413 (.0062) ^{***}	.0193 (.0040) ^{***}	.0027 (.0022)	.0198 (.0051) ^{***}	.0037 (.0015) ^{**}	-.0002 (.0035)
PPI	.0153 (.0050) ^{***}	.0140 (.0031) ^{***}	.0038 (.0022) [*]	.0111 (.0045) ^{**}	.0021 (.0014)	.0042 (.0047)
Unemployment Rate	-.0052 (.0030) [*]	-.0091 (.0029) ^{***}	-.0078 (.0034) ^{**}	-.0074 (.0043) [*]	-.0077 (.0025) ^{***}	-.0080 (.0041) ^{**}
Nonfarm Payrolls	.0147 (.0033) ^{***}	.0168 (.0036) ^{***}	.0212 (.0045) ^{***}	.0174 (.0054) ^{***}	.0237 (.0039) ^{***}	.0094 (.0054) [*]
Unemployment Claims	-.0063 (.0026) ^{***}	-.0048 (.0018) ^{***}	-.0008 (.0016)	-.0039 (.0027)	-.0008 (.0014)	-.0013 (.0020)
Industrial Production	-.0044 (.0056)	.0010 (.0035)	-.00002 (.0027)	.0043 (.0051)	.0010 (.0020)	-.0048 (.0049)
Retail Sales	.0044 (.0062)	.0024 (.0041)	.0047 (.0032)	.0023 (.0061)	.0044 (.0024) [*]	-.0005 (.0060)
Housing Starts	.0018 (.0059)	.0045 (.0033)	.0016 (.0022)	.0033 (.0045)	.0008 (.0018)	.0034 (.0030)
Durable Goods Orders	.0445 (.0439)	.0007 (.0066)	.0040 (.0032)	.0046 (.0088)	.0054 (.0020) ^{***}	-.0030 (.0058)
Personal Income	.0044 (.0045)	.0025 (.0041)	-.0009 (.0017)	.0047 (.0053)	-.0013 (.0020)	.0017 (.0031)
Trade Deficit	.0061 (.0042)	.0035 (.0031)	.0010 (.0026)	.0040 (.0046)	.0007 (.0016)	-.0006 (.0049)
Leading Indicators	.0177 (.0109)	.0043 (.0033)	.0016 (.0026)	.0020 (.0051)	.0003 (.0016)	.0040 (.0055)
Consumer Confidence	-.0148 (.0418)	-.0069 (.0081)	.0036 (.0026)	-.0003 (.0100)	.0041 (.0020) ^{**}	-.0036 (.0029)
Constant	-.00003 (.0003)		-.0009 (.0006)			-.0008 (.0006)
Cross-equation restrictions						41.18(39)

Notes: Standard errors are in parentheses.

*, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Number of daily observations = 1558

Appendix A: Weighting Factors for News Events

Assumptions:

1. Market participants expect target rate changes to occur only at scheduled meetings so changes at unscheduled meetings are always unexpected.
2. The effective funds rate for any day is computed using quotes at the end of the day so that FOMC target changes on a particular day will affect the effective funds rate on that day since the FOMC announces target changes at 2:15 ET. If the effective funds rate for each business day is computed using quotes at noon, the weighting factors would change slightly.

We examine changes in the prices of fed funds futures contracts for the current month, one-month ahead, and two-months ahead. There are four possible cases for the timing of FOMC meetings because there are 8 meetings per year and there is never a case where there are two straight months without a meeting:

1. Meeting in current month, meeting in next month, no meeting in second month ahead
2. Meeting in current month, no meeting in next month, meeting in second month ahead
3. No meeting in current month, meeting in next month, meeting in second month ahead
4. No meeting in current month, meeting in next month, no meeting in second month ahead
5. Meeting in current month, meeting in next month, meeting in second month ahead

Notation:

d = day of news announcement

D_0 = day of FOMC meeting if there is one in the current month and = 0 if there is no meeting

D_1 = day of FOMC meeting if there is one in the next month and = 0 if there is no meeting

D_2 = day of FOMC meeting if there is one in the second month ahead and = 0 if there is no meeting

M_0 = number of days in current month

M_1 = number of days in next month

M_2 = number of days in second month ahead

FF_{-1} = fed funds target at beginning of current month

FF_0 = fed funds target at end of current month

FF_1 = fed funds target at end of next month

FF_2 = fed funds target at end of second month ahead

If there is no meeting in the current month, then $FF_0 = FF_{-1}$

If there is no meeting in next month, the $FF_1 = FF_0$

If there is no meeting in second month ahead, then $FF_2 = FF_1$

Of course if the FOMC decision is not to change the target, the target for the month of the meeting is the same as the previous target.

$f_{0,d}$ = implied interest rate from current month contract on day t

$f_{1,d}$ = implied interest rate from next month contract on day t

$f_{2,d}$ = implied interest rate from second month ahead contract on day t
 ff_0 = average of effective funds rates for current month
 ff_1 = average of effective funds rate for next month
 ff_2 = average of effective funds rate for second month ahead

The implicit interest rate on the current month contract is assumed to be the expected average funds rate which is the beginning of the month's target plus the expected change in the target, Δ_0 , which is triggered by the news event if the news event occurs on or before the day of the FOMC meeting. We assume below that there is only one news event to keep the notation cleaner.

For the current month contract:

$$\begin{aligned}
 f_{0,d} &= E_d ff_0 \\
 f_{0,f} &= FF_{-1} && \text{if there is no FOMC meeting in the current month} \\
 &= [(D0-1)/M0] FF_{-1} + [(M0-D0+1)/M0] [FF_{-1} + \Delta_0] \\
 &= FF_{-1} + [(M0-D0+1)/M0] \Delta_0 && \text{if there is a FOMC meeting in the current month}
 \end{aligned}$$

$$\begin{aligned}
 f_{0,d} - f_{0,d-1} &= 0 && \text{if no meeting or } d > D0 \\
 &= [(M0-D0+1)/M0] [E_d \Delta_0 - E_{d-1} \Delta_0] && \text{if there is a meeting and } d \leq D0
 \end{aligned}$$

We assume that market participants change their expectation of the change in the target (Δ_0) based on observed and unobserved (by the econometrician) news or that

$$E_d \Delta_0 - E_{d-1} \Delta_0 = \beta_0 N_d + \varepsilon_{0,D} \quad \text{for } d \leq D0$$

Thus the change in the expected average funds rate on the day of the news event is

$$\begin{aligned}
 f_{0,d} - f_{0,d-1} &= [(M0-D0+1)/M0] \beta_0 I_0 N_d + u_{0,d} && \text{where } I_0 = 1 \quad \text{for } d \leq D0 \\
 &= 0 && \text{for } d > D0 \text{ or no meeting}
 \end{aligned}$$

To estimate the model, we would regress the change in the fed funds futures prices on an appropriately weighted news event:

$$f_{0,d} - f_{0,d-1} = \beta_0 w_{00} N_d + u_{0,d} \quad \text{where } w_{00} = [(M0-D0+1)/M0] I_0$$

For the one-month ahead contract:

$$\begin{aligned}
 f_{1,d} &= FF_0 && \text{if there is no meeting in next month} \\
 &= [(D1-1)/M1] FF_0 + [(M1-D1+1)/M1] FF_1 && \text{if there is a meeting next month} \\
 FF_0 &= FF_{-1} && \text{if there is no meeting this month} \\
 &= FF_{-1} + \Delta_0 && \text{if there is a meeting this month}
 \end{aligned}$$

$$\begin{aligned}
FF_1 &= FF_{-1} + \Delta_0 && \text{if there is a meeting this month but not next month} \\
&= FF_{-1} + \Delta_1 && \text{if there is no meeting this month but a meeting next month} \\
&= FF_{-1} + \Delta_0 + \Delta_1 && \text{if there are meetings this month and next month}
\end{aligned}$$

Suppose there is a meeting this month but not next month

$$ff_1 = [(D1-1)/M1] FF_0 + [(M1-D1+1)/M1] FF_1 \quad \text{if FOMC hits targets on average}$$

$$\begin{aligned}
f_{1,d} - f_{1,d-1} &= E_d ff_1 - E_{d-1} ff_1 \\
&= E_d (FF_{-1} + \Delta_0) - E_{d-1} (FF_{-1} + \Delta_0) \\
&= E_d \Delta_0 - E_{d-1} \Delta_0 \\
&= 0 && \text{if } d > D0 \\
&= \beta_0 N_d + \varepsilon_{0,d} && \text{if } d \leq D0
\end{aligned}$$

Suppose there is a meeting next month

$$\begin{aligned}
ff_1 &= [(D1-1)/M1] FF_0 + [(M1-D1+1)/M1] FF_1 && \text{if FOMC hits targets on average} \\
&= [(D1-1)/M1] FF_0 + [(M1-D1+1)/M1] [FF_0 + \Delta_1] && \text{if FOMC hits targets on average} \\
&= FF_0 + [(M1-D1+1)/M1] \Delta_1 \\
&= FF_{-1} + [(M1-D1+1)/M1] \Delta_1 && \text{if no meeting this month} \\
&= FF_{-1} + \Delta_0 + [(M1-D1+1)/M1] \Delta_1 && \text{if a meeting this month}
\end{aligned}$$

$$\begin{aligned}
E_d (ff_1) &= FF_{-1} + [(M1-D1+1)/M1] E_d \Delta_1 && \text{if no meeting this month} \\
&= FF_{-1} + \Delta_0 + [(M1-D1+1)/M1] E_d \Delta_1 && \text{if a meeting this month \& } d > D0 \\
&= FF_{-1} + E_d \Delta_0 + [(M1-D1+1)/M1] E_d \Delta_1 && \text{if a meeting this month \& } d \leq D0
\end{aligned}$$

Thus

$$\begin{aligned}
f_d - f_{1,d-1} &= (M1-D1+1)/M1 [E_d \Delta_1 - E_{d-1} \Delta_1] && \text{if } d > D0 \text{ or } D0=0 \\
&= (M1-D1+1)/M1 [\beta_1 N_d + \varepsilon_{1,d}]
\end{aligned}$$

$$f_d - f_{1,d-1} = [E_d \Delta_0 - E_{d-1} \Delta_0] + (M1-D1+1)/M1 [E_d \Delta_1 - E_{d-1} \Delta_1] \quad \text{if } d \leq D0 \text{ \& } D0 > 0$$

$$= [\beta_0 N_d + \varepsilon_{0,d}] + [(M1-D1+1)/M1] [\beta_1 N_d + \varepsilon_{1,d}]$$

The regression equation for the one-month ahead forecasts is therefore:

$$\begin{aligned}
f_d - f_{1,d-1} &= \beta_0 I_0 N_d + [(M1-D1+1)/M1] \beta_1 I_1 N_d + u_{1,d} \\
&= \beta_0 w_{01} N_d + \beta_1 w_{11} N_d + u_{1,d}
\end{aligned}$$

where $w_{01} = I_0$

$I_0 = 1$ if $d \leq D_0$ and $D_0 > 0$
 $= 0$ if $d > D_0$ or $D_0 = 0$

$w_{11} = [(M_1 - D_1 + 1)/M_1] I_1$

$I_1 = 1$ if $D_1 > 0$
 $= 0$ if $D_1 = 0$

For the two-months ahead contract:

$$f_{2,d} = E_d(ff_2)$$

$$= [(D_2 - 1)/M_2] E_d(FF_1) + [(M_2 - D_2 + 1)/M_2] E_d(FF_2) \quad \text{if } D_2 > 0$$

$$= E_d(FF_1) \quad \text{if } D_2 = 0$$

$$FF_1 = FF_{-1} + \Delta_0 + \Delta_1$$

$$FF_2 = FF_{-1} + \Delta_0 + \Delta_1 + \Delta_2$$

Suppose there is no meeting two months from now ($D_2 = 0$)

$$f_{2,d} = E_d(FF_1)$$

$$f_{2,d-1} = E_{d-1}(FF_1)$$

$$\begin{aligned} f_{2,d} - f_{2,d-1} &= E_d(FF_1) - E_{d-1}(FF_1) \\ &= E_d(\Delta_0 + \Delta_1) - E_{d-1}(\Delta_0 + \Delta_1) \\ &= (E_d \Delta_0 - E_{d-1} \Delta_0) + (E_d \Delta_1 - E_{d-1} \Delta_1) \end{aligned}$$

$$\begin{aligned} (E_d \Delta_0 - E_{d-1} \Delta_0) &= 0 && \text{if } d > D_0 \text{ or } D_0 = 0 \\ &= \beta_0 N_d + \varepsilon_{0,d} && \text{if } d \leq D_0 \end{aligned}$$

$$\begin{aligned} (E_d \Delta_1 - E_{d-1} \Delta_1) &= 0 && \text{if } D_1 = 0 \\ &= \beta_1 N_d + \varepsilon_{1,d} && \text{if } D_1 > 0 \end{aligned}$$

so

$$\begin{aligned} f_{2,d} - f_{2,d-1} &= (\beta_0 N_d + \varepsilon_{0,d}) I_0 + (\beta_1 N_d + \varepsilon_{1,d}) I_1 && I_0 = 1 \text{ if } d \leq D_0 \text{ and } D_0 > 0 \\ &&& = 0 \text{ if } d > D_0 \text{ or } D_0 = 0 \\ &&& I_1 = 1 \text{ if } D_1 > 0 \\ &&& = 0 \text{ if } D_1 = 0 \end{aligned}$$

Suppose there is a meeting two months ahead ($D_2 > 0$)

$$f_{2,d} = [(D_2 - 1)/M_2] E_d(FF_1) + [(M_2 - D_2 + 1)/M_2] E_d(FF_2)$$

$$= [(D_2 - 1)/M_2] E_d(FF_{-1} + \Delta_0 + \Delta_1) + [(M_2 - D_2 + 1)/M_2] E_d(FF_{-1} + \Delta_0 + \Delta_1 + \Delta_2)$$

$$= E_d(FF_{-1} + \Delta_0 + \Delta_1) + [(M_2 - D_2 + 1)/M_2] E_d(\Delta_2)$$

$$f_{2,d-1} = E_{d-1} (FF_{-1} + \Delta_0 + \Delta_1) + [(M2-D2+1)/M2] E_{d-1} (\Delta_2)$$

$$f_{2,d} - f_{2,d-1} = [E_d (\Delta_0) - E_{d-1} (\Delta_0)] + [E_d (\Delta_1) - E_{d-1} (\Delta_1)] + [(M2-D2+1)/M2] [E_d (\Delta_2) - E_{d-1} (\Delta_2)]$$

$$\begin{aligned} E_d (\Delta_0) - E_{d-1} (\Delta_0) &= 0 && \text{if } d > D0 \text{ or } D0 = 0 \\ &= \beta_0 N_d + \varepsilon_{0,d} && \text{if } d \leq D0 \end{aligned}$$

$$\begin{aligned} E_d (\Delta_1) - E_{d-1} (\Delta_1) &= 0 && \text{if } D1 = 0 \\ &= \beta_1 N_d + \varepsilon_{1,d} && \text{if } D1 > 0 \end{aligned}$$

$$\begin{aligned} E_d (\Delta_2) - E_{d-1} (\Delta_2) &= 0 && \text{if } D2 = 0 \\ &= \beta_2 N_d + \varepsilon_{2,d} && \text{if } D2 > 0 \end{aligned}$$

Thus

$$f_{2,d} - f_{2,d-1} = \beta_0 I_0 N_d + \beta_1 I_1 N_d + [(M2-D2+1)/M2] \beta_2 I_2 N_d + u_{2,d}$$

where I_0 and I_1 are defined above and $I_2 = 1$ if $D2 > 0$ and $= 0$ if $D2 = 0$

Weighting factors in regressions for each contract

General regression equation: $\Delta f_{i,d} = \beta_0 X_{0,d} + \beta_1 X_{1,d} + \beta_2 X_{2,d} + u_{i,d}$ $I = 0, 1, 2$

$$\Delta f_{0,d} = \beta_0 X_{0,d} + \beta_1 X_{1,d} + \beta_2 X_{2,d} + u_{0,d}$$

where

$X_{0,d} = [(M0-D0+1)/M0] I_0 N_d$ where $I_0 = 1$ if $d \leq D0$ and $D0 > 0$ and $I_0 = 0$ if $d > D0$ or $D0 = 0$

$$X_{1,d} = 0$$

$$X_{2,d} = 0$$

$$\Delta f_{1,d} = \beta_0 X_{0,d} + \beta_1 X_{1,d} + \beta_2 X_{2,d} + u_{1,d}$$

where

$$X_{0,d} = I_0 N_d$$

$X_{1,d} = [(M1-D1+1)/M1] I_1 N_d$ where $I_1 = 1$ if $D1 > 0$ and 0 otherwise

$$X_{2,d} = 0$$

$$\Delta f_{2,d} = \beta_0 X_{0,d} + \beta_1 X_{1,d} + \beta_2 X_{2,d} + u_{2,d}$$

where

$$X_{0,d} = I_0 N_d$$

$$X_{1,d} = I_1 N_d$$

$$X_{2,d} = [(M_2 - D_2 + 1)/M_2] I_2 N_d \quad \text{and } I_2 = 1 \text{ if } D_2 > 0 \text{ and } 0 \text{ otherwise}$$

Appendix B: Supplementary Results

Table B1

SUR Estimates of the Effects of News on the Expected Change in Monetary Policy Using Daily Data and Omitting Days with Unscheduled FOMC meetings

January 2, 1995– March 28, 2008

News Variable	Current Month Contact β_0	One-Month Ahead Contract β_0	One-Month Ahead Contract β_1	Two-Months Ahead Contract β_0	Two-Months Ahead Contract β_1	Two-Months Ahead Contract β_2
Core CPI	.0252 (.0047) ^{***}	.0142 (.0026) ^{***}	.0028 (.0019)	.0164 (.0035) ^{***}	.0026 (.0013) ^{**}	.0006 (.0029)
PPI	.0099 (.0053) [*]	.0119 (.0026) ^{***}	.0035 (.0020) [*]	.0094 (.0039) ^{**}	.0015 (.0013)	.0045 (.0039)
Unemployment Rate	-.0048 (.0028) [*]	-.0067 (.0019) ^{***}	-.0112 (.0023) ^{***}	-.0043 (.0029)	-.0118 (.0018) ^{***}	-.0067 (.0026) ^{**}
Nonfarm Payrolls	.0163 (.0029) ^{***}	.0156 (.0020) ^{***}	.0115 (.0023) ^{***}	.0168 (.0029) ^{***}	.0141 (.0017) ^{***}	.0091 (.0029) ^{***}
Unemployment Claims	-.0063 (.0026) ^{**}	-.0044 (.0014) ^{***}	-.0017 (.0008) ^{**}	-.0041 (.0019) ^{**}	-.0021 (.0008) ^{***}	-.0010 (.0014)
Industrial Production	.0103 (.0045) ^{**}	.0080 (.0021) ^{***}	.0020 (.0022)	.0079 (.0031) ^{**}	.0022 (.0017)	.0013 (.0033)
Retail Sales	.0073 (.0056)	.0078 (.0031) ^{**}	.0062 (.0019) ^{***}	.0091 (.0043) ^{**}	.0062 (.0016) ^{***}	.0006 (.0037)
Housing Starts	.0053 (.0054)	.0038 (.0025)	.0016 (.0020)	-.0002 (.0036)	.0002 (.0015)	.0059 (.0028) ^{**}
Durable Goods Orders	-.0030 (.0363)	-.0058 (.0044)	.0044 (.0021) ^{**}	-.0087 (.0058)	.0042 (.0014) ^{***}	.0036 (.0026)
Personal Income	.0041 (.0040)	.0019 (.0031)	.0002 (.0016)	.0057 (.0042)	.0023 (.0015)	-.0018 (.0026)
Trade Deficit	.0057 (.0051)	.0024 (.0027)	-.0007 (.0023)	.0032 (.0040)	.0012 (.0015)	-.0007 (.0038)
Leading Indicators	.0056 (.0060)	.0012 (.0023)	.0044 (.0024) [*]	-.0013 (.0035)	.0017 (.0014)	.0093 (.0034) ^{***}
Consumer Confidence	-.0281 (.0271)	.0005 (.0041)	.0040 (.0021) [*]	.0009 (.0054)	.0035 (.0015) ^{**}	.0046 (.0020) ^{**}
Constant	-.0005 (.0002) ^{**}		-.0012 (.0003) ^{***}			-.0014 (.0004) ^{***}
Cross-equation restrictions						$\chi^2(39)=$ 34.43

Notes: Standard errors are in parentheses.

*, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Number of daily observations = 3305

Table B2
 SUR Estimates of the Effects of News on the Expected Change in Monetary Policy Using Daily
 Data and Omitting Days with FOMC meetings
 January 2, 1995– March 28, 2008

News Variable	Current Month Contact β_0	One-Month Ahead Contract β_0	One-Month Ahead Contract β_1	Two-Months Ahead Contract β_0	Two-Months Ahead Contract β_1	Two-Months Ahead Contract β_2
Core CPI	.0237 (.0060)***	.0143 (.0030)***	.0030 (.0019)	.0165 (.0038)***	.0026 (.0013)**	.0008 (.0029)
PPI	.0048 (.0071)	.0064 (.0031)**	.0035 (.0021)*	.0042 (.0047)	.0018 (.0013)	.0032 (.0045)
Unemployment Rate	-.0059 (.0032)*	-.0074 (.0022)***	-.0114 (.0024)***	-.0049 (.0030)	-.0119 (.0018)***	-.0069 (.0026)***
Nonfarm Payrolls	.0157 (.0033)***	.0152 (.0022)***	.0116 (.0023)***	.0164 (.0030)***	.0141 (.0017)***	.0090 (.0029)***
Unemployment Claims	-.0068 (.0030)**	-.0047 (.0015)***	-.0015 (.0008)*	-.0045 (.0020)**	-.0020 (.0008)***	-.0008 (.0013)
Industrial Production	.0080 (.0055)	.0068 (.0024)***	.0024 (.0023)	.0072 (.0034)**	.0029 (.0017)*	.0005 (.0033)
Retail Sales	.0079 (.0064)	.0079 (.0034)**	.0059 (.0020)***	.0096 (.0045)**	.0060 (.0016)***	.0001 (.0036)
Housing Starts	.0009 (.0099)	.0031 (.0033)	.0030 (.0021)	.0032 (.0043)	.0022 (.0016)	.0030 (.0029)
Durable Goods Orders	-.0556 (.0535)	-.0041 (.0054)	.0047 (.0021)**	-.0070 (.0067)	.0043 (.0014)***	.0037 (.0025)
Personal Income	.0037 (.0045)	.0016 (.0035)	.0003 (.0017)	.0055 (.0044)	.0023 (.0015)	-.0018 (.0026)
Trade Deficit	.0204 (.0112)*	.0038 (.0034)	-.0089 (.0023)***	.0071 (.0049)	.0000 (.0015)	-.0051 (.0044)
Leading Indicators	.0168 (.0072)**	.0034 (.0026)	.0060 (.0024)**	-.0003 (.0036)	.0016 (.0014)	.0109 (.0034)***
Consumer Confidence	.0593 (.0727)	.0137 (.0056)**	.0040 (.0021)*	.0122 (.0068)*	.0037 (.0015)**	.0043 (.0020)**
Constant	-.0007 (.0002)***		-.0016 (.0004)***			-.0018 (.0005)***
Cross-equation restrictions						$\chi^2(39)=60.65^{**}$

Notes: Standard errors are in parentheses.

*, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Number of daily observations = 3201

Table B3
 SUR Estimates of the Effects of News on the Expected Change in Monetary Policy Measured
 from 15 Minutes to 6 Hours after the Announcements
 January 2, 1995– March 28, 2008

News Variable	Current Month Contact β_0	One-Month Ahead Contract β_0	One-Month Ahead Contract β_1	Two-Months Ahead Contract β_0	Two-Months Ahead Contract β_1	Two-Months Ahead Contract β_2
Core CPI	.0184 (.0043) ^{***}	.0061 (.0023) ^{***}	-.0010 (.0020)	.0104 (.0030) ^{***}	-.0008 (.0013)	-.0086 (.0031) ^{***}
PPI	.0101 (.0048) ^{**}	.0084 (.0023) ^{***}	.0001 (.0021)	.0034 (.0035)	-.0010 (.0013)	.0052 (.0042)
Unemployment Rate	.0016 (.0026)	-.0011 (.0017)	-.0024 (.0022)	-.0061 (.0026) ^{**}	-.0039 (.0017) ^{**}	.0011 (.0028)
Nonfarm Payrolls	-.0012 (.0027)	-.0017 (.0018)	-.0033 (.0023)	.0064 (.0026) ^{**}	-.0026 (.0016) [*]	.0013 (.0033)
Unemployment Claims	-.0029 (.0024)	-.0005 (.0013)	-.0008 (.0007)	.0015 (.0017)	.0001 (.0007)	-.0017 (.0015)
Industrial Production	.0002 (.0041)	-.0049 (.0019) ^{**}	-.0041 (.0021) [*]	-.0016 (.0027)	-.0006 (.0015)	.0058 (.0034) [*]
Retail Sales	-.0003 (.0051)	-.0010 (.0028)	.0022 (.0018)	.0008 (.0037)	.00002 (.0015)	.0013 (.0040)
Housing Starts	.0046 (.0050)	.0040 (.0023) [*]	.0020 (.0020)	-.0015 (.0032)	-.00003 (.0015)	.0059 (.0030) [*]
Durable Goods Orders	-.0058 (.0333)	.0004 (.0040)	-.0023 (.0021)	-.0003 (.0049)	-.0015 (.0014)	.0034 (.0028)
Personal Income	.0039 (.0036)	.0015 (.0028)	-.0001 (.0016)	.0035 (.0036)	.0008 (.0015)	.0014 (.0028)
Trade Deficit	.0062 (.0047)	.0023 (.0024)	-.0108 (.0023) ^{***}	.0069 (.0036) [*]	-.0026 (.0014) [*]	-.0056 (.0042)
Leading Indicators	-.0102 (.0050) ^{**}	-.0026 (.0019)	.0019 (.0021)	-.0069 (.0027) ^{**}	.011 (.0012)	.0062 (.0032) [*]
Consumer Confidence	-.0399 (.0224) [*]	-.0019 (.0032)	.0003 (.0018)	-.0025 (.0039)	-.0009 (.0013)	.0023 (.0019)
Joint test that all coefficients are zero	$\chi^2(10) = 27.50$ ^{***}		$\chi^2(20) = 57.26$ ^{***}			$\chi^2(30) = 70.43$ ^{***}

Notes: Standard errors are in parentheses.

*, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Joint test is for the 10 announcements made at 8:30 am

Number of daily observations = 3301

Table B4
 SUR Estimates of the Effects of News on the Expected Change in Monetary Policy:
 Responses to Negative and Positive News
 January 2, 1995– March 28, 2008

News Variable	Current Month Contact		One-Month Ahead Contract		One-Month Ahead Contract		Two-Months Ahead Contract		Two-Months Ahead Contract		Two-Months Ahead Contract	
	β_0		β_0		β_1		β_0		β_1		β_2	
	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos
Core CPI	.030**	.016*	.014***	.012***	.001	.005	.019** *	.011*	.002	.004	.0002	.0003
PPI	.012	.003	.017***	.000	.002	.005*	.015***	-.0005	.0003	.003	.003	.005
Unemployment Rate	-.0004	-.014***	-.004	-.013***	-.0001	-.031***	-.007	-.0004	-.003	-.027***	.0001	-.019***
Nonfarm Payrolls	.014***	.012	.013***	.015***	.005	.016***	.018** *	.014**	.010***	.017***	.005	.011
Unemployment Claims	-.004	-.011**	-.001	-.013***	-.003	-.001	.001	-.015***	-.003**	-.002	-.003	.0001
Industrial Production	-.003	.018**	.004	.010***	.006*	-.0002	.003	.011**	.003	.003	.004	-.001
Retail Sales	-.004	.031**	.001	.017***	.010**	.004*	-.001	.023***	.009***	.005**	.003	-.005
Housing Starts	.002	.006	.006	.006	.002	.003	-.003	-.001	.001	.000	.003	.011**
Durable Goods Orders	.031	-.019	-.005	-.007	.006*	.002	-.010	-.007	.007***	.001	.006*	-.001
Personal Income	.001	.008	.001	.003	.001	-.001	-.002	.010*	.005	.002	.005	-.006
Trade Deficit	.006	.004	.002	.003	-.002	-.017***	.001	.006	.001	-.001	.001	-.005
Leading Indicators	-.005	.013	.004	.0003	.005	.011**	.005	-.005	.001	.004*	.007	.013**
Consumer Confidence	-.096**	.048	.001	-.002	.009**	.002	-.004	.004	.005*	.002	.016** *	.002

Notes: *, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Bold indicates that the hypothesis of equal coefficients for positive and negative news is rejected at .01 or .05 level

Number of daily observations = 3310

Table B5
 SUR Estimates of the Effects of News on the Expected Change in Monetary Policy:
 Allowing for State-Dependent Responses to News
 January 2, 1995– March 28, 2008

News Variable	Current Month Contact			One-Month Ahead Contract			One-Month Ahead Contract			Two-Months Ahead Contract			Two-Months Ahead Contract			Two-Months Ahead Contract		
	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
Core CPI	.001	.014**	.061***	.008	.010**	.032***	.0003	.002	.010*	.010	.013***	.032***	.002	.002	.004	-.008	.001	.011
PPI	.024	-.001	.013	.022***	.008	.012***	.002	.006	.005	.020	.005	.009	.0002	.002	.002	.010	.008	.001
Unemployment Rate	-.004	-.005	-.004	-.008**	-.006*	-.007	-.002	-.010***	-.022***	-.007	-.004	-.003	-.003	-.009***	-.024***	-.004	-.007*	-.007*
Nonfarm Payrolls	.018***	.008*	.040***	.014***	.011***	.034***	.003	.012***	.017*	.022**	.013***	.038***	.002	.015***	.014***	-.0003	.010***	-.002
Unemployment Claims	-.008	-.006*	-.005	-.008*	-.008*	-.005	-.003	-.001	-.005	-.008	-.004	.001	-.004**	-.002*	-.0004	.001	-.0000	-.016***
Industrial Production	-.003	.020**	-.004	-.002	.012***	.004	.006	.004	-.001	-.006	.010**	.009	.005	.003	.002	.008	.005	-.007
Retail Sales	-.001	.020**	.002	-.003	.019***	.008	.005*	.008**	.009	-.006	.021***	.012	.006**	.006**	.007	-.006	.003	.006
Housing Starts	-.013	.005	.017	-.002	-.0005	.017***	.006	.002	-.0001	-.011	-.006	.018**	.001	-.0002	.001	.016**	.003	.009
Durable Goods Orders	-.023	-.065	.041	-.058**	-.007	.002	.003	.005	.005	-.062**	-.011	.004	.001	.007***	.005*	.003	.005	-.0003
Personal Income	.0005	.005	.005	-.0002	.002	.003	-.012	-.0003	-.004	-.014	.006	.008	-.005	.001	.006	.020*	-.003	-.004
Trade Deficit	.008	-.007	.013	-.002	-.006	.011**	-.002	-.014***	.005	-.002	-.005	.011*	-.002	-.001	.003	.006	-.004	-.001
Leading Indicators	.019	.006	-.028	.002	.001	.006	.006	.009***	-.008	-.001	.0002	.002	.003	.003	-.002	.006	.013***	.006
Consumer Confidence	-.034	.112**	-.153***	-.020	.010*	-.016	.004	.003	.005	-.019	.007	-.010	.006*	.002	.004	-.005	.007***	.012*

Notes: *, **, *** denote statistically significant coefficients at the .10, .05, and .01 levels.

Bold indicates that the hypothesis of equal coefficients across states of the economy is rejected at .01 or .05 level

Number of daily observations = 3310

High state is when unemployment is low and Low state is when unemployment is high.