Do Federal Reserve Policy Surprises Reveal Private Information About the Economy?

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Abstract

A number of recent papers have hypothesized that the Federal Reserve possesses information about the course of inflation and output that is unknown to the private sector, and that policy actions by the Federal Reserve convey some of this inside information. We conduct two tests of this hypothesis: 1) *could* monetary policy surprises be used to improve the private sector's ex ante forecasts of subsequent macroeconomic statistical releases, and 2) *does* the private sector revise its forecasts of macroeconomic statistical releases in response to these monetary policy surprises? We find little evidence that Federal Reserve policy surprises convey inside information about the state of the economy: they could not systematically be used to improve forecasts of statistical releases and forecasts are not systematically revised in response to policy surprises. One possible exception to this pattern is Industrial Production, a statistic that the Federal Reserve produces.

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1. Introduction

Do Federal Reserve policy announcements reveal inside information about the economy? Answers to this question have important implications for macroeconomic research, ranging from identifying the effects of monetary policy on financial markets (Cook and Hahn (1989), Romer and Romer (2000), Kuttner (2001), Gürkaynak, Sack, and Swanson (2003), Bernanke and Kuttner (2003)), to identifying the effects of monetary policy in a VAR (Cochrane and Piazzesi (2002), Faust, Swanson, and Wright (2002), Faust, Rogers, Swanson, and Wright (2002)),[1] to optimal central bank design (Canzoneri (1985), Athey, Atkeson, and Kehoe (2001)).[2] In addition, the financial press is often interested in the same question: for example, the "Ahead of the Tape" column in the May 6, 2003, *Wall Street Journal* noted that "The downside of cutting rates is clear: It might panic the market into thinking that Sir Alan no longer believes in the coming economic bounce he's been predicting" (Eisinger (2003)). Finally, central bankers themselves have shown concern about monetary policy actions conveying information about the economy to the private sector: the minutes of the June 2003 Federal Open Market Committee (FOMC) meeting report that one factor that dissuaded the committee from easing by 50 basis points was that doing so "might be misread as an indication of more concern among policymakers about the economic outlook than was in fact the case." For all of these reasons, clear and robust empirical answers to the question posed by the title of this paper are of great interest.

There is some evidence in favor of the view that the Fed has superior information and that agents attempt to deduce this information from policy surprises. For example, Romer and Romer (2000) find that the Federal Reserve's forecasts of inflation and output dominate those of the private sector, in the sense that the optimal linear combination of the private sector's forecast and the Fed's internal forecast places a weight of essentially

[1] These authors use high-frequency financial market data to measure the surprise component of Federal Reserve policy actions, and treat this surprise as an exogenous monetary policy shock to identify the effects of monetary policy in a structural VAR. This approach becomes problematic if the observed monetary policy shock is correlated with structural shocks to other variables in the VAR, such as output and inflation.

[2] If the central bank possesses a significant informational advantage that for some reason cannot be successfully communicated, then a much stronger case can be made that central bankers should be permitted to be discretionary rather than committed to a rule in terms of publicly observable variables. These authors formally analyze the tradeoff between committing the central bank to a publicly verifiable rule versus the benefits of allowing the central bank to respond to any inside information it may have about the state of the economy.

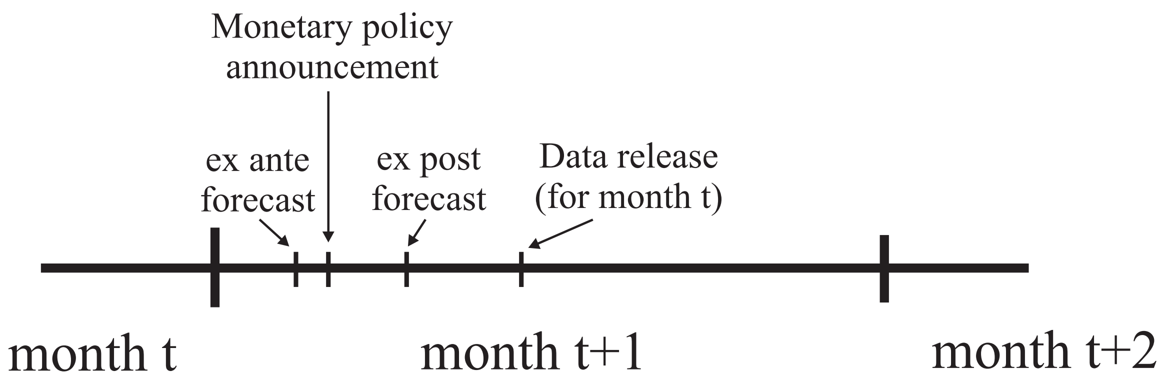
one on the Fed's forecast and essentially zero weight on the private sector's. They conclude that the Federal Reserve possesses significant inside information about the economy, and interpret the Fed's informational advantage as stemming from the huge amount of resources it devotes to forecasting, relative to individual private-sector firms. Romer and Romer also point to large movements in long-term bond yields after Federal Reserve policy actions as evidence that these actions convey some of the Fed's inside information to the private sector.[3]

Both the arguments and evidence put forward by Romer and Romer can be debated, however. Sims (2002) notes that the finding that Fed forecasts are superior to the private sector's is sensitive to sample period. Kurz (2002) analyzes the heterogeneity of forecasts across market participants and finds no significant difference in the information sets underlying the Fed's and private sector's forecasts. Grossman (1989) notes that the private sector as a whole devotes far more resources to forecasting than any individual private-sector firm, which through financial markets and other channels could be aggregated into a forecast that compares more favorably to the Fed's forecast than does any one individual private sector forecast. Since a great deal of money is at stake—especially in derivative markets—from forecasting the economy and Fed actions, we might expect any informational advantage of the Fed to be small. Finally, and perhaps most importantly, Fed policymakers communicate regularly with the public, giving the Fed an opportunity directly to share any special insights.

These arguments provide some reason to believe that the amount of private information that remains unshared may be small and subtle. One might then question how much of this information could be encoded and transmitted to the public in surprise changes in policy. In this view, one has to account for the often sharp reaction of financial markets to monetary policy surprises. Of course, it may be that the policy surprise conveys information not about the state of the economy but about the future course of policy. The future course of policy is a question about which the FOMC possesses a natural informational

[3] Ellingsen and Söderström (2001) reach a similar conclusion when they classify every Fed policy action between October 1988 and March 1997 based on their reading of *The Wall Street Journal* as being either an exogenous policy action or an endogenous response to the state of the economy. They note that if the yield curve responds to an *en*dogenous Fed policy action, then the Fed's information must not have been available to the private sector, and conclude that Fed announcements reveal significant inside information.

Figure 1: Timing of Monetary Policy Announcements and Data Releases for our proposed tests of inside information



advantage. Gürkaynak, Sack, and Swanson (2003) present arguments and evidence that the reactions of long-term forward rates are most consistent with this view.[4]

In this paper, we conduct two new tests of whether Federal Reserve monetary policy surprises (as measured from futures markets) convey inside information about the economy to the private sector. The intuition for our tests proceeds as follows. Macroeconomic statistics for a given month (or quarter) are typically released after the end of that month (or quarter), in most cases with a significant lag. For example, the Consumer Price Index for May is not released until about the 17th of June. Federal Reserve policy surprises that occur *after* the end of May but *before* the statistical release in mid-June cannot have any causal effect on the May data, which are "water under the bridge" (see Figure 1). Thus, if the Fed's monetary policy surprise actually does have predictive power for the statistical release, above and beyond the private sector's *ex ante* forecast, it is evidence that the Fed has superior information about the release. It is crucial for these regressions that the macroeconomic data release being considered covers a period strictly before the policy surprise. If we used *future* values of macroeconomic statistics, then it would be very difficult to disentangle any inside information of the Fed from the effects of the monetary policy surprise on the future state of the economy.

We run two sets of regressions to test whether the Federal Reserve's monetary policy surprises contain any additional information beyond the private sector's *ex ante* forecasts.

[4] For example, Gürkaynak, Sack, and Swanson (2003) show that long-term *forward* interest rates *fall* after a surprise monetary policy tightening. This does not seem to reflect Fed inside information about inflation in the short to medium run; instead, it suggests that the private sector's estimate of the central bank's long-run inflation target varies in response to shocks.

These regressions address two questions: 1) *could* the private sector's forecasts be improved upon using the Fed's upcoming monetary policy surprises?, and 2) *does* the private sector systematically revise its forecasts for macroeconomic statistics in a way suggested by the policy surprise? We find that the answer is "No" to both of these questions, with one notable exception in both cases: the Industrial Production Index, a statistic which the Fed produces.

Our first two tests investigate whether Federal Reserve monetary policy surprises reveal inside information about macroeconomic data series that are just about to be released. As a robustness check, we conduct additional tests of whether Fed policy surprises reveal inside information about the economy in the future.[5] These tests address whether the policy surprise helps explain the difference between the Fed's Greenbook forecast and private sector forecasts formed before the policy surprise. Thus, the test attempts to assess whether the policy surprise is correlated with private Fed views about the economic forecast at horizons out to several quarters. We discuss how all of our findings relate to those of Romer and Romer (2000) and other authors in the literature.[6]

Throughout this paper we talk about testing for whether Federal Reserve monetary policy surprises reveal inside information about macroeconomic data series that are just about to be released. It is important to be clear about exactly what we mean by this and what hypothesis it is that we are trying to test. In this paper, we are testing a narrow statistical reduced form hypothesis: is the policy surprise correlated with aspects of the state of the economy that are unknown to the public? This could arise from any piece of information or from superior economic analysis that is available to the FOMC (but not to the public) having an influence on the policy decision of the FOMC and also being correlated with the macroeconomic release.

The remainder of our paper proceeds as follows. Section two describes our private

[5] For example, one might argue that the Fed has better forecasts than the private sector for future data (say 4 quarters ahead) even if it does not have an information advantage for macroeconomic data series that are just about to be released.

[6] Note that we restrict attention to the revelation of Fed inside information about U.S. macroeconomic statistics such as GDP and the CPI, and do not consider whether monetary policy actions reflect inside information about the health of the banking sector, as studied by Peek, Rosengren, and Tootell (1999). Those authors find that the Fed possesses significant inside information about the health of the banking sector (due to its role as a bank regulator), and that the Fed has used that information in the conduct of monetary policy. While we find this variation on our question and the corresponding results very interesting, our data do not allow us to independently verify or refute their findings.

sector forecast data and how we measure monetary policy surprises. Section three presents our two primary tests of Federal Reserve inside information. Section four conducts a number of robustness checks on our basic tests to verify the robustness of our results, and compares our results to the literature. Section five concludes.

2. Data

2.1 Macroeconomic Statistics

We consider whether Federal Reserve policy surprises convey inside information about the following nine major macroeconomic statistics: Nonfarm Payrolls, Retail Sales, the PPI, core PPI, Industrial Production, the CPI, core CPI, Real GDP, and the GDP Deflator. Of these, the first seven are monthly statistics, and the last two are quarterly.[7]

Table 1 summarizes the basic features of each of these macroeconomic statistics. For example, Nonfarm Payrolls is released as the change in employment from the previous month, in thousands. In all cases, we consider the seasonally adjusted version of the statistic in question, as this is the version that the markets forecast and that the financial press emphasizes.

We choose to study these particular statistics because they are both closely linked to U.S. output and inflation—and thus are very closely watched and forecast by the Federal Reserve—and have very large impacts on prices and trading volumes in the financial markets (Ederington and Lee (1993), Fleming and Remolona (1997))—and thus are very closely watched and forecast by the private sector.

2.2 Monetary Policy Surprises

We calculate the surprise component of Federal Reserve policy announcements as in Kuttner (2001) and Faust, Swanson, and Wright (2002), using federal funds futures.[8] Fed

[7] For GDP and the GDP Deflator, we consider the private sector's forecast of the first ("advance") release of GDP, which is typically released about one month after the end of the quarter. Our results are not qualitatively different when we also consider private sector forecasts of the updates to this release over the subsequent two months (the "preliminary" and "final" GDP releases).

[8] Gürkaynak, Sack, and Swanson (2002) consider several market-based measures of monetary policy expectations and find that federal funds futures provide the best forecast of the federal funds rate.

Table 1: Macroeconomic Data, Description, and Sources

Macroeconomic Statistic	Full Name	Produced by	Release Date	Units
Nonfarm Payrolls	Employees on Nonagricultural Payrolls	Bureau of Labor Statistics	Friday after 1st day of following month	change from prev. month, 000s
Retail Sales	Advance Monthly Sales for Retail and Food Services	U.S. Census Bureau	about 12th day of following month	change from prev. month, percent
PPI	Producer Price Index for Finished Goods	Bureau of Labor Statistics	about 13th day of following month	change from prev. month, percent
core PPI	Producer Price Index for Finished Goods, less Food and Energy Items	Bureau of Labor Statistics	about 13th day of following month	change from prev. month, percent
Industrial Production	Industrial Production Index	Federal Reserve Board	about 15th day of following month	change from prev. month, percent
CPI	Consumer Price Index, All Urban Workers	Bureau of Labor Statistics	about 17th day of following month	change from prev. month, percent
core CPI	Consumer Price Index, less Food and Energy Items, All Urban Workers	Bureau of Labor Statistics	about 17th day of following month	change from prev. month, percent
Real GDP	Real Gross Domestic Product	Bureau of Economic Analysis	last Thursday of month following end of quarter	change from prev. quarter, annual percentage rate
GDP Deflator	Implicit Price Deflator for Gross Domestic Product	Bureau of Economic Analysis	last Thursday of month following end of quarter	change from prev. quarter, annual percentage rate

The first column lists the usual name by which the markets refer to each series; the second column provides the full name used in official publications; the third column lists the official agency that produces each statistic; release dates in the fourth column are approximate (actual release dates vary from month to month, can depend on the details of the given statistic's exact sample period for the month, and have in some cases changed over time); the last column presents the units in which each statistic is reported.

funds futures contracts have traded on the Chicago Board of Trade Exchange since October 1988. The contracts settle based on the average federal funds rate that prevails over that calendar month. Each federal funds futures contract trades up to and including the last day of the contract month. The market is liquid, volumes for the first few contracts are high and spreads are narrow (Gürkaynak, Sack, and Swanson (2002)). Moreover, Krueger and Kuttner (1996), Rudebusch (1998), Faust, Swanson, and Wright (2002), and Gürkaynak, Sack, and Swanson (2002) have shown that federal funds futures-based forecasts pass standard tests of efficiency.

We measure the surprise component of a Federal Reserve policy decision using the one-day change in the current-month federal funds futures rate from before to after the FOMC announcement. Prior to February 1994, the Fed did not make an explicit announcement of changes in policy, but financial markets learned about changes in policy through the Fed's open market operation the following morning; thus, prior to February 1994 we treat the announcement as though it were made the morning of the open market operation (see the Appendix for details).

In order to back out the surprise in the federal funds rate target, as opposed to the surprise in the monthly average federal funds rate, we scale the change in the federal funds futures rate upward by the ratio:

$$\text{(number of days in contract month)} \Big/ \text{(number of days remaining in contract month)} \qquad (1)$$

For example, if a monetary policy announcement on November 15 is met with a change in the current-month fed funds futures rate of 10 basis points, we regard this as a 20 basis point surprise in the federal funds rate target.[9]

2.3 Private Sector Forecasts

We obtained data on private sector forecasts of major macroeconomic statistical releases from Wrightson Associates, a financial information services company that focuses on the U.S. Treasury and money markets. Their financial market newsletter, the *Money Market Observer,* is published every Saturday of the year and forecasts all of the major macroeconomic statistics to be released over the subsequent four weeks. The fact that Wrightson provides consistent forecasts of each statistic at multiple weekly horizons is unique and crucial to our purpose. The familiar Money Market Survices survey often used in announcement work, for example, does not have this feature.[10]

[9] For monetary policy announcements that occur late in the month (in the last seven days of the month), we use the change in the *next*-month rather than current-month federal funds futures contract to measure the surprise component of the announcement. This is because any surprise in the federal funds rate near the end of the month has only a small effect on the current-month average and will be difficult to distinguish from any ambient noise that may be present in the fed funds futures data, such as changes in bid-ask spreads or rounding error due to the fact that the data are recorded only to the nearest half basis point.

[10] Where the Wrightson and Money Market Services data are both available, the correlation between the two is generally above .95.

Wrightson staff justify their forecasts for the major statistical releases in great detail the week before each statistic is released. The newsletter is well-regarded by market participants. Forecasts for most series are available back to at least 1980 (see the Appendix for details).

When we present our methods more formally below, we will demonstrate that the quality of the forecast data as measures of true market expectations will affect the power, but not the validity, of our tests. The tests remain valid even if these forecasts poorly reflect the underlying expectations. Since power is an important issue, however, we investigate the usefulness of our private sector forecast data by calculating the R^2 in the regression:

$$y_t = \alpha_0 + \alpha_1 \hat{y}_t + \varepsilon_t \tag{2}$$

and also testing the joint hypothesis that $\alpha_0 = 0$ and $\alpha_1 = 1$, where y_t is a given macroeconomic time series, $\hat{y}_t$ is the corresponding 1-week, 2-week, 3-week, or 4-week-ahead Wrightson forecast, and ε_t is a stochastic disturbance term. Table 2 reports the results from these regressions. Point estimates and heteroskedasticity-consistent (White) standard errors for α_0 and α_1 are not reported due to space constraints; the R^2 and p-value for the forecast rationality test for each regression are reported. The latter are calculated using 10,000 bootstrap replications and are generally very close to the asymptotic values except for the monthly inflation equations, which have noticeably fatter-tailed residuals.[11]

The forecasts have substantial predictive power for the data releases they are predicting: R^2 values for the one-week-ahead forecasts are above 0.7 in most cases. The most problematic series to forecast, as measured by the efficiency tests, are the PPI and core CPI. The estimated $\hat{\alpha}_1 = 1.13$ for the one-week-ahead PPI forecast while $\hat{\alpha}_1 = 0.68$ for the one-week-ahead core CPI forecast (both of which are statistically different from 1), so Wrightson staff appear to have underforecast the magnitude of the PPI releases while simultaneously overforecasting the magnitude of the core CPI (and also CPI) releases. All of the other series generally pass the forecast efficiency tests. Overall, the forecasts seem to have good predictive power for future statistical releases.

[11] Bootstrap simulations follow Horowitz (2000) and involve 10,000 bootstrap samples drawing $(y, \hat{y})$ pairs from the data with replacement (which accounts for possible heteroskedasticity).

Table 2: Private Sector Forecast R^2 and Efficiency Tests

$$y_t = \alpha_0 + \alpha_1 \hat{y}_t + \varepsilon_t$$

July 1978 – June 2003

Macroeconomic Statistic	N	1-week-ahead R^2	1-week-ahead p-value	2-week-ahead R^2	2-week-ahead p-value	3-week-ahead R^2	3-week-ahead p-value	4-week-ahead R^2	4-week-ahead p-value
		Private Sector Forecast R^2 and Efficiency Test p-values:							
Nonfarm Payrolls	216	.71	.164	.69	.360	.66	.391	.66	.150
Retail Sales	289	.59	.017*	.49	.125	.42	.186	.37	.732
PPI	280	.64	.004**	.53	.010*	.48	.088	.47	.209
core PPI	154	.40	.626	.36	.749	.36	.725	.35	.832
Industrial Prod.	286	.73	.827	.62	.928	.49	.596	.44	.488
CPI	288	.88	.119	.85	.044*	.86	.067	.86	.150
core CPI	154	.78	.087	.77	.037*	.76	.003**	.76	.011*
Real GDP	91	.93	.246	.92	.350	.93	.075	.92	.147
GDP Deflator	61	.96	.960	.96	.551	.97	.623	.96	.560

N denotes number of observations for 1-week-ahead private sector forecast; number of observations for 2, 3, and 4-week-ahead forecasts are similar but slightly less; forecast efficiency test is for the joint hypothesis $\alpha_0 = 0$, $\alpha_1 = 1$; p-values are bootstrapped to account for possible fat tails; * (**) denotes statistical signficance at the 5% (1%) level. See text for details.

3. Tests for Information in Federal Reserve Policy Surprises

3.1 Methods

First, we test the null hypothesis that the monetary policy surprise provides no news relevant for predicting statistical releases (relative to the public's information before the surprise). In particular, we test the implication of this hypothesis that $\beta_2 = 0$ in the following regression:

$$y_t = \beta_0 + \beta_1 \hat{y}_t + \beta_2 \, \text{MPsurprise}_t + \varepsilon_t \tag{3}$$

where t indexes monetary policy surprises, MPsurprise_t denotes the policy surprise on date t, $\hat{y}_t$ is the Wrightson forecast immediately preceding the policy surprise, y_t is the subsequent statistical release and ε_t is an error term. Remember that the data release y_t is for a period strictly before the monetary policy surprise.

It is important to note that this is not simply a test of whether the Wrightson forecast could be improved using the surprise: it is a test of whether the true conditional expectation based on the private sector's information set could be improved. For example, even if we did not control for $\hat{y}$ at all, or even if the Wrightson forecasts had no predictive power for y, our test would still be valid, although it would be less powerful. To see this, note that we can decompose $y_t = y_t^e + \nu_t$ where y_t^e is the rational expectation based on the private sector's information set the instant before the policy surprise. Assume that MPsurprise_t is the surprise component of the monetary policy announcement, again measured with respect to the rational expectation from the instant before the policy announcement. In particular, MPsurprise_t is orthogonal to y_t^e. Thus, if MPsurprise_t is correlated with y_t, it must be due to correlation with ν_t. In this case, the surprise could be used to update y_t^e. In measuring the association between ν_t and MPsurprise_t, we are free to condition on nothing or on any variables in the information set upon which y_t^e is based. From a standpoint of power, the ideal conditioning variables would be ones with the maximum possible correlation with y_t^e, which makes our choice of $\hat{y}_t$ a sensible one.

If Fed policy surprises do reveal inside information, then given how the data are defined we expect $\hat{\beta}_2 > 0$, since the Fed will presumably raise interest rates above the private sector's expectation if its estimate of output or inflation is stronger than the private sector's.

Other than the standard type I and II errors that arise in any statistical test, the primary way that this test could mislead is if our policy surprises are mismeasured. In this case, for example, a finding of $\beta_2 \neq 0$ could simply reflect an association between the measurement error in the surprise and y_t^e, the public's expectation before the surprise.

Our second test assesses whether Wrightson systematically revises its forecast of statistical releases in light of monetary policy surprises. Our first test sheds light on whether the true expectation of the release could be improved based on the policy surprise. This second test asks whether Wrightson forecast revisions are correlated with policy surprises. Specifically, we test whether $\gamma_1 = 0$ in the following regression,

$$\Delta\, \hat{y}_t = \gamma_0 + \gamma_1 \text{MPsurprise}_t + \varepsilon_t \tag{4}$$

where the t index and MPsurprise_t are as before, and $\Delta\hat{y}_t$ is the change in the Wrightson forecast from the Saturday immediately preceding the policy surprise to the Saturday immediately following the policy surprise. Alternatively, if Fed policy surprises convey useful information to Wrightson we would expect $\hat{\gamma}_1 > 0$ for the reasons given above. In the first test, the quality of the Wrightson data is of secondary importance. For this test to be of much interest it is obviously necessary that the Wrightson forecast revision process is reflective of the revisions of public expectations more generally.

3.2 Do Non-Monetary Surprises Reveal Information?

A big concern in our testing methodology is that it may have very low power. Obviously, the inability to reject a null hypothesis does not mean that it is in fact true. We shed some light on this issue by verifying that some other surprises, namely other data release surprises, have predictive power for subsequent releases and that Wrightson, in fact, performs the suggested revisions. In particular, the nine macroeconomic statistics we consider are released in a staggered fashion over the course of each month (Table 1), so early statistical releases, such as Nonfarm Payrolls and the PPI, are likely to contain information that is useful for predicting later statistical releases, such as Industrial Production, real GDP, and the CPI.

We investigate the power of our first test by running the regression:

$$y_t = \theta_0 + \theta_1 \hat{y}_t + \theta_2 (x_t - \hat{x}_t) + \varepsilon_t \tag{5}$$

where t indexes months, $x_t - \hat{x}_t$ denotes the surprise in a statistical release occuring *early* in the month (such as Nonfarm Payrolls), and y_t is the released value of a macroeconomic statistic that is released *later* in the month than statistic x. Since y is released later in the month than x, it is natural to think that *ex ante* forecasts of y could be improved upon by using information contained in the statistical release x. Note that the forecasts $\hat{y}_t$ and $\hat{x}_t$ are both taken from the Wrightson newsletter immediately *preceding* the release date of x, so that the forecast $\hat{y}_t$ does not already include information from the release of x.

Results from regression (5) are reported in Table 3. We report the estimates of θ_2 and one-sided bootstrap p-values testing the hypothesis that $\theta_2 = 0$. Under the alternative hypothesis we expect $\hat{\theta}_2 > 0$ (we are regressing output measures on other output measures, and inflation measures on other inflation measures). The results suggest that our test does indeed have power. The Nonfarm Payrolls release is a very significant predictor of the upcoming Retail Sales and Industrial Production releases, and is somewhat significant for Real GDP as well.[12] The Industrial Production release also contains information about

[12] The coefficients on the Nonfarm Payrolls statistic are numerically small because Nonfarm Payrolls is reported in thousands of workers rather than in percentage terms (see Table 1).

Table 3: Private Sector Forecast Errors and Non-Monetary Surprises

$$y_t = \theta_0 + \theta_1 \hat{y}_t + \theta_2 (x_t - \hat{x}_t) + \varepsilon_t$$

July 1978 – June 2003

Dependent Variable	Independent Variable	N	Coefficient Estimates $\hat{\theta}_2$	(std. err.)	[p-value]
Retail Sales	Nonfarm Payrolls	218	.00104	(.00047)	[.019]*
Industrial Prod.	Nonfarm Payrolls	216	.00115	(.00019)	[.000]**
Real GDP	Nonfarm Payrolls	51	.00194	(.00129)	[.082]
Industrial Prod.	Retail Sales	286	−.0232	(.0331)	[.751]
Real GDP	Retail Sales	90	.0656	(.1652)	[.357]
Real GDP	Industrial Prod.	91	.9093	(.5747)	[.032]*
CPI	PPI	275	.1042	(.0296)	[.000]**
core CPI	core PPI	154	−.0187	(.0423)	[.667]
GDP Deflator	PPI	60	−.2437	(.2538)	[.810]
GDP Deflator	CPI	58	.3704	(.5524)	[.241]

N denotes number of observations; heteroskedasticity-consistent standard errors are in parentheses; p-values are for a one-tailed test in the positive direction and are bootstrapped; * (**) denotes statistical signficance at the 5% (1%) level. See text for details.

Table 4: Private Sector Forecast Revisions and Non-Monetary Surprises

$$\Delta \hat{y}_t = \phi_0 + \phi_1 (x_t - \hat{x}_t) + \varepsilon_t$$

July 1978 – June 2003

Dependent Variable	Independent Variable	N	($N \neq 0$)	Coefficient Estimates $\hat{\phi}_1$	(std. err.)	[p-value]
Retail Sales	Nonfarm Payrolls	213	(157)	.00045	(.00033)	[.098]
Industrial Prod.	Nonfarm Payrolls	213	(158)	.00104	(.00015)	[.000]**
Real GDP	Nonfarm Payrolls	43	(20)	.00181	(.00053)	[.001]**
Industrial Prod.	Retail Sales	107	(25)	.0131	(.0207)	[.275]
Real GDP	Retail Sales	98	(35)	.0866	(.0389)	[.006]**
Real GDP	Industrial Prod.	85	(40)	−.0305	(.2051)	[.584]
CPI	PPI	205	(55)	.0930	(.0154)	[.000]**
core CPI	core PPI	89	(8)	.0279	(.0144)	[.004]**
GDP Deflator	PPI	64	(7)	−.0141	(.0452)	[.646]
GDP Deflator	CPI	54	(16)	.5185	(.1971)	[.002]**

N denotes number of observations; ($N \neq 0$) number of observations for which dependent variable is nonzero; heteroskedasticity-consistent standard errors are in parentheses; p-values are for a one-tailed test in the positive direction and are bootstrapped; * (**) denotes statistical signficance at the 5% (1%) level. See text for details.

Real GDP, and the PPI release is a strongly significant predictor of the future CPI release.

We investigate the power of our second test with the regression:

$$\Delta\, \hat{y}_t = \phi_0 + \phi_1 (x_t - \hat{x}_t) + \varepsilon_t \tag{6}$$

which is similar to (5) but with dependent variable $\Delta\, \hat{y}_t$, which denotes the *change* in the Wrightson forecast of y from the Saturday immediately preceding the release of x to the Saturday immediately following the release of x.[13]

Estimates of ϕ_1 in this regression are reported in Table 4. Associated p-values are bootstrapped and are again for one-tailed tests in the positive direction, consistent with the alternative hypothesis that $\hat{\phi}_1 > 0$. Wrightson staff clearly revise their forecasts of Industrial Production and Real GDP in response to Nonfarm Payrolls releases, and there is some evidence that they revise their Retail Sales forecast as well. Real GDP forecasts seem to be revised in response to Retail Sales releases, the GDP Deflator forecast is revised in response to CPI releases, and CPI and core CPI forecasts are revised in response to PPI and core PPI releases, respectively.

In addition to verifying the power of our statistical tests, these results provide evidence that our private sector forecast data are not excessively inertial and respond significantly to relevant information as it becomes available.

3.3 Do Monetary Policy Surprises Reveal Information?

Results for our first test, the test of whether the surprise could be used to improve private sector expectations, are reported in Table 5. The number of observations in each row of the Table is affected by the availability of Wrightson forecasts for that series and by some practical considerations that we discuss in the Appendix. For example, there are several instances prior to 1994 in which the Fed implemented an intermeeting policy move immediately following the Employment Report (Nonfarm Payrolls) release, and we omit all of these intermeeting policy moves from our sample, since we have already shown that Nonfarm Payrolls by itself is a very informative indicator of future data releases.

[13] Note that this requires that the statistic y not be released in the same week as x, so that we have a nontrivial forecast for y on the Saturday following the release of x.

Table 5: Private Sector Forecast Errors and Monetary Policy Surprises

$$y_t = \beta_0 + \beta_1 \hat{y}_t + \beta_2 \, \text{MPsurprise}_t + \varepsilon_t$$

Macroeconomic Statistic	Oct 1988 – June 2003	Coefficient Estimates			Feb 1994 – June 2003	Coefficient Estimates		
	N	$\hat{\beta}_2$	(std. err.)	[p-value]	N	$\hat{\beta}_2$	(std. err.)	[p-value]
Nonfarm Payrolls	76	121.3	(122.6)	[.179]	47	25.2	(148.9)	[.420]
Retail Sales	61	0.071	(0.775)	[.554]	32	0.533	(0.814)	[.373]
PPI	58	−0.025	(0.429)	[.527]	31	0.289	(0.722)	[.356]
core PPI	47	−0.133	(0.328)	[.654]	31	−0.481	(0.295)	[.937]
Industrial Prod.	65	1.138	(0.354)	[.004]**	34	1.285	(0.384)	[.002]**
CPI	76	−0.090	(0.200)	[.671]	41	−0.102	(0.235)	[.675]
core CPI	59	−0.101	(0.164)	[.732]	41	−0.006	(0.130)	[.506]
Real GDP	20	−2.165	(1.145)	[.919]	10	−4.068	(0.991)	[.870]
GDP Deflator	19	−0.386	(0.887)	[.604]	9	0.004	(1.204)	[.524]

N denotes number of observations; heteroskedasticity-consistent standard errors are in parentheses; p-values are for a one-tailed test in the positive direction and are bootstrapped; * (**) denotes statistical signficance at the 5% (1%) level. See text for details.

We report results for both our full sample (October 1988–June 2003) and the February 1994–June 2003 period. The Federal Reserve began explicitly announcing its policy decisions in February 1994, and thus there is a potential structural break in the information content of Federal Reserve policy announcements beginning with that date.

In contrast to our earlier results for non-monetary surprises, Federal Reserve monetary policy surprises generally do not seem to be informative about any of the macroeconomic statistics in Table 5. For example, we find that positive Federal Reserve monetary policy surprises are correlated, if anything, with a *lower*-than-expected subsequent real GDP release and *lower*-than-expected CPI, core CPI, and core PPI releases. There is only one exception to our finding of no release of Federal Reserve inside information in Table 5: Industrial Production, for which the hypothesis of no release of inside information is rejected at the 1% level for both the full and post-1994 sample periods.

Results of our second test—does Wrightson systematically revise forecasts based on the policy surprise—are reported in Table 6.[14] The majority of coefficient estimates for monetary policy surprises in Table 6 are statistically insignificant. There are only two

[14] There are fewer observations for these regressions than for those in Table 5 because we require that there be a Wrightson forecast on the Saturday following the monetary policy surprise, which eliminates observations for which the statistical release occurred after the monetary policy surprise but before the end of the week.

Table 6: Private Sector Forecast Revisions and Monetary Policy Surprises

$$\Delta\,\hat{y}_t = \gamma_0 + \gamma_1 \text{MPsurprise}_t + \varepsilon_t$$

Macroeconomic Statistic	Oct 1988 – June 2003 N	$(N\neq 0)$	Coefficient Estimates $\hat{\gamma}_1$	(std. err.)	[p-val]	Feb 1994 – June 2003 N	$(N\neq 0)$	Coefficient Estimates $\hat{\gamma}_1$	(std. err.)	[p-val]
Nonfarm Payrolls	41	(11)	64.0	(40.9)	[.080]	25	(5)	−35.8	(25.7)	[.979]
Retail Sales	56	(34)	1.187	(0.479)	[.026]*	28	(17)	1.114	(0.612)	[.089]
PPI	46	(5)	−0.086	(0.060)	[.919]†	26	(3)	−0.067	(0.073)	[.817]†
core PPI	40	(2)	0.090	(0.070)	[.102]†	26	(1)	0.002	(0.010)	[.206]†
Industrial Prod.	60	(29)	0.910	(0.411)	[.046]*	30	(16)	1.310	(0.376)	[.079]
CPI	59	(8)	0.003	(0.025)	[.505]	29	(4)	0.028	(0.049)	[.144]†
core CPI	45	(3)	−0.001	(0.013)	[.520]†	29	(2)	−0.008	(0.015)	[.689]†
Real GDP	19	(12)	−0.562	(0.966)	[.730]	10	(5)	−1.743	(1.081)	[.936]
GDP Deflator	18	(4)	−0.684	(0.487)	[.910]†	9	(3)	−0.221	(0.162)	[.992]†

N denotes number of observations; $(N \neq 0)$ number of observations for which dependent variable is nonzero; heteroskedasticity-consistent standard errors are in parentheses; p-values are for a one-tailed test in the positive direction and are bootstrapped; * (**) denotes statistical signficance at the 5% (1%) level; † denotes asymptotic rather than bootstrap p-value due to small number of nonzero observations of dependent variable. See text for details.

possible exceptions to this rule: Industrial Production and Retail Sales, both of which are significant at the 5% level for the full sample and at the 10% level for the post-1994 period. Since we found little useful information was embedded in the policy surprise, it is perhaps not surprising that we also find that Wrightson does not systematically revise forecasts based on the surprise, with the possible exception of Retail Sales and Industrial Production.

4. Sensitivity Analysis

4.1 Excluding Intermeeting Policy Moves

We have found some evidence consistent with the idea that Federal Reserve policy surprises have predictive power for Industrial Production data. There are several reasons to suppose that the Fed might have an information advantage in this area. First, after financial market indicators, production data are some of the most timely indicators of economic acitivity—for example, timely weekly production numbers are forthcoming from some industries. Given its policy assignment, the Fed has a particular incentive to monitor such developments. Further, the Fed produces the Industrial Production Index, a task which

Table 7: Private Sector Forecast Errors and Monetary Policy Surprises excluding intermeeting moves

$$y_t = \beta_0 + \beta_1 \hat{y}_t + \beta_2 \,\text{MPsurprise}_t + \varepsilon_t$$

Macroeconomic Statistic	Oct 1988 – June 2003	Coefficient Estimates			Feb 1994 – June 2003	Coefficient Estimates		
	N	$\hat{\beta}_2$	(std. err.)	[p-value]	N	$\hat{\beta}_2$	(std. err.)	[p-value]
Nonfarm Payrolls	68	258.0	(155.2)	[.087]	46	−42.6	(346.8)	[.522]
Retail Sales	50	−0.295	(1.326)	[.656]	31	−0.728	(2.140)	[.719]
PPI	49	−0.157	(0.675)	[.582]	30	0.604	(1.957)	[.402]
core PPI	41	0.021	(0.474)	[.511]	30	−0.258	(0.755)	[.669]
Industrial Prod.	50	1.570	(0.449)	[.001]**	32	0.974	(1.174)	[.205]
CPI	62	−0.173	(0.262)	[.763]	39	−0.034	(0.495)	[.546]
core CPI	51	−0.107	(0.152)	[.766]	39	−0.227	(0.202)	[.893]
Real GDP	12	4.28	(7.28)	[.340]	7	−13.91	(6.70)	[.745]
GDP Deflator	11	−8.07	(4.39)	[.910]	6	−5.35	(9.30)	[.454]

N denotes number of observations; heteroskedasticity-consistent standard errors are in parentheses; p-values are for a one-tailed test in the positive direction and are bootstrapped; * (**) denotes statistical signficance at the 5% (1%) level. See text for details.

could help the Fed develop a unique perspective on this topic relative to private sector analysts who might acquire many of the same raw inputs. If the Fed has gained a unique perspective in analyzing this topic, and if this perspective is helpful in informing the policy process, then our earlier results would not be surprising.

Even in this case, however, one might wonder how much additional information about IP could be conveyed in a *typical* policy surprise. This leads us to consider the possibility that our earlier results are driven by intermeeting moves. After all, the Fed presumably has a very strong reason for moving between regularly scheduled meetings rather than waiting just a few weeks for the next scheduled meeting to take place. If the Fed makes intermeeting policy moves when the incoming indications of weakness in the production sector are strongest, and if the Fed (say, as a byproduct of producing the IP data) has a unique advantage in assessing these indicators, then intermeeting moves might be most likely when inside information is the greatest. Table 7 investigates this hypothesis by excluding all intermeeting policy moves by the Federal Reserve from the sample.[15]

In fact, there is some support for this hypothesis in the table. Although policy sur-

[15] Recall that, up until this point, we have already been excluding all intermeeting policy moves by the Federal Reserve that occurred on the dates of Employment Reports.

prises at regularly scheduled FOMC meetings remain informative about Industrial Production over the full sample, in the post-1994 period regularly scheduled FOMC meetings have not been significantly informative about any macroeconomic statistic, including Industrial Production. Since 1994, then, the information content of Federal Reserve announcements seems to have been primarily concentrated in intermeeting policy moves; however, additional data will be needed to make this conclusion more definitively, since our post-1994 sample is relatively small—indeed, the post-1994 point estimate is similar in magnitude to our earlier estimates, and it is just the much larger standard error that has eliminated statistical significance.

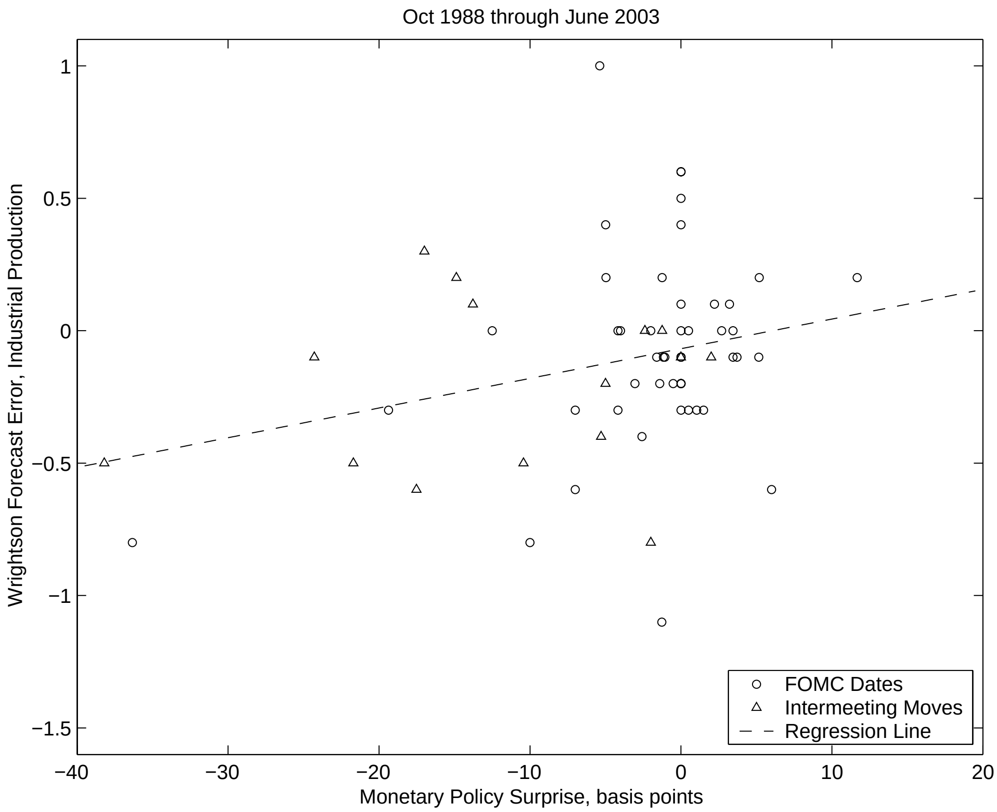
Finally, to investigate whether a few outliers have had an undue influence on our results for Industrial Production, we plot in Figure 2 the private sector's *ex ante* forecast errors for Industrial Production against the corresponding Federal Reserve monetary policy surprises over both the full and post-1994 samples. Observations corresponding to FOMC meeting dates are plotted as circles and those corresponding to intermeeting policy moves are plotted as triangles. The least-squares regression line for each sample is depicted by the dashed line in each panel. The positive relationships estimated in Tables 5 and 7 can be seen clearly in the figure. The slope of the relationship does not seem to be greatly affected by a few outliers or by intermeeting policy moves, although the significance of the relationship is affected, due to the fact that most of the large negative policy surprises in our sample are the result of intermeeting moves.

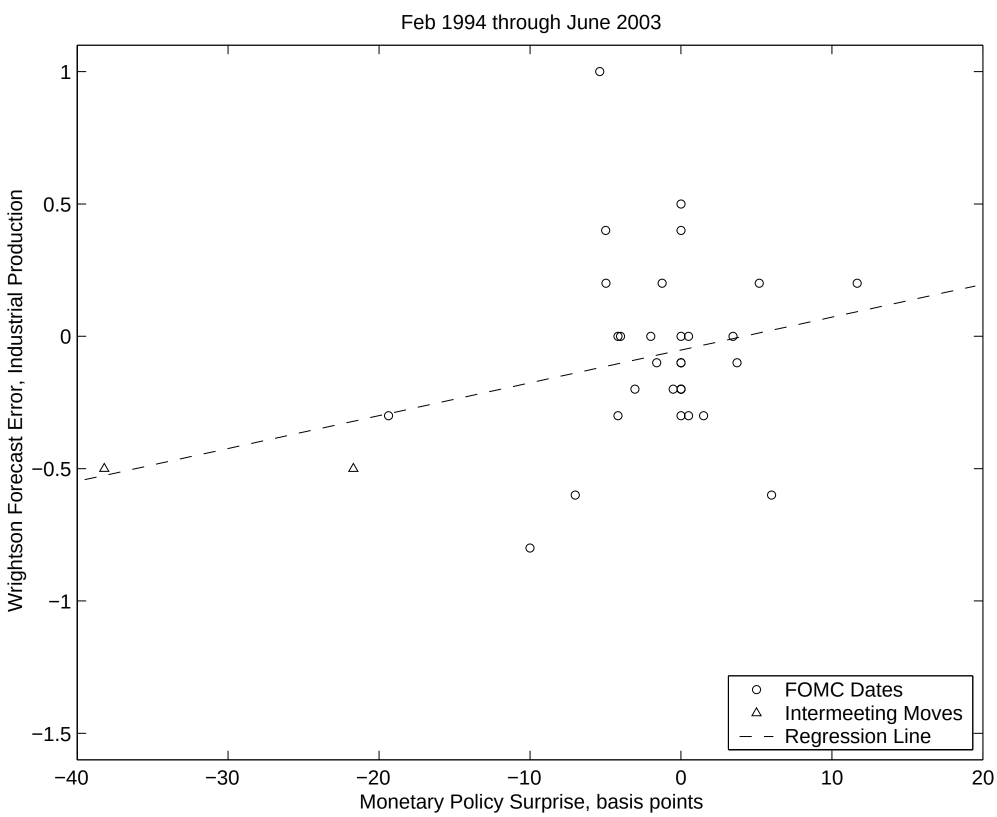
4.2 Do Monetary Policy Surprises Reveal Information About the Fed's Forecasts of Future Data?

Up to this point, we have tested whether Federal Reserve monetary policy surprises reveal inside information about macroeconomic data series that are just about to be released. The advantage of this approach is that it clearly eliminates any possibility of the policy surprise having a causal effect on the data. A disadvantage of this approach, however, is that some might argue that the Fed's informational advantage truly lies in its ability to forecast data further ahead into the future—say 4 quarters ahead.[16] Unfortunately, we

[16] Although one might think that an information advantage for 4-quarter ahead forecasts ought to imply at least some information advantage for data that are just about to be released.

Figure 2: Private Sector Industrial Production Forecast Errors and Monetary Policy Surprises





cannot re-run our basic tests (3) and (4) with *future* realized data on the left-hand side. The reason is that even if the Fed has no inside information, the monetary policy surprise will have a direct, causal effect on the future data anyway.

However, we can run a modified version of our first test using the Fed's Greenbook forecast in place of the statistical release (the Greenbook forecast is prepared by Board staff for the FOMC just before each FOMC meeting). That is, we test the hypothesis that $\beta_2 = 0$ in the regression:

$$\hat{y}^{GB}_{n,t} = \beta_0 + \beta_1 \hat{y}^{PS}_{n,t} + \beta_2 \, \text{MPsurprise}_t + \varepsilon_t \tag{7}$$

where t indexes monetary policy surprises, MPsurprise_t is as before, $\hat{y}^{GB}_{n,t}$ is the Fed's n-quarter-ahead Greenbook forecast immediately preceding the policy surprise, $\hat{y}^{PS}_{n,t}$ is the corresponding n-quarter-ahead private sector forecast, and ε_t is a stochastic error term.

If we assume that the Greenbook forecast is the rational expectation based on the Federal Reserve's information set, and that the Fed's information set is a superset of the private sector's information set, then the interpretation of this equation is essentially the same as the interpretation of the regression in our first test. In particular, the Greenbook forecast will equal the private sector's expectation plus a term uncorrelated with the private sector's information at the time of the surprise, and any correlation between the Greenbook forecast and the policy surprise indicates that the private sector could use the surprise to improve its expectation. The primary complication that arises for this test (but not for our earlier tests) is that a nonzero β_2 could occur not because of superior Fed information about the economy, but because of superior Fed information about the future course of policy. For example, if the Fed correctly expects policy to be tighter than does the private sector, then the Greenbook forecast of output and inflation would tend to be lower than the private sector's forecast for these variables in the short run, which would tend to push the coefficient β_2 in the negative direction.[17]

For our private sector forecasts $\hat{y}^{PS}_{n,t}$, we use both the Survey of Professional Forecasters (SPF) and Blue Chip. The SPF is a quarterly survey, conducted in the middle month of

[17] A second complication is that the Greenbook forecast assumes a baseline path for policy that is not necessarily a rational expectation. It is not clear that this would have significant effects on our estimate of β_2, so, as is standard practice in work using Greenbook forecast data, we ignore this complication.

each quarter, and Blue Chip is conducted monthly, in the first week of each month. We consider n-quarter-ahead forecasts of real GDP growth and of GDP deflator inflation. We restrict attention to these two series because SPF and Blue Chip do not publish n-quarter-ahead forecasts for all of the statistics we considered earlier and because previous work by other authors on n-quarter-ahead forecasts has focused on forecasts of real GDP growth and GDP deflator inflation, which allows us to better compare our results to those of previous authors. As with our previous tests, note that even if the Blue Chip and SPF forecasts are not efficient, our test remains valid, albeit less powerful.

Since there are no Greenbook forecasts produced for intermeeting policy moves, we restrict attention to regularly scheduled FOMC meetings when running regression (7). This results in eight monetary policy surprises per year over our sample period, October 1988 through December 1997 (fed funds futures data begin in October 1988, and for confidentiality reasons, the Fed releases Greenbook forecast data with a five-year lag). For each monetary policy surprise and Greenbook forecast, we use the Blue Chip forecast immediately preceding the policy surprise. The SPF data are quarterly, so for those regressions we restrict attention to just four monetary policy surprises per year—in particular, to the FOMC announcement that is closest to the middle of each quarter.

Results from regression (7) are presented in Table 8. To correct for possible serial correlation in the residuals, Newey-West standard errors are reported in parentheses. Reported p-values are for a one-tailed test in the positive direction, since if monetary policy surprises do release information about GDP or inflation to the private sector, we expect that $\beta_2 > 0$.[18]

In fact, as can be seen in the Table, the coefficients on the monetary policy surprise are not significantly different from zero in any of our regressions—indeed, many of the point estimates are even negative. It thus appears that monetary policy surprises tell the private sector little if anything about Greenbook forecasts of output or inflation.

4.3 Relation to Previous Literature

Our finding that monetary policy surprises reveal nothing about Greenbook forecasts to

[18] In contrast to earlier tables, we do not report bootstrapped p-values in Table 8 because accounting for serial correlation would involve block-boostrapping with only a relatively small number of independent blocks of data, and because even the asymptotic p-values are insignificant.

TABLE 8: n-QUARTER-AHEAD FORECASTS AND MONETARY POLICY SURPRISES

$$\hat{y}_{n,t}^{GB} = \beta_0 + \beta_1 \hat{y}_{n,t}^{PS} + \beta_2 \,\text{MPsurprise}_t + \varepsilon_t$$

Oct 1988 – Dec 1997

Private Sector Forecast Source	Macroeconomic Statistic	Forecast Horizon (n)	N	Coefficient Estimates $\hat{\beta}_2$	(std. err.)	[p-value]
SPF	Real GDP	1	37	.0047	(.0066)	[.242]
	Real GDP	2	37	−.0111	(.0120)	[.820]
	Real GDP	3	37	.0036	(.0088)	[.341]
	Real GDP	4	37	.0052	(.0049)	[.151]
SPF	GDP Deflator	1	37	−.0137	(.0127)	[.906]
	GDP Deflator	2	37	.0023	(.0034)	[.257]
	GDP Deflator	3	37	.0070	(.0070)	[.162]
	GDP Deflator	4	37	−.0023	(.0036)	[.742]
Blue Chip	Real GDP	1	69	.0080	(.0086)	[.180]
	Real GDP	2	69	−.0099	(.0130)	[.824]
	Real GDP	3	69	−.0095	(.0073)	[.912]
	Real GDP	4	69	−.0007	(.0056)	[.548]
Blue Chip	GDP Deflator	1	69	−.0083	(.0076)	[.860]
	GDP Deflator	2	69	−.0050	(.0060)	[.800]
	GDP Deflator	3	69	−.0086	(.0070)	[.886]
	GDP Deflator	4	69	−.0093	(.0094)	[.837]

n denotes forecast horizon in quarters; N denotes number of observations; Newey-West standard errors in parentheses; p-values are for a one-tailed test in the positive direction; * (**) denotes statistical signficance at the 5% (1%) level. See text for details.

the private sector conflicts with a related result obtained by Romer and Romer (2000). Those authors essentially estimated our regression equation (7) over the sample period 1984–1991, using the raw change in the federal funds rate target at each FOMC meeting rather than the monetary policy surprise.[19] Thus, their regression differs from ours in that: (i) they use an earlier sample period, and (ii) they use the total change in monetary policy as a predictor whereas we use the unanticipated component of the change in monetary policy. At some of the horizons they consider, they find a significant positive coefficient on the change in the federal funds rate.

We can replicate the results of Romer and Romer over their sample period, using the

[19] See, in particular Table 7 of Romer-Romer (2000). For the Blue Chip data, their sample period is 1984–1991; for the SPF data, they use a combined sample of 1974–1979 and 1984–1991. Romer and Romer also incorporate intermeeting changes in the federal funds rate into their analysis by aggregating Fed policy actions up into a monthly time series variable—in particular, the Fed action for a given month is defined to be the sum of all daily Fed actions that occurred within the month. We found that whether we aggregated Fed actions into a monthly series or not did not significantly affect our results in Table 8 or below.

total change in the federal funds rate as the right-hand side variable. However, running exactly their regression over the later sample period October 1988 to December 1997—the period of our data—the coefficient on the change in the federal funds rate is numerically close to zero for all horizons n and not statistically significant for any horizon. In fact, this coefficient ceases to be significant for all horizons if estimated over the period 1985–1991 rather than 1984–1991.[20] Switching from the total change in the federal funds rate to the monetary policy surprise as the right-hand side variable further reduces the size and statistical significance of the coefficient estimates.[21]

One explanation for the discrepancy between our results and those of Romer and Romer (2000) is that monetary policy surprises did indeed convey information about the Greenbook forecasts to the private sector in the early 1980s but that this is no longer the case. This could occur, for example, during a period in which the Fed's policy expectations were not fully credible, but were in fact confirmed over time. Another possibility is that the SPF and Blue Chip forecasts are not perfect measures of private sector expectations just before the FOMC meeting. Since Romer and Romer use the total change in monetary policy rather than just the unexpected component of the monetary policy change, this could explain their finding of a positive coefficient, because an anticipated monetary policy tightening should be correlated with forecasts of higher future inflation even if the Fed surprises were not revealing inside information.

5. Conclusions

Do Federal Reserve monetary policy surprises reveal inside information about the economy? Using two new tests based on the timing of monetary policy surprises and data releases, we find that the answer is "No" for all the major macroeconomic statistics we consider, with one potential exception: Industrial Production. Even for the case of Industrial Production, there is some evidence that only intermeeting monetary policy actions by the FOMC convey

[20] Obviously, 1984 is a very influential year for this regression. Closer inspection of the data revealed that Fall 1984 was a period in which the Fed cut the federal funds rate dramatically (from 11.25% on Oct. 1 to 8.5% on Dec. 19). At the same time, the Fed was forecasting inflation would come in significantly below what the private sector was forecasting, and the Fed's forecast turned out to be correct.

[21] We cannot run the regressions back to 1984 with monetary policy surprises as the right-hand side variable because the federal funds futures market did not exist prior to October 1988.

useful information about that statistic, and that policy announcements after regularly scheduled FOMC meetings since 1994 have been largely uninformative about all of the statistics we consider, including Industrial Production.

As a robustness check on our primary results, we investigated whether monetary policy announcements revealed inside information about Federal Reserve forecasts of real GDP or inflation further ahead into the future—say 1, 2, 3, and 4 quarters ahead. Here we found that monetary policy surprises have also been uninformative about the Fed's Greenbook forecasts of real GDP or inflation at these longer horizons.

It is important to emphasize that we have not directly concerned ourselves with the question of whether the Federal Reserve *has* inside information about output or inflation, but rather whether the Fed's monetary policy announcements *reveal* any such additional information to the private sector.

These results have important implications for the interpretation of the financial market reaction to surprise changes in the federal funds rate target. They suggest that the reaction may principally reflect changes in the expected future course of policy, rather than revised private sector views of the current state of the economy. This conclusion supports the identified VAR work of Faust, Swanson, and Wright (2002) and Faust, Rogers, Swanson, and Wright (2002), and is consistent with the empirical evidence presented in Gürkaynak, Sack, and Swanson (2003), which shows that long-term forward interest rate responses to policy surprises are consistent with changes in market expectations about the central bank's long-run target for inflation.

Data Appendix

In this appendix, we discuss details surrounding the timing and measurement of monetary policy surprises and the sample for our regression tests.

As a general rule, we measure monetary policy surprises from the federal funds futures closing price immediately preceding an FOMC announcement to the closing price immediately following the announcement. Since February 1994, Federal Reserve policy actions have been explicitly announced at about 2:15pm after regularly scheduled FOMC meetings. Prior to 1994, changes in the federal funds rate target were implicitly announced the morning after FOMC meetings through the size and type of open market operation. Intermeeting policy actions by the FOMC have typically been decided upon in the morning, prior to the Fed's open market operation, and thus became known to the markets on the same day as the decision both pre- and post-1994. In all cases, we measure the monetary policy surprise using the close-to-close change in federal funds futures rates bracketing the time that the markets recognized the change in policy.

There are a few cases where the market's recognition of the monetary policy action does not conform to the basic timing rules described above. On Oct. 15, 1998, the intermeeting ease was announced at 3pm, after the close of the federal funds futures market; thus we measure the monetary policy surprise as the close-to-close change in the fed funds futures rate from Oct. 15 to Oct. 16. The Nov. 13, 1990, policy ease was not recognized in the market until the morning of Nov. 16 due to volatility in the federal funds market on Nov. 14 and 15. The Nov. 7, 1989, intermeeting ease was not recognized in the market until the morning of Nov. 8, due to volatility in the federal funds market on Nov. 7. The Oct. 18, 1989, intermeeting ease by the FOMC was actually perceived by markets to have taken place on Oct. 16—*before* the actual FOMC decision—as the Desk decided (in consultation with the Chairman) not to offset excess reserves in the market due to stock market turmoil, the San Francisco earthquake, and anticipation of the FOMC's action two days later. See Kuttner (2003) for details.

After 1994, FOMC announcements were made at fixed times, and we could use federal funds futures quotes for a smaller, intraday, window around each announcement to measure monetary policy surprises. Before 1994, actions were not explicitly announced and the daily window seems reasonable. For consistency, we use the daily window throughout the whole sample but do not believe this to be a major issue. Since 1994, the correlation of the daily surprise with the surprise in a twenty-minute window around the announcement is .95.

The sample period of our Wrightson forecast data is as follows: forecasts for the core PPI and core CPI are available back to August 1990; Nonfarm Payrolls forecasts are available going back to January 1985; PPI forecasts are available back to March 1979; GDP Deflator forecasts are available from July 1978 through September 2001; and forecasts for Retail Sales, Industrial Production, the CPI, and Real GDP are available going back to July 1978, although several newsletters are missing from mid-1980 and mid-1981.

As a general rule, we include monetary policy surprises in a given regression if they occur before a given data release, and *after* the end of the month to which the data release refers (as in Figure 1). However, our results in the text also include monetary policy surprises that occur on or after the third-to-last day of the preceding month, which increases our sample size by several observations while still avoiding essentially any chance of the monetary policy surprise having an observable causal effect on the macroeconomic statistic. In the case of Nonfarm Payrolls, we also include monetary policy surprises that occur on or after the 20th of the previous month for the same reason: Nonfarm Payrolls is the number of employees on business payrolls *at any time* during the pay period including the 12th of the month, which will be largely unaffected by a monetary policy surprise occuring on or after the 20th. In all cases, our results are robust to including only monetary policy surprises that occur after the last day of the preceding month—we simply lose observations by doing so.

There are also several instances prior to 1994 in which the Fed implemented an intermeeting policy move immediately following the Employment Report (Nonfarm Payrolls) release. Since we showed in the text that Nonfarm Payrolls by itself is a very informative indicator of future macroeconomic releases, and since the Fed was presumably also responding to the information contained in the Employment Report release, we omit all of the intermeeting policy moves that occurred on these dates to avoid finding a spurious correlation in our tests. There have been five such intermeeting moves on Employment Report release dates since October 1988: Dec. 7, 1990, Feb. 1, 1991, Mar. 8, 1991, Dec. 6, 1991, and Sep. 4, 1992. Not surprisingly, the estimated coefficients and statistical significances in the Industrial Production regression both increase when we include these intermeeting moves. Rudebusch (1998) lists two additional dates (Jul. 7, 1989, and Jul. 2, 1992), but both of these correspond to the day *after* a regularly scheduled FOMC meeting; thus, the FOMC's decision was made the day *before* the Employment Report release, and there is no endogeneity problem.

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