Setting the Target for the Federal Funds Rate: The Determinants of Fed Behavior

Abstract

This paper analyzes the factors the Federal Open Market Committee (FOMC) considers in setting the target for the federal funds rate. The sample consists of 262 FOMC meetings between 1983 and 2005. Statistical results indicate that the Fed’s target is inversely related to the unemployment rate and directly related to several measures of expected inflation. Technical factors such as the number of days since the last target change, the size and direction of the previous target change and the gap between the actual federal funds rate and its targeted value were also statistically significant explanatory variables. Estimations were performed using ordinary least squares, censored regression and two types of ordered probit; but, the results proved to be robust regardless the statistical technique used.

Introduction

One of the rare moments of high drama in economics is when the Federal Reserve (Fed) announces its decision about a change in the federal funds rate. Headlines in the New York Times have cautioned “Wall Street May See Volatile Week.”¹ Headlines like “Neutral Isn’t Easy to Define” followed the search for a neutral federal funds rate that was neither expansionary nor contractionary.² Uncertainty over the actions of the Federal Open Market Committee (FOMC) resulted in columns entitled “Interest Rate Turbulence: What’s a Bond Investor to Do?”³ Finally, the Federal Reserve’s decision carries an announcement effect that may signal the Fed’s intentions whether future monetary policy will be tight or easy. However, as headlines like

“Fed’s Restrained Pace on Rates Inspires Only a Limp Rally” attest, the Fed’s actions seldom please everyone.\textsuperscript{4}

This paper reports the results of statistical models that describe how the Fed changes its target for the federal funds rate. Most of the past research on the behavior of the Fed used the Taylor rule which models the actual federal funds rate as a function of inflation, unemployment, and the gap between potential and actual GDP.\textsuperscript{5} Rather than explaining the actual federal funds rate, this paper estimates regression models that explain changes in the target that the Fed sets for the federal funds rate.

The data sample consists of 262 decisions made by the FOMC between August 17, 1983 and December 13, 2005. In 149 of these meetings, the FOMC decided to change its target for the federal funds rate. This sample coincides with the time when the Fed returned to targeting the federal funds rate after it had experimented with targeting nonborrowed reserves between October 1979 and October 1982. During this time period, there was a change in the chairman of the Board of Governors and the FOMC. Paul Volker was chair of both until August 11, 1987. After that date, Alan Greenspan began his term as chairman of the Board of Governors and the FOMC.

Statistical results show that the Fed changes its target for the federal funds rate in response to changes in unemployment and inflation. The paper presents statistical evidence that the change in the Fed’s target for the federal funds rate is inversely related to changes in the unemployment rate since the last FOMC meeting. There is also statistical evidence that the Fed’s federal funds target is directly related to measures that signal future inflation such as


\textsuperscript{5} See Taylor (1993).
changes in the yield on long-term government bonds, changes in the real oil price, and the GDP gap.

There is also evidence of policy persistence and rigidity in setting targets as positive changes in the target are more likely to follow past positive changes and reductions in the targeted rate are more likely to follow a previous reduction. The change in the federal funds target is directly related to the gap between the current federal funds rate and the target set at the previous FOMC meeting. For example, if the current federal funds rate is significantly greater than the targeted level, it is more likely the FOMC will increase the target. However, other variables of interest, such as the percentage change in the Dow Jones Industrial index, the actual change in the inflation rate, and the change in consumer confidence have no statistically significant effect on changes in the targeted level of the federal funds rate.

Following this introduction, the second section of this paper reviews the literature regarding Fed behavior and setting a target for the federal funds rate. The third section of the paper describes how the targeted level of the federal funds rate has changed over the last twenty years. Data and model specifications are described in the fourth section of the paper, while the fifth section of the paper presents the estimation results. The final section of the paper contains a brief summary of the results and some concluding thoughts.

**Literature Review**

Lombra and Moran (1980) produced one of the earliest attempts at modeling the FOMC’s target for the federal funds rate. Their model used OLS to estimate the relationship between the target rate and (1) the deviation of the preliminary money stock from its long-run target, (2) the average FOMC staff GNP forecasts for the next three quarters, (3) the average FOMC staff inflation forecasts over the next three quarters, (4) the average of the FOMC staff’s current
quarter real GNP forecast and the previous quarter’s preliminary real GNP, and (5) the average of the staff’s current inflation rate forecast and the previous quarter’s preliminary inflation rate. The results generally corresponded to a priori expectations. However, subsequent authors have argued the use of OLS in such a model is somewhat questionable.

Rudebusch (1995) proposes a model that attempts to reconcile term structure evidence with the Fed’s targeting behavior. His results indicate that the Fed’s targeting behavior can be described by four important characteristics. First, deviations of the spot federal funds rate from the target rate do occur but tend to disappear within one day. Second, targets tend to be adjusted slowly and are seldom reversed. So, for example, if a target increase has occurred there is a greater probability that an additional increase will follow. Third, the Fed tends to set the target at a level that it expects to maintain, and fourth, the target is set in accordance with the long-run economic objectives of the Fed. These long-run objectives can be many and varied. As the goal of this investigation was primarily aimed at reconciling the information available from the term structure with the Fed’s targeting behavior, Rudebusch opted not to model long-run economic objectives, choosing instead to simulate an entire term structure from his observations of and resulting assumptions about the Fed’s targeting behavior. The periods examined were September 1974 to September 1979 and March 1984 to September 1992.

Michael Dueker (1999) used an ordered probit technique based on a Taylor-rule model with a partial adjustment mechanism to predict target changes in the Fed funds rate. His ordered probit model used monthly observations for the period between January 1985 and December 1998 and he compared the result to those of a similar, linear model. Both models produced results indicating the importance of the output gap in predicting target changes and both also showed evidence that the target is changed in a way that Taylor defines as inflation fighting (i.e.
the long-run response of the target rate to a one unit change in inflation is greater than 1). However, the estimated coefficient for inflation in the ordered probit model was significant while it was insignificant in the linear model.

Hamilton and Jorda (2002) use a variation on the ACD (autoregressive conditional duration) model to predict the timing of a change in the federal funds rate target. Difficulties with estimation created the necessity of splitting the estimation into two distinct time periods. First, for the period between March 1, 1984 and November 23, 1989, the only variables found to significantly affect the probability of a change in the Fed funds target (other than simple lagged durations) were the occurrence of an FOMC meeting in the prior week and the lagged value of the effective Federal funds rate. For the period between November 30, 1989 and June 5, 1997, the significant variables were the occurrence of an FOMC meeting during the week in question and the absolute value of the spread between the effective Federal Funds rate and the six-month Treasury bill rate. For the ordered probit, all changes in the target were collapsed into five categories—two positive, two negative and zero. Interestingly, they found that most of the variables that affected the timing of a change had no significant effect on the size of the change. Instead, the two variables that had the most influence on the size of the change were: (1) a previous change in the target (i.e. if the target had been previously increased, the likelihood of a current increase is greatly elevated), and (2) the lagged spread between the Fed funds rate and the six month Treasury bill rate. For the most part, variables representing long-run economic objectives were of little statistical value in the various specifications.

Khouri (1990) attempted to make sense of a large number of studies purporting to clarify the Fed’s reaction to changes in various measures of economic conditions. What separates Khoury’s effort from those previously described is his willingness to test a large number of
variables often used to describe macroeconomic conditions and his singular emphasis on macroeconomic indicators. The articles described above tend to emphasize the importance of the timing of decisions and the Fed’s desire to smooth out changes in the target by stepping through small increments (sometimes referred to as “inertial” behavior). Khouri used Leamer’s (1978) specification search techniques to determine the robustness of various macroeconomic indicators. After application of the technique, only one variable, GDP, was found to be a robust indicator of Fed behavior. It should, however, be mentioned that of 42 reaction function studies examined by Khoury, only one used the federal funds target rate as a dependent variable.

Thornton (2000) investigates quite a different question regarding the federal funds rate target.6 The primary purpose of his research was to determine whether the market responds to actual changes in the federal funds target rate or if it is simply the market’s belief that the target has changed that generates observed changes in market interest rates. His conclusions in this regard are not encouraging. He finds that market rates are not determined by open market operations and, hence, not determined by the setting of the federal funds rate target. In addition, he finds that they are not determined by announcement effects (he refers to this as open mouth operations). His conclusion is that some target changes are endogenous and some are exogenous, making analysis of the relationship between the target rate and the federal funds rate quite complex and, consequently, difficult to untangle.

Using monthly data and an ordered probit, Vanderhart (2000) found that changes in industrial production and measures indicating increased prices for final goods were statistically

significant in explaining changes in the monthly federal funds target. However, the estimated
coefficients for other economic variables such as unemployment and changes in the consumer
price index were not statistically different from zero. His model did not include any structural
variables such as a binary variable indicating whether a FOMC meeting was scheduled to occur
in a given month, the gap between the actual federal funds rate and its target, the direction of the
previous target change and how long it had been since the last target change.

Meetings of the FOMC and Changes in the Target Federal Funds Rate: 1983–2005

Between July 1983 and December 2005, the FOMC met 262 times and it changed its
federal funds target during 149 of those meetings. The largest federal funds rate target was the
one of 11.5625 percent set on August 9, 1984. The smallest target that the FOMC set for the
federal funds rate was the 1 percent level that was in place between June 25, 2003 and June 30,
2004. During this time period, the actual federal funds rate was the lowest it had been in over
forty years.

Most of these meetings occurred on regularly scheduled dates specified in advance. Federal law requires the FOMC to meet in Washington D.C. at least four times a year and since
the 1980s, the FOMC has usually had eight regularly scheduled meetings a year. Pressing
economic problems have sometimes prompted the FOMC to hold an unscheduled meeting either
in person or over the phone.

7 The dates of the meetings and the level of the federal funds rate target come from Rudebusch (1995), Thornton
A table listing the dates of the FOMC meetings and the federal funds rate target is available upon request.
8 See http://www.minneapolisman.org/info/policy/dates-hist.cfm for the dates of regularly scheduled FOMC meetings
between 1970 and now.
The frequency of meetings and how often the federal funds target is changed depends on the underlying economic conditions and membership of the FOMC. For example, during 1984 when Paul Volker was chair, the FOMC met 23 times and it changed its federal funds target in 20 of those meetings. On the other hand, under Alan Greenspan’s chairmanship in 1993, the FOMC only met during its eight regularly scheduled meetings, and it never changed its targeted federal funds rate of 3 percent.

The business cycle clearly affects targeting of the federal funds rate. During the recessionary period of 1991, the FOMC met 18 times and it cut the federal funds target 10 times from 6.75 percent to 4 percent. The terrorist attacks on 9-11 were bracketed by the recession of 2001. During that year, the FOMC met 11 times and it cut the federal funds target every time reducing it from 6 percent to 1.75 percent.9

**Model Specification and Data**

*A simple theoretical model to motivate discussion*

Assume the Fed sets the federal funds rate target in an attempt to minimize a loss function. For simplicity, assume the loss function penalizes diverging from a desired inflation rate ($\pi_d$) and a desired unemployment rate ($u_d$). Both $\pi_d$ and $u_d$ are set at levels that are conducive to achieving the Federal Reserve’s often mutually exclusive goals of high employment, economic growth, price stability, stable financial and foreign exchange market stability and interest rate stability. The loss function, $L$, is

$$L = \alpha[u_t(r_T, \gamma) - u_d]^2 + \beta[\pi_t(r_T, \delta) - \pi_d]^2$$

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9 Charts showing the daily effective federal funds rate and the targeted level of the federal funds rate are available upon request.
where $\alpha$ and $\beta$ are two positive, exogenous parameters. Referring to equation (1), $u_t$ is the actual unemployment rate and $\pi_t$ is the actual inflation rate, both of which are functions of the Fed’s target for the federal funds rate, $r_t$. The actual unemployment rate is also a function of $\gamma$, a vector of exogenous variables, and the actual inflation rate is also a function of $\delta$, another vector of exogenous variables. It is possible that both $\gamma$ and $\delta$ contain common exogenous variables. The bracketed terms in equation (1) are both squared to equally punish actual unemployment and inflation rates that are either too high or too low relative to their desired levels.

The FOMC sets its federal funds rate target ($r_t$) to minimize its loss function. The first order condition is

$$\frac{dL}{dr_t} = 2\alpha[u_t(r_t, \gamma) - u_d]u_t'(r_t, \gamma) + 2\beta[\pi_t(r_t, \delta) - \pi_d]\pi_t'(r_t, \delta) = 0.$$  \hspace{1cm} (2)

The FOMC’s optimal target for the federal funds rate is $r_t^*$ which minimizes the loss function and is a function of the model’s exogenous variables or $r_t^* = r(\alpha, \beta, \delta, \gamma, u_d, \pi_d)$. As the Fed receives information of changes in the actual unemployment or inflation rate, it adjusts its federal funds target to reduce the deviation from either $u_d$ or $\pi_d$.

**Specifying the empirical model**

The dependent variable is the change in the Federal Reserve’s target for the federal funds rate. This variable was constructed by subtracting the previous target rate from the current target rate. For example, if $r_t^*$ is the federal funds target set during the current meeting and $r_{t-1}^*$ was the target set during the previous FOMC meeting, then $\Delta_{\text{target}} = r_t^* - r_{t-1}^*$.

The set of explanatory variables that explain changes in the FOMC’s target federal funds rate is not known with certainty. This paper tests a series of explanatory variables that
theoretically affect the Fed’s target for the federal funds rate. These variables capture changes in the unemployment rate, changes in the inflation rate, the rigidity of monetary policy, and whether the economy is experiencing expansion or contraction. All of the explanatory variables and their definitions are listed in Table 1. The general functional form for this relationship with the selected variables is

$$D_{\text{target}} = f(\text{Lastmet}, \text{Last} \Delta, \text{Notscheduled}, D_{\text{target},1}, \text{Targetgap}, \Delta \text{Unemployment}, \Delta \text{Rate10}, \Delta \text{Dow}, \Delta \text{Confidence}, \Delta \text{OilP}, \text{GDPgap}).$$  \hspace{1cm} (3)

In the above equation, $D_{\text{target},1}$ is the change in the targeted level of the federal funds rate that occurred during the previous meeting of the FOMC.

Technical Factors Affecting the Chosen Target Rate

Previous authors have made strong arguments that the technical details of setting the target rate influence greatly how the FOMC makes changes to the target. So, several variables were selected to account for such actions. Lastmet, the number of days since the last meeting of the FOMC for the purpose of setting the target rate, is probably an important variable. The shorter the time period, in all likelihood, the greater the imperative the FOMC feels for making a change. If they were unconcerned, it is highly unlikely that they would conduct a special meeting. However, while the shorter time period might be important, it does not lend itself to establishing an *a priori* direction of causality. A short time period might just as well lead to an increase in the target rate as a decrease. Therefore, this variable is included primarily for control purposes. Similar arguments can also be made for Last $\Delta$, the number of days since the target was last changed, and Notscheduled, a binary variable denoting that the current FOMC meeting was not one of the regularly scheduled meetings. Both of these variables are probably indicators of intent to make a change, but they don’t lend themselves to predicting the direction of the change.
On the other hand, $D_{\text{target,}_1}$ is quite different. Both Rudebusch and Hamilton argue the Fed’s behavior exhibits policy persistence and rigidity. This implies that an increase in the federal funds target rate is more likely to follow a previous increase and a decrease in the federal funds target is more likely to follow a previous decrease. If this hypothesis is correct, and many other authors have argued that it is, $D_{\text{target}}$ and $D_{\text{target,}_1}$ should be directly related.

*The gap between the actual and targeted level of the federal funds rate*

One measure that should be a strong indicator of the Fed’s willingness to change its targeted level of the federal funds rate is how far the current federal funds rate diverges from the targeted rate adopted during the previous FOMC meeting. The independent variable Targetgap equals the actual federal funds rate on the day prior to the current FOMC meeting minus the targeted level of the federal funds rate set at the previous meeting.

As Targetgap increases, this is evidence of increasing inflationary pressure and a need for the Fed to further tighten the money supply. Likewise, a falling or negative gap signals the need for easier monetary policy making the Fed more likely to reduce target. Consequently, there should be a positive relationship between Targetgap and $D_{\text{target}}$.

*The effect of changes in unemployment*

$\Delta$Unemployment measures the change in the unemployment rate between the current and previous FOMC meeting. Changes in the Fed’s target for the federal funds rate and changes in the unemployment rate should be inversely related. A significant increase in the unemployment rate suggests the Fed will stimulate the economy with open market purchases that increase reserves and reduce the federal funds rate. Conversely, as the unemployment rate falls, it is

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10 Unless otherwise noted, the economic variables there were used as explanatory variables were obtained from FRED at the Federal Reserve Bank of St. Louis webpage at http://research.stlouisfed.org/fred2/.
likely that the resulting tighter labor market would lead to higher wages and greater inflationary pressure. The Fed would probably want to counter this potential increase in inflation by conducting open market sales that would reduce the amount of reserves and increase the federal funds rate.

The effect of changes in inflation

The specified model includes several variables measuring the change in inflation. The reason for this is that the “correct” inflation measure is probably difficult to capture. For example, the Greenspan Fed has famously argued that the most important measure of inflation is one referred to as the “core” inflation rate—one excluding energy and food costs. While this has generated a great deal of discussion, the essential question about inflation and the FOMC’s response is one of prediction. In all likelihood, the FOMC forms an expectation about future inflation rates and acts on those expectations. It seems reasonable to assume that the FOMC is influenced by several variables in the process of forming these expectations. One likely variable, ∆Rate10—the change in the ten-year Treasury rate from the last meeting, is specifically included because it provides information on the market’s prediction of future inflation rates. An increase in ∆Rate10 is a signal from the bond market that long-run inflationary pressure is increasing. To offset this pressure, the Fed would be expected to raise its target for the federal funds rate—assuming the Fed pays attention to the market.

Two additional signals of possible inflationary pressure are ∆Dow, the change in Dow Jones Industrials since the last FOMC meeting, and ∆Confidence, the change in consumer confidence since the last FOMC meeting. The first provides information on what is happening in the stock market and the second provides information on household attitudes. Increases in either variable signal potential future expansion of private expenditures. All else constant, the Fed
would be expected to respond to such changes with an attempt to dampen the expected pressure. Consequently, a positive relationship would be expected for both of these variables.

Another perhaps controversial measure of potential inflation is \( \Delta \text{OilP} \), the percentage change in real oil prices between the current and previous FOMC meetings. The controversy stems from the Fed’s insistence that core inflation is their primary area of concern. However, many economists have argued that changes in oil prices act as external shocks that can push the economy in an unwanted direction. If the Fed pays attention to such arguments, an attempt to offset the expected economic shift would be expected. If this is truly how the Fed views changes in oil prices, a positive relationship would be expected between this variable and \( \Delta \text{target} \). However, in the current sample, higher oil prices may be less likely to derail an economic recovery and more likely to result in inflationary pressures, implying Fed action to tighten monetary policy in order to counter the resulting inflationary pressure.

The last measure of potential inflation included in equation (3) is \( \text{GDPgap} \) that measures the difference between actual real GDP and potential real GDP. Both of these data series were acquired from the Federal Reserve’s database and the variable was calculated as potential real GDP – actual real GDP. The effect of this variable is straightforward. A larger number would indicate a slowing economy that should lead the FOMC to adopt an expansionary stance. Conversely, a declining GDPgap would indicate rising inflationary pressures leading the FOMC to adopt a more restrictive monetary policy. So, one would expect GDPgap and \( \Delta \text{target} \) to be inversely related. Table 2 lists the variables described above and summarizes the discussion regarding the expected \textit{a priori} signs of the regression coefficients.
Estimation Results

Table 3 lists the size of the various changes in the FOMC’s target for the federal funds rate. It also indicates the number of times that the particular rate change occurred during the time period of the current study. The changes ranged from a negative 0.5% to a positive 0.75%. The most frequent occurrence by far was no change in the target (113 occurrences in 262 meetings). After that, the two most frequent changes were a negative 0.25% (36 occurrences) and a positive 0.25% (33 occurrences). This quick overview of the data indicates a limited range within which the FOMC chooses to work. As mentioned before, the nature of this data has led previous authors to reject ordinary least squares in favor of estimation routines more appropriate to the limited nature of the data. However, the existence of a relatively large number of different size changes (a total of 16), and the relatively large number of occurrences that were not changes of 0, -0.25% or +0.25% (80 or 31% of the total) could raise some doubt as to the use of an ordered estimation routine such as an ordered probit. Consequently, one of the purposes of this research was to see if selection of methodology had a greater impact on the outcome than the data itself.

Table 4 provides the estimation results produced by application of four different estimation techniques to the data. The first technique (Model 1) is ordinary least squares which provides a point of comparison for the other techniques. The second technique assumes that the dependent variable is truncated at both the upper and the lower ends of its distribution (Model 2). There seems little question that the data is limited. It clearly exists only between –0.5 and +0.75. However, there exists many numbers between these two extremes and the truncation model allows for the existence of continuity between the extremes. Model 3 used an ordered probit technique that differs slightly from that used by other authors. In this case, the maximum
number of possible orders, 16, was used. Using all 16 categories required 42 iterations before convergence was achieved and the regression results were obtained. Previous authors have tended to collapse the various categories into far fewer groups thereby providing a simpler estimation problem for the computer. Consequently, an ordered probit with the exact ordering sequence used by Hamilton and Jorda was estimated in Model 4. This required collapsing the sixteen different categories into five: two positive, two negative and zero. This reduced number of classifications greatly sped up convergence of the routine as only 22 iterations were required before convergence was achieved.

A brief look at Table 4 reveals a stunning degree of uniformity among the estimates produced by the four techniques. For each of the explanatory variables, the signs of the coefficients are the same for all four estimation techniques. In each of the four models, $D_{\text{target}1}$, Targetgap, $\Delta$Unemployment, and $\Delta$Rate10 all had coefficient estimates of the expected sign and the same level of significance. The few differences are very small. In Model 2, the coefficient for $\Delta$OilP is marginally significant but it is very close to significant in the other three models. In Models 3 and 4, GDPgap is marginally significant, but it is very close to significant in Models 1 and 2. Finally, Last$\Delta$ is marginally significant in Model 4, but it is very close to significance in the other three models.

One of the most interesting outcomes is that of the four variables with uniform significance, only half of them ($D_{\text{target}1}$ and Targetgap) are of the technical variety. The other two--$\Delta$Unemployment and $\Delta$Rate10—are clear indicators of macroeconomic performance. Many previous studies of this relationship had concluded that the best predictors of a change in the federal funds target rate were merely technical and not solidly related to macroeconomic indicators. However, the results produced by the techniques used in this paper show the
importance of the traditional variables often talked about in the literature—the unemployment rate and expected inflation rates.

Other theoretically plausible independent variables were included in the regressions; however, these variables never had a statistically significant impact. When inflation was calculated using the CPI for all items and urban consumers, the change in the inflation rate was always statistically insignificant. This is probably because the primary concern is not about past inflation rates but those expected to occur in the future. Between two FOMC meetings, the daily federal funds rate was regressed on time in a univariate regression model that estimated an intercept and slope coefficients. When either the estimate of the slope coefficient or its t-statistic was included in the models estimated in Table 4, the resulting slope coefficient wasn’t statistically different from zero.

**Concluding Thoughts**

The Fed changes its targeted level of the federal funds rate in response to changes in economic data. During periods of heightened inflationary pressures, the Fed raises its target for the federal funds rate, signaling tighter monetary policy. Rising unemployment rates and falling long-term interest rates imply the Fed will respond with an easier monetary policy, signaled by a decrease in its federal funds target. Using statistical evidence from several estimation techniques, this paper shows that the targeted level of the federal funds rate is inversely related to changes in the unemployment rate. There is also statistical evidence that the Fed will increase its target for the federal funds rate in the face of rising expected inflation. This is indicated by the statistically significant, direct relationship between changes in the targeted level and changes in long-term interest rates.
Technical issues are also important. If the current federal funds rate significantly drifts away from its previously targeted level, the Fed will adjust its target accordingly. Finally, evidence is found for a degree of persistence and even, perhaps, rigidity in monetary policy as indicated by the direct and significant relationship between the current and previous changes in the target.

While this paper provides some evidence on the Fed’s setting of target rates, further work may produce additional returns. The issue of specification is always a problem. One way of dealing with this would be to use sensitivity analysis as suggested by Leamer (1978). Another interesting question would be whether increases and decreases in the targeted level of the federal funds rate are symmetric. In other words, will an increase in the unemployment rate from 5 to 6 percent cause the same change in the federal funds target in absolute value as a fall in the unemployment rate from 5 to 4 percent? Perhaps the most important conclusion from this effort is the evidence that the Fed does follow rules, and it changes the targeted level of the federal funds rate in a predictable way.

References


TABLE 1
The Variables and Their Definitions

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dtarget</td>
<td>Change in target, if any, from previous level</td>
</tr>
<tr>
<td>Lastmet</td>
<td>Number of days since previous meeting to set targets</td>
</tr>
<tr>
<td>LastΔ</td>
<td>Days since the last time the target was changed</td>
</tr>
<tr>
<td>Notscheduled</td>
<td>Binary Variable: 1= unscheduled meeting, 0= otherwise</td>
</tr>
<tr>
<td>∆Unemployment</td>
<td>Change in unemployment since previous target decision</td>
</tr>
<tr>
<td>∆Rate10</td>
<td>Change in 10 year Treasury rate since previous target decision</td>
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<tr>
<td>∆Dow</td>
<td>Percentage change in the DOW</td>
</tr>
<tr>
<td>∆Confidence</td>
<td>Percentage change in consumer confidence since last target decision</td>
</tr>
<tr>
<td>Targetgap</td>
<td>Actual federal funds rate – targeted rate on day prior to FOMC meeting</td>
</tr>
<tr>
<td>∆OilP</td>
<td>Percentage change in real oil price</td>
</tr>
<tr>
<td>GDPgap</td>
<td>Difference between real potential GDP and real GDP (chain-weighted)</td>
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</table>

TABLE 2
A Priori Signs of Estimated Regression Coefficients

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Expected Sign</th>
<th>Explanatory Variable</th>
<th>Expected Sign</th>
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<tr>
<td>Lastmet</td>
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<td>Dtarget₁</td>
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<tr>
<td>Targetgap</td>
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<td>GDPgap</td>
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<tr>
<td>∆Unemployment</td>
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TABLE 3
Sizes of Changes in the Federal Funds Rate Target and Number of Occurrences

<table>
<thead>
<tr>
<th>Size of change</th>
<th>Number of Occurrences</th>
<th>Size of change</th>
<th>Number of Occurrences</th>
</tr>
</thead>
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<td>4</td>
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<td>113</td>
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<td>Explanatory Variables</td>
<td>Model 1 (OLS)</td>
<td>Model 2 (Upper and Lower Truncated)</td>
<td>Model 3 (Ordered Probit)</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
<td>-------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.0190</td>
<td>-0.0281 (-0.886)</td>
<td>2.2925* (11.233)</td>
</tr>
<tr>
<td>Lastmet</td>
<td>0.0011</td>
<td>0.0012 (1.396)</td>
<td>0.0060 (1.090)</td>
</tr>
<tr>
<td>Last∆</td>
<td>-0.0002</td>
<td>-0.0002 (-1.376)</td>
<td>-0.0011 (-1.523)</td>
</tr>
<tr>
<td>Notscheduled</td>
<td>-0.0421</td>
<td>-0.0437 (-1.376)</td>
<td>-0.2308 (-1.666)</td>
</tr>
<tr>
<td>Dtarget.1</td>
<td>0.2814* (5.482)</td>
<td>0.2881* (5.358)</td>
<td>2.1054* (6.048)</td>
</tr>
<tr>
<td>Targetgap</td>
<td>0.2462* (7.626)</td>
<td>0.2895* (7.646)</td>
<td>1.6998* (7.783)</td>
</tr>
<tr>
<td>∆Unemployment</td>
<td>-0.1561** (-2.226)</td>
<td>-0.1746** (-2.272)</td>
<td>-1.0014*** (-1.999)</td>
</tr>
<tr>
<td>∆Rate10</td>
<td>0.0948* (3.022)</td>
<td>0.0960* (2.964)</td>
<td>0.7016* (3.341)</td>
</tr>
<tr>
<td>∆Dow</td>
<td>-0.0028</td>
<td>-0.0029 (-1.099)</td>
<td>-0.0150 (-0.899)</td>
</tr>
<tr>
<td>∆Confidence</td>
<td>0.0030</td>
<td>0.0034 (1.365)</td>
<td>0.0180 (1.081)</td>
</tr>
<tr>
<td>∆OilP</td>
<td>0.0021</td>
<td>0.0023*** (1.589)</td>
<td>0.0139 (1.579)</td>
</tr>
<tr>
<td>GDPgap</td>
<td>-0.0001</td>
<td>-0.0001 (-1.547)</td>
<td>-0.0010*** (-1.795)</td>
</tr>
</tbody>
</table>

R² 0.481  
F 20.97‡  
Chi² 171.12‡ 175.7851‡ 175.765‡ 162.7655‡  
Log Likelihood 113.6122 119.8612 418.9621 255.5832

Italics are in parentheses. *, **, and *** indicate the null hypothesis that the coefficient is not equal to zero is rejected at the 1, 5, or 10 percent level, respectively. ‡ indicates the null hypothesis that all the slope coefficients are simultaneously equal to zero is rejected at the 1 percent level.