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DERIVATION AND IMPLICATIONS

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Working Paper **9866**

NBER WORKING PAPER SERIES

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Working Paper 9866
<http://www.nber.org/papers/w9866>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 2003

We are grateful to Normand Bernard for providing data and Federal Reserve records, to Jeffrey Fuhrer, Charles Jones, and Janet Yellen for helpful comments and suggestions, and to the National Science Foundation for financial support. The views expressed herein are those of the authors and not necessarily those of the National Bureau of Economic Research.

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NBER Working Paper No. 9866
July 2003
JEL No. E52, E58, E32, E31

ABSTRACT

Conventional measures of monetary policy, such as the federal funds rate, are surely influenced by forces other than monetary policy. More importantly, central banks adjust policy in response to a wide range of information about future economic developments. As a result, estimates of the effects of monetary policy derived using conventional measures will tend to be biased. To address this problem, we develop a new measure of monetary policy shocks in the United States for the period 1969 to 1996 that is relatively free of endogenous and anticipatory movements.

The derivation of the new measure has two key elements. First, to address the problem of forward-looking behavior, we control for the Federal Reserve's forecasts of output and inflation prepared for scheduled FOMC meetings. We remove from our measure policy actions that are a systematic response to the Federal Reserve's anticipations of future developments. Second, to address the problem of endogeneity and to ensure that the forecasts capture the main information the Federal Reserve had at the times decisions were made, we consider only changes in the Federal Reserve's intentions for the federal funds rate around scheduled FOMC meetings. This series on intended changes is derived using information on the expected funds rate from the records of the Open Market Manager and information on intentions from the narrative records of FOMC meetings. The series covers the entire period for which forecasts are available, including times when the Federal Reserve was not exclusively targeting the funds rate.

Estimates of the effects of monetary policy obtained using the new measure indicate that policy has large, relatively rapid, and statistically significant effects on both output and inflation. We find that the effects using the new measure are substantially stronger and quicker than those using prior measures. This suggests that previous measures of policy shocks are significantly contaminated by forward-looking Federal Reserve behavior and endogeneity.

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I. INTRODUCTION

The accuracy of estimates of the effects of monetary policy depends crucially on the validity of the measure of monetary policy that is used. Use of an inappropriate measure may obscure a relationship between monetary policy and other economic variables that actually exists, or create the appearance of a relationship where there is no true causal link. For this reason, this paper derives a new measure of monetary policy shocks that is free from some key deficiencies of previous measures. The new measure yields estimates of the impact of monetary policy on both real and nominal variables that are stronger and faster than those obtained using conventional indicators.

A. Problems with Conventional Measures

The change in the federal funds rate has become the standard indicator of monetary actions in studies of the effects of monetary policy. This is especially true of the vector autoregression literature, where this particular short-term interest rate has replaced monetary aggregates, measures of reserves, and other interest rates as the key policy variable.

While the funds rate has many virtues as an indicator of policy, it also has some obvious flaws. First, it is exceedingly noisy. The series moves a great deal from day to day for reasons unrelated to monetary policy. Second, and more importantly, in eras when the Federal Reserve was targeting the funds rate less closely than it has in the Greenspan era, the funds rate often moved endogenously because of changes in economic conditions. Because such endogenous movements create a positive relationship between the funds rate and economic activity, they may lead researchers to underestimate the negative relationship between monetary policy actions and real economic variables.

An alternative indicator that eliminates some of these defects is the change in the Federal Reserve's target for the federal funds rate. The target funds rate abstracts from short-run noise and short-run endogeneity. However, even the change in the target funds rate is an imperfect input to studies of the effects of monetary policy. One obvious problem is that existing studies have only derived a target series for the

years 1974-1979 and 1984-present. As a result, empirical studies using the target miss some key episodes of postwar monetary action, such as the Nixon-Burns expansion of the early 1970s and the Volcker disinflation of the early 1980s.

A more fundamental problem is that the Federal Reserve often moves the target funds rate in anticipation of future economic developments. For example, the Federal Reserve is likely to cut rates if it is forecasting a recession. In such a situation, output is unlikely to rise in the wake of the interest rate cut, even if the monetary policy action is having a substantial stimulative effect. If such anticipatory countercyclical actions are common, a regression may fail to find a positive relationship between reductions in the target and output growth even if it is actually present.

B. A New Measure of Monetary Shocks

In this paper we derive a new indicator of monetary policy shocks that avoids the problems inherent in both the change in the actual funds rate and the change in the funds rate target. We begin by deriving a series on intended funds rate changes around meetings of the Federal Open Market Committee (FOMC) for the entire period 1969-1996. To do this we combine information on the Federal Reserve's expected funds rate derived from the Weekly Report of the Manager of Open Market Operations with detailed readings of the Federal Reserve's narrative accounts of each FOMC meeting. We find that even for periods when the FOMC did not set an explicit funds rate target, the discussion of policy intentions gives a good indication of the desired changes in the funds rate. The resulting series on intended funds rate movements around FOMC meetings eliminates much of the endogenous relationship between interest rates and economic conditions and covers the crucial episodes missed by existing series for the funds rate target.

While the new intended funds rate series is an improvement over existing target measures, it is possible to go further. In particular, we use the Federal Reserve's internal forecasts of inflation and real activity to purge this measure of monetary policy actions taken in anticipation of developments in the economy. The "Greenbook" forecasts prepared by the Federal Reserve staff before each meeting of the FOMC contain information about what the staff anticipates will happen to output, prices, and

unemployment. We regress the change in the intended funds rate around forecast dates on these forecasts. The residuals from this regression show changes in the intended funds rate not taken in response to anticipated developments. The resulting series for monetary shocks, when used in a study of the effects of policy, should neither obscure a relationship with output and prices that is there, nor create one that is not.

C. Implications of the New Measure

Once we derive our new measure of monetary shocks, we use the series to analyze the responses of output and inflation to monetary developments. We estimate straightforward regressions of the growth rate of industrial production and the producer price index for finished goods on the new measure of monetary shocks. We also estimate similar regressions using the change in the actual funds rate and our series on the change in the intended funds rate around FOMC meetings as the indicator of monetary policy. Such comparisons can show whether using the new measure yields results that differ in important ways from those based on more conventional measures.

The cumulative response of industrial production to our measure of monetary shocks indicates a strong relationship. Industrial production begins to fall five months after a contractionary shock and reaches its minimum after 22 months. The effects of monetary shocks on real output are both large and statistically significant. A 100-basis-point shock to the funds rate is associated with a reduction in industrial production of 4.8% after 22 months.

The response of output to either the change in the actual funds rate or the change in the intended funds rate around FOMC meetings indicates a substantially weaker correlation between monetary developments and real activity. The estimated impact of either of these measures is smaller, slower, and less significant than the impact of our new indicator. This suggests that the endogenous behavior of the funds rate and the anticipatory component of Federal Reserve actions may be substantial, and may obscure some of the true relationship between monetary policy and the real economy.

Our estimates derived using the new measure of monetary shocks also show a strong, if somewhat delayed, negative response of inflation to monetary contraction. We find that in response to a 100-basis-

point shock, the price level is virtually unchanged for the first 18 months and then falls steadily relative to what it otherwise would have been. After 48 months the price level is 6% lower. The effect is highly statistically significant.

The same regressions run using the change in the actual funds rate or our series on the change in the intended funds rate around FOMC meetings as the indicator of monetary policy yield very different results. In our baseline specification, using either alternative indicator, the cumulative impact of a rise in the funds rate is positive for all 48 months that we consider. That is, there is a strong “price puzzle,” similar to the positive correlation between monetary tightening and increases in the price level found in the VAR literature (see, for example, Sims, 1992). Thus, again, it appears that endogenous movements in interest rates and anticipatory policy moves are obscuring the true effects of monetary policy.

Previous work has found that controlling for commodity prices eliminates the price puzzle when broad measures of policy are used (see, for example, Sims, 1992; Christiano, Eichenbaum, and Evans, 1996; and Bernanke and Mihov, 1998). Nonetheless, commodity prices may fail to capture important parts of the Federal Reserve’s information about future developments. To investigate this issue, we examine the effects of controlling for commodity prices both in regressions estimated using our new measure of monetary shocks and in ones estimated using the alternatives. Controlling for commodity prices has no consistent effect on the impact of policy estimated using our new measure, suggesting that our measure does capture anticipatory policy actions motivated by supply shocks. With the alternative measures, controlling for commodity prices largely eliminates the price puzzle. However, the effects of monetary policy actions are still much smaller and slower than when our new measure is used. This suggests that using conventional policy measures but controlling for commodity prices is not enough to deal with forward-looking Federal Reserve behavior.

Most of the recent literature on the effects of monetary policy has used vector autoregressions. To facilitate comparisons with this literature, we run VARs using both our new measure of monetary shocks and broader measures of monetary policy. We find that the VAR results using our new measure show a substantially stronger effect of monetary policy on output and a stronger and more rapid effect on prices

than found in the literature or in our VARs using broader indicators. This again suggests that endogenous and anticipatory movements in previous monetary indicators may have led to underestimates of the effects of monetary policy.

Several recent investigations of the effects of monetary policy also control for central bank forecasts. Barth and Ramey (2001) and Boivin (2001) add information from the Federal Reserve's forecasts to largely conventional models of monetary policy and its effects. Jansson and Vredin (2001) consider Swedish monetary policy over the period 1992-1998. They include forecast information in their monetary policy reaction function to attempt to isolate policy shocks, and compare the central bank's forecasts with alternatives to attempt to determine the impact of judgmental forecasting on policy.

Our paper differs from these studies in two critical respects. First, we derive a genuine measure of policy intentions, rather than use the actual interest rate. Furthermore, our measure of policy intentions is derived so that the policy actions occur at the same time as the forecasts. This ensures that the forecasts capture policymakers' anticipations at the time the policy decisions are made. Second, our focus is explicitly on the usefulness of the new measure of monetary shocks that we derive. By comparing the results using the new measure with those using conventional measures, we can see if using a consistent measure of policy intentions and controlling for anticipatory actions affects the estimates of the impact of monetary policy.

II. DERIVATION OF A NEW MEASURE OF MONETARY POLICY SHOCKS

The derivation of our new measure of monetary policy shocks has two key steps. The first is to derive a series for Federal Reserve intentions for the federal funds rate around FOMC meetings. The second is to control for Federal Reserve forecasts, and so create a measure of intended monetary policy actions not driven by expectations of future economic developments. This section discusses both steps in detail. It also discusses the main features of the new series and compares it with other indicators.

A. Changes in the Intended Funds Rate Around FOMC Meetings

1. Motivation

The Greenbook forecasts are only done before FOMC meetings. Therefore, the only policy actions for which we can use the forecasts as a proxy for policymakers' information are those around FOMC meetings. For this reason, we derive a series for Federal Reserve intentions around FOMC meetings. The focus on FOMC meetings is likely to be quite important. Policy actions taken between meetings are often substantial and are virtually always based on the arrival of new information. As a result, the Greenbook forecast for the previous meeting would likely be a poor indicator of the information that led to the intermeeting action.

The particular variable for which we analyze the Federal Reserve's intentions around FOMC meetings is the nominal federal funds rate. We focus on the intentions for the funds rate, instead of intentions for reserves or other variables, for several reasons. Most obviously, for much of the period for which we have detailed forecast data (1969-1996), the Federal Reserve explicitly targeted the funds rate. This was the case between 1974 and September 1979 and for the entire period since the mid-1980s. Therefore, the change in the intended funds rate is the single indicator that best captures what the Federal Reserve was aiming to do over this period.

Even in periods when the Federal Reserve was not explicitly targeting the federal funds rate, it was concerned about this key interest rate and typically made predictions about its behavior. Therefore, as a practical matter, the change in the intended funds rate is the easiest indicator of Federal Reserve intentions to deduce accurately over a long period of time.

The final reason for focusing on the change in the intended funds rate around forecasts as the indicator of Federal Reserve intentions is that an interest rate measure is more likely to be consistent over time than other candidates. The same Federal Reserve objectives for quantity variables such as reserves or monetary aggregates may reflect very different intentions even in nearby periods because of regulatory or definitional changes. This is much less likely to be true of the federal funds rate.

2. Sources

To identify changes in the intended funds rate decided upon around FOMC meetings, we use two types of sources. One is the narrative record of Federal Open Market Committee meetings. We use both the published summaries of FOMC discussions contained in the Record of Policy Actions of the Federal Open Market Committee and the more complete accounts contained in the Minutes of the Federal Open Market Committee and, later, the Transcripts of Federal Open Market Committee.¹ The Minutes cover the period through March 1976, and the Transcripts cover the period beginning in February 1981; no detailed accounts are currently available for the intervening period. A final narrative source that we employ is the FOMC document Monetary Policy Alternatives, or the "Bluebook," that is prepared for each FOMC meeting. The Bluebook typically includes a summary of the implementation of policy since the previous meeting and a presentation of some possible decisions for the FOMC.

For times when the FOMC was using the funds rate as its main policy instrument, the narrative sources typically contain detailed information on what the FOMC decided to do to the target. For periods when the FOMC was emphasizing another variable more, these sources still almost always include discussions of the likely implications of the FOMC's actions for the funds rate. Hence we can use the narrative record to deduce changes in the intended funds rate in a variety of monetary regimes.

Our other type of sources is more quantitative. Specifically, we employ a pair of internal memos from the Federal Reserve showing the "expected federal funds rate." One covers the period from January 1971 to December 1984 and the other covers the period from December 1983 to September 1992.² These memos are based on the Weekly Report of the Manager of Open Market Operations. In addition to numerical values, the memos contain brief narrative remarks about the timing of moves and where, within a given range, the open market desk was aiming. These remarks make it clear that the series reflects Federal Reserve intentions rather than passive expectations or forecasts. And indeed, the reported expected federal funds rates are very similar to the target values given in Rudebusch (1995) for the periods where the series overlap (1974-1979 and 1984-1992). The obvious benefit of the internal memos for our purposes is that they also include expected funds rate changes in the early 1970s and the Volcker period.

While the expected funds rate series is a useful input to our identification of Federal Reserve intentions, it is important to note that we do not use it in a mechanical fashion. For example, we do not take the change in the expected rate between the day before the forecast and some arbitrary number of days after the corresponding FOMC meeting. The reason for this is that we only want changes in the expected funds rate for which the forecasts are a reasonable summary of the available information. Some funds rate changes even very soon after FOMC meetings are based on new information. Similarly, some changes in the expected federal funds rate two or more weeks after an FOMC meeting are explicitly decided upon at the meeting. For this reason, it is crucial to combine the narrative and quantitative evidence.³

3. Method

Our analysis requires both the level of the federal funds rate that the FOMC intended to prevail at the time of the forecast and the level it intended on the basis of its decision at its meeting. For each meeting, we therefore begin by reading the Record of Policy Actions for information on the current or prevailing level of the intended funds rate. The Record of Policy Actions almost always reports the actual level of the funds rate before the meeting and indicates if it was temporarily deviating from what the Federal Reserve was intending. Thus, it is usually straightforward to deduce the level the FOMC was intending before the meeting. The Record of Policy Actions also typically reports any actions taken in the days just before the meeting that may have affected the funds rate, so it is possible to back out the intended funds rate at the time of the forecast.

We then check our deduced level of the intended funds rate at the time of the forecast against the expected funds rate from the internal memos. If there is a discrepancy or ambiguity, we examine the more detailed accounts of the meetings in the Minutes of the Federal Open Market Committee or Transcripts and the descriptions of how policy was implemented in the Bluebooks. If there are discrepancies on these relatively factual issues, we typically resolve them in favor of the expected rate, unless the narrative sources are very explicit. This is especially true of changes between the forecast and the meeting, for which the narrative accounts are often not particularly quantitative.

We then read the Record of Policy Actions to see what the FOMC decided to do at the meeting.

That is, we determine as well as possible from the narrative description what the FOMC intended to happen to the funds rate as a result of the actions agreed upon at the meeting. This post-meeting level for the intended funds rate will incorporate any changes in the series taken between the forecast and the meeting that are confirmed by the FOMC. In deducing the new intended level we make no adjustment for timing: changes that are scheduled to be implemented gradually are treated as an immediate change in intentions.

The Record of Policy Actions is often very clear about the change in the intended funds rate. This is especially true for the mid-1970s when a very narrow range for the new intended funds rate is usually given, and since 1987 when the Federal Reserve has targeted the funds rate very closely. For other episodes the FOMC's intentions for the funds rate are more opaque. While this is especially true in the early Volcker era of non-borrowed reserve targeting, it also occurs periodically in eras of quite obvious funds rate targeting. A decision for no change is usually very explicit and the direction of change, if there is one, is usually obvious. But the magnitude of the change is often much less explicit.

For all meetings, we also consider the evidence from the expected funds rate series. Whenever the Record of Policy Actions and the expected rate do not yield a clear and consistent view of what the FOMC intended, we examine the more detailed narrative sources. In these cases, the Minutes and Transcripts usually provide more explicit information than the Record of Policy Actions about the FOMC's intentions. The narrative sources from the subsequent meeting are also often very useful: the Record of Policy Actions, Minutes, and Bluebooks almost always contain descriptions of what was decided at the previous meeting. We assume that when the FOMC says it decided to tighten a certain amount at the last meeting it is not rewriting history.

In the vast majority of cases, either the different sources provide a clear picture of what monetary policymakers intended for the federal funds rate prior to the meeting and how they anticipated their decision at the meeting would affect the funds rate, or they leave room for only very minor disagreement. In a few cases, however, there is more ambiguity. Sometimes, the narrative sources provide evidence about the direction but not the magnitude of the intended move in the funds rate. In these cases, we rely mainly on the quantitative evidence from the expected funds rate series to deduce the magnitude of the intended action.

Another type of ambiguity concerns asymmetry in the FOMC's decisions. Periodically, when the FOMC decides not to change rates immediately, it makes it clear that any future rate changes will most likely be in a particular direction. When such asymmetry is strong and explicit, we feel it is reasonable to say that the intended funds rate has in fact moved. The likely rate change times the probability of a change is surely not zero. As a starting point, we scale strong asymmetry as one-half of the usual rate change in a given era. For example, for the mid-1970s, when quarter-point moves in the intended funds rate were typical, strong asymmetry is recorded as a change of 1/8 of a point in the intended direction. In the early Burns era, when larger movements were common, strong asymmetry may get a value of 1/4 point or more. We then adjust this preliminary estimate of the expected change in the intended funds rate due to asymmetry using the narrative accounts of the meeting. For example, in some cases the narrative accounts make it clear that the asymmetry was being included in the Record of Policy Actions mainly for signaling purposes and that it was unlikely to be acted on. In other cases, the narrative accounts include fairly clear discussions of the magnitude or likelihood of a move in the funds rate.

A final case where the evidence is less than fully clear involves the beginning of the period of non-borrowed reserve targeting under Federal Reserve Chairman Paul Volcker. The FOMC was sufficiently focused on non-borrowed reserve targeting that for many meetings the Record of Policy Actions provides only a vague description of the likely implications of the FOMC's decisions for the funds rate. Furthermore, the Federal Reserve's series on the expected funds rate is so volatile from week to week that it is difficult to discern the FOMC's intentions from this source. Finally, neither the Minutes nor the Transcripts are currently available for late 1979 and 1980. Because of this ambiguity, in our empirical work we check that our results are robust to omitting the early Volcker period.

The appendix contains a meeting-by-meeting description of our application of these general procedures for deducing Federal Reserve intentions. Table A-1 of the appendix shows the resulting series on the change in the intended federal funds rate decided at or just before FOMC meetings.

A comparison of the new intended series around FOMC meetings and the target series given in Rudebusch (1995) shows both some clear differences and some key similarities. The most obvious

difference is that the target series is only available for the mid-1970s and the post-1984 period, when the Federal Reserve was targeting the funds rate closely, whereas we have derived the intended series for the entire period 1969-1996. More fundamentally, the target series includes many actions taken between meetings in response to new information, whereas our intended series only shows actions taken at FOMC meetings for which Greenbook forecasts are available.

For changes in the funds rate around FOMC meetings, the new intended series and the conventional target series are fundamentally similar. The directions of the moves in the two series are almost always the same, and often the sum of changes in the target in the week to ten days following the FOMC meeting is quite close to our measure of the intended change decided at the meeting. However, the two series are certainly not identical even around FOMC meetings. One reason for the differences is that our series for intended movements series treats strong asymmetry as a policy action, while the target series measures only actual moves. Another source of differences is that some changes that were not implemented for a substantial time after a meeting are included in the intended series because they were decided at the meeting. Finally, the arrival of new information also causes the two series to differ. For example, there are a few changes in the target very soon after FOMC meetings that we find were based on the arrival of new information, and so do not include in the intended series. Likewise, there are some changes that were decided at a meeting but were never implemented because the arrival of new information led to rapid policy reversals.

B. Controlling for the Federal Reserve's Forecasts

We can now use the series on changes in the intended funds rate around FOMC meetings to derive a new measure of monetary policy shocks. As described above, the central idea behind the new measure is to control for the Federal Reserve's forecasts of future changes in prices and output. By eliminating the component of changes in the intended funds rate made in response to forecasts, we can derive a measure of policy shocks that will not be biased toward or against having a relationship with future output and prices.

1. Federal Reserve Forecast Data

The Federal Reserve's internal forecasts are contained in the document Current Economic and Financial Conditions, or the "Greenbook," that is issued roughly six days before each FOMC meeting. The fact that the Greenbook is issued so soon before the corresponding FOMC meeting suggests that it is likely to contain most of the information about future economic developments available to policymakers at the time of the meeting. More fundamentally, the Greenbook forecasts are very good. The Federal Reserve devotes a vast amount of resources to the forecasts. Romer and Romer (2000) show that contemporaneous private-sector forecasts contain no important information not already contained in the Greenbook forecasts. Thus, it is unlikely that members of the FOMC have significant useful additional information.

The Greenbooks contain forecasts for a wide variety of variables. The particular forecasts that we use are those for the growth rate of real GNP/GDP and the GNP/GDP deflator, and for the unemployment rate. These are three key macroeconomic indicators that the FOMC is likely to consider in setting policy. These Greenbook forecasts begin in late 1965, but the forecast horizon is very short (typically just one quarter ahead) until 1969. In addition, the forecasts are only released with a five-year lag. As a result, our analysis is restricted to the period 1969-1996.

Both the intended funds rate series that we derive and the forecast data correspond to FOMC meetings. Therefore, at this stage in the analysis, we use FOMC meetings rather than months as our unit of observation. In the early part of our sample, the FOMC met at least once a month and sometimes twice. Since 1979, the FOMC has typically met eight times a year.

2. Specification

To derive our new measure of monetary shocks, we first estimate the usual relationship between the Federal Reserve's intentions for the funds rate around FOMC meetings and the Greenbook forecasts for inflation, real growth, and unemployment. We estimate the following regression:

$$(1) \quad \Delta ff_m = \alpha + \beta ffb_m + \sum_{i=-1}^2 \gamma_i \tilde{\Delta y}_{mi} + \sum_{i=-1}^2 \lambda_i (\tilde{\Delta y}_{mi} - \tilde{\Delta y}_{m-1,i}) + \sum_{i=-1}^2 \phi_i \tilde{\pi}_{mi} + \sum_{i=-1}^2 \theta_i (\tilde{\pi}_{mi} - \tilde{\pi}_{m-1,i}) + \rho \tilde{u}_{m0} + \varepsilon_t.$$

Δff_m is the change in the intended funds rate around FOMC meeting m . ffb_m is the level of the intended

funds rate before any changes associated with meeting m . It is included to capture any tendency toward mean reversion in FOMC behavior. $\tilde{\pi}$, $\tilde{\Delta y}$, and \tilde{u} refer to Federal Reserve forecasts of inflation, real GNP/GDP growth, and the unemployment rate. Both the forecasts for the contemporaneous meeting and the change in the forecast since the previous meeting are included because it is plausible that both the levels and the changes in the forecasts may be important determinants of Federal Reserve behavior. The i subscripts refer to the horizon of the forecast: -1 is the previous quarter; 0 is the current quarter; and 1 and 2 are one and two quarters ahead, respectively.⁴ The forecast for the previous quarter is often actual data rather than a forecast. We include it because lagged conditions could obviously play a substantial role in FOMC decisions. Using lagged data from the Greenbook is desirable because it reflects what the FOMC believed recent history was at the time of the meeting, rather than what our current revised estimates suggest was the case.

We only include forecasts up to two quarters ahead for two reasons. The more prosaic one is that the Greenbooks for the late 1960s and early 1970s rarely forecast more than two quarters out. As a result, we lose many observations if we try to incorporate longer-term forecasts. The more fundamental reason has to do with policy assumptions. All forecasters, including the Federal Reserve staff, must incorporate assumptions about future policy into their forecasts. The Federal Reserve's Greenbook forecast is almost always predicated on the assumption of no change in monetary policy in the very short run, where the very short run means at least until the FOMC meeting after the one for which the forecast is being made. This characteristic, along with the usual assumption of some lag in the effects of monetary policy, makes it unlikely that forecasts zero, one, and two quarters ahead are contaminated by assumptions or inside information about the course of monetary policy. As a result, these near-term forecasts provide information about what the Federal Reserve expected to happen to the economy in the absence of changes in monetary policy. At the same time, both output growth and inflation are serially correlated enough that forecasts one and two quarters ahead provide a good indication of the likely forecasted path of the economy over longer horizons.

Because the Okun's Law relationship between output growth and unemployment is so strong, we do

not include all horizons of the forecasts of both variables. We focus primarily on forecasts of output growth because it has greater prominence in the Greenbooks, suggesting a more central role in FOMC decision-making. We do, however, include the contemporaneous unemployment forecast so that we control for the current level of the economy as well as forecasted changes.

3. Results

Using the series for changes in the intended funds rate around FOMC meetings that we have derived and the forecast data described above, we estimate equation (1) using data from the beginning of 1969 through the end of 1996. The regression shows how the Federal Reserve has typically responded to forecasts of real growth and inflation over this period. The results are reported in Table 1.

The coefficient estimates show that the FOMC tends to behave countercyclically. The sum of the coefficients on the real growth forecasts is 0.04 with a t-statistic of 2.5, and the sum of the coefficients on the changes in the real growth forecasts since the previous meeting is 0.24 with a t-statistic of 4.0. An increase from one meeting to the next in forecasted real growth at all horizons of 1 percentage point leads to a rise in the intended funds rate of 29 basis points. Although all the estimated coefficients on the growth variables are positive, the strongest estimated effect is for the change in the forecast of real growth for the current quarter. The estimated coefficient on $\Delta\tilde{y}_{m0} - \Delta\tilde{y}_{m-1,0}$ is 0.15, with a t-statistic of 5.1. The significant negative coefficient on the forecast of the unemployment rate for the current quarter also confirms the countercyclical tendency in FOMC behavior.

The regression suggests that the Federal Reserve also tends to resist forecasted inflation. The sum of the coefficients on the inflation forecasts is 0.04 with a t-statistic of 2.3. The sum of the coefficients on the changes in the inflation forecasts is 0.03, but is estimated quite imprecisely ($t = 0.3$). Thus, an increase from one meeting to the next in forecasted inflation at all horizons of 1 percentage point is associated with a rise in the intended funds rate of 7 basis points. All but two of the coefficients on the inflation variables are positive. The largest are for the level of forecasted inflation two quarters ahead and the change in forecasted inflation for the previous quarter.

The R^2 of the regression is 0.28. This suggests that a substantial fraction of Federal Reserve actions

over the last three decades have been taken in response to their forecasts of future growth and inflation. As a result, it is certainly possible that not controlling for these responsive actions could bias estimates of the effects of policy. At the same time, the relatively low R^2 indicates that many Federal Reserve actions were taken for reasons unrelated to anticipations of output growth and inflation.

C. New Measure of Monetary Shocks

1. Construction and Behavior of the New Series

We construct our new measure of monetary shocks by taking the residuals of equation (1). The resulting series shows changes in the intended federal funds rate around FOMC meetings not made in response to forecasts of inflation and real growth.

This new measure of monetary policy shocks may reflect a variety of developments. Changes in policymakers' views about the acceptable levels of inflation and unemployment would certainly show up in this measure. Similarly, changes in policymakers' understanding of how the economy worked, and thus in what they thought monetary policy could accomplish, could lead to residuals in equation (1). Political pressures and changes in operating procedures could also cause movements in the new series. In short, the new measure should capture any changes in Federal Reserve intentions for the funds rate around FOMC meetings that are not systematic responses to the internal forecasts.

Because the base data used in equation (1) correspond to FOMC meetings, the residuals also correspond to FOMC meetings. Therefore, before the shocks series can be used in further analysis, it must be converted to a monthly series. To do this, we assign each shock to the month in which the corresponding FOMC meeting occurred. If there are two meetings in a month, we sum the shocks.⁵ If there are no meetings in a month, we record the shock as zero for that month.⁶ Table 2 reports our monthly shock series. The top panel of Figure 1 presents a graph of the series, where the monthly values have been averaged into quarterly observations to improve legibility.

Several episodes of monetary contraction stand out in the new series. There are obvious upward spikes in the new series in 1969, 1973-1974, 1979-1982, and 1994-1995. The first three of these episodes

correspond to the dates of Federal Reserve decisions to restrict aggregate demand in order to reduce inflation that we identified from the narrative record in two earlier papers (Romer and Romer, 1989, 1994). The 1994-1995 episode corresponds to a period of unusual tightening following the prolonged period of loose policy associated with the 1990-1991 recession and the subsequent credit crunch.

The new series also shows some obvious periods of monetary expansion. One that stands out very clearly occurred in late 1971 and early 1972. This corresponds to the period when the Federal Reserve under chairman Arthur Burns embarked on a deliberate program of aggressive monetary expansion. Whether this expansion was motivated by a misguided model of the economy (Romer and Romer, 2002) or political considerations (Tufte, 1978, and De Long, 1997) remains an open question. Another obvious extreme expansion occurred in April 1980, when the credit crunch was in full swing. A less extreme, but quite persistent, expansion extended from late 1975 through early 1978. This expansion corresponds to the end of the Burns era and the beginning of the widely criticized tenure of G. William Miller as Federal Reserve chairman.

The largest values in the new series, both positive and negative, occur between October 1979 and May 1981. This corresponds to the early period of non-borrowed reserve targeting under Federal Reserve chairman Paul Volcker. Some of the volatility of the shock series during this period could be due to the fact that it is particularly difficult to derive the input series on the intended funds rate around FOMC meetings for these months. However, it is also the case that monetary policy is generally considered to have been quite volatile in this period.

2. Robustness of the New Series

The new series is derived by regressing the intended funds rate on the Federal Reserve's internal forecasts and taking the residuals. There are obviously many possible ways of specifying the key regression. One permutation that we consider is to include a quadratic trend in the regression to take into account possible long-run changes in inflation and the level of the intended funds rate. Another is to include the lagged, contemporaneous, and one- and two-quarter-ahead forecasts and forecast innovations for the change in the index of industrial production. Including industrial production could be useful because it is a

cyclically sensitive series and one that the Federal Reserve is likely to forecast particularly well (since it constructs the index). A third permutation adds the full complement of unemployment forecasts to the basic specification. Finally, a fourth permutation we consider estimates the regression separately for the pre- and post-1983 periods. If Federal Reserve behavior changed substantially during the Volcker era, splitting the sample will allow for tighter estimates of the reaction function in the two periods.⁷

The various permutations certainly have some effect on the individual coefficient estimates. However, the sums of the coefficients on the different forecasts and forecast innovations are qualitatively very similar. More importantly, the shock series derived as the residuals of the alternative regressions are all very similar to the basic series. The correlation between the permutations and the basic series is over 0.97 in each case. Given that the series being compared do not have a noticeable trend, this degree of correlation is indicative of genuinely similar movements. Thus, our new shock series is robust to a wide array of sensible permutations in the specification of the underlying regression.

3. Comparison with Broader Measures of Monetary Policy

The lower panel of Figure 1 shows two broader measures of monetary policy that we consider throughout the paper.⁸ One is the change in the intended funds rate around FOMC meetings that we use in constructing our measure. This measure differs from our shock series in not controlling for the FOMC's forecasts of output and inflation. It differs from conventional target series in covering a longer time span and excluding actions taken between FOMC meetings. The second is the change in the actual federal funds rate, measured using the monthly average.⁹ This measure includes not only the changes in the intended funds rate as a result of FOMC meetings, but changes between meetings coming from both deliberate policy and other sources.

Because the R^2 of the regression used to derive the new measure is not particularly large, there is some similarity between our new shock series and the change in the intended funds rate around FOMC meetings that we use as the dependent variable of the regression. Indeed, the contemporaneous correlation between our new shock series and the change in the intended funds rate is 0.78. However, the series do differ noticeably in some key periods. For example, the Burns expansion of late 1971 and early 1972 is

much more obvious in our new series than in the intended series: between October 1971 and June 1972 the sum of our new monthly series is -1.92 percentage points, while that of the intended series is only -0.56 percentage points. The same is true of the expansion of the early Carter administration: between January 1977 and May 1978, the sum of monthly values of the new series is -1.33 percentage points while that of the intended series is +1.00 percentage points.

The two series differ just as noticeably during some key contractionary episodes. For example, the monetary contraction during the 1973-1975 recession is more noticeable in the new shock series than in the intended series: between November 1973 and August 1974 the new series rises 1.51 percentage points, while the intended series declines 0.06 percentage points. Likewise, the new series suggests that monetary policy was substantially more contractionary before the 1990 recession than the intended series suggests: between December 1988 and August 1990 the sum of monthly values of the new series is 1.20 percentage points while that of the intended series is 0.13 percentage points. In general, the two series are most different when the Federal Reserve acts at a time when economic conditions (and hence forecasts) are extreme.

The new series also differs from the change in the actual funds rate. The correlation between the new series and the change in the actual funds rate is 0.43. Many of the differences are similar to those between the new series and the intended series around FOMC meetings, and reflect the impact of controlling for forecasts. For example, policy in 1971-1972 and 1977-1978 is again more expansionary in the new series than in the actual funds rate series. Similarly, policy in 1974 and 1988-1990 is more contractionary in the new series than in the actual funds rate series. However, the differences between the new series and the actual funds rate are even more widespread than those between the new series and the intended series around FOMC meetings. This is due largely to the fact that intermeeting changes in the funds rate are included in the actual series but not in the new series. Such intermeeting changes were largest and most prevalent in periods when the Federal Reserve was not targeting the funds rate closely, such as the early 1970s and the early 1980s. As a result, the new series differs particularly strongly from the actual series in those eras.

III. IMPLICATIONS

The next step in our analysis is to use the new measure of monetary policy shocks to estimate the effects of policy. We start with the impact on output, and then consider prices.

A. Output

1. Methodology

We want to determine how output behaves in the wake of monetary shocks. In our basic specification, we therefore regress output growth on a constant, its own lagged values, and lagged values of the new policy measure. Thus, our baseline regression takes the form

$$(2) \quad \Delta y_t = a + \sum_{i=1}^I b_i \Delta y_{t-i} + \sum_{j=1}^J c_j S_{t-j} + e_t,$$

where y is a measure of log output and S is our new measure of monetary policy shocks. The lagged values of the shock series are included to capture the direct impact of shocks on output growth, and the lagged values of output growth are included to control for the normal dynamics of output.

We summarize the results by examining the response of the level of log output to a one-time realization of our monetary policy variable (S) of 100 basis points. The estimated response of log output after one month is just c_1 , the coefficient on the first lag of S ; the estimated response of log output after two months is $c_1 + (c_2 + b_1 c_1)$; and so on.

A natural variation on our approach is to control for other variables that may affect output. Since we control for the Federal Reserve's expectations of output growth in constructing the measure of policy changes, there is no reason to expect the measure to be correlated with other variables that influence output. Our basic specification therefore does not include any controls. We show below that controlling for a measure of supply shocks has little impact on the results. Similarly, an obvious alternative to our one-equation approach is to run a vector autoregression with output growth and the policy measure (and perhaps other variables). We show below that using our new policy measure in a VAR yields results similar to those in our basic specification.

Because our measure of monetary policy is monthly, we use industrial production as our output series.¹⁰ To avoid the complications introduced by the government's seasonal adjustment algorithm, we use data that have not been seasonally adjusted and include monthly dummies in the regression. In our baseline regression, we include 24 lags of output growth and 36 lags of the monetary policy measure. Thus the baseline regression is

$$(3) \quad \Delta y_t = a_0 + \sum_{k=1}^{11} a_k D_{kt} + \sum_{i=1}^{24} b_i \Delta y_{t-i} + \sum_{j=1}^{36} c_j S_{t-j} + e_t,$$

where the D_k 's are monthly dummies. Our sample period is 1970:1-1996:12, with the values of S_t before 1969:3 set to zero. The end date is the last month for which our policy measure is available. The start date is chosen so that a reasonable number of lagged values of the policy measure are available at the beginning of the sample.

2. Results

The estimates of equation (3) are given in Table 3. The coefficients on the first two lags of our shock variable are positive, and the first is significantly larger than zero. The coefficients then turn sharply negative: all but two of the estimated coefficients on lags 3 through 22 are negative, although most of them are not individually significant. Starting with lag 23, the coefficients are almost all positive, though again few of them are significant.

Figure 2 shows the implied response of log output to a realization of the policy measure of 100 basis points, together with one-standard-error bands.¹¹ The estimated cumulative impact is slightly positive for the first four months, small and negative in months 5 through 7, and then declines essentially linearly through month 22. The estimated maximum effect is -4.8%. This means that a one-percentage-point rise in the Federal Reserve's intentions for the funds rate, not taken in response to anticipated developments, results in a reduction in industrial production relative to its initial value of nearly 5 percent. The impact then weakens gradually, reaching -1.2% at month 48. The estimated cumulative impact in the middle months is highly significant: the t-statistic for the estimated cumulative effect in each of months 12 through 29 exceeds 2.5. The two-standard-error confidence interval for the impact in month 22 is (-7.6%, -2.0%). The

later effect, on the other hand, is not precisely estimated. The two-standard-error confidence interval in month 48 is (-5.7%, +3.3%). Thus it encompasses both no effect and the estimated maximum impact.¹²

Closer inspection of the data shows that the significant positive coefficient on the first lag of our shock variable is due to the April 1980 observation. Our shock measure for April 1980 is -3.2 percentage points and industrial production fell 2.9% from April to May. Setting the April shock to zero lowers the coefficient on the first lag from 0.0044 to 0.0027, and the t-statistic from 2.4 to 1.3. The extreme loosening in April 1980 came just one month after the imposition of credit controls. However, examination of the Record of Policy Actions for the April 1980 meeting yields no evidence that the FOMC's decision to ease aggressively was based on information about unfavorable economic prospects beyond the information contained in the Greenbook forecast. Indeed, if anything the members' outlook may have been less pessimistic than the forecasts. Thus, the most likely possibility is that the small estimated positive coefficient on the first lags of our shock variable simply reflects sampling error, not mismeasurement in the shock series or a genuine response.¹³

3. Robustness

We investigate the robustness of these results along four dimensions. First, as described in Section II, our estimated policy changes are largest and least certain during the early part of the period of non-borrowed reserve targeting under Paul Volcker. It is therefore natural to ask whether including the values of the policy measure from this period are crucial to our results.

To address this question, we reestimate equation (3) treating the policy measure as missing from October 1979 through May 1981. Omitting these observations weakens the results only slightly. The estimated peak effect is now -3.5% after 28 months rather than -4.8% after 22 months, and the estimated effect after 48 months is +0.5% rather than -1.2%. The omission of the information from the early Volcker era raises the standard errors of the estimated output effects only by about 10 percent.

Second, we investigate the effects of including 48 rather than 36 lags of the policy measure. This change has virtually no impact on the point estimates or standard errors through month 36. Thereafter the inclusion of the additional lags increases the estimate of the extent of mean reversion. With the additional

lags, the estimated impact at month 48 is -0.6% rather than -1.2%.

Third, we investigate the robustness of our findings to alternative specifications of the regression used to derive the new shock series. Using any of the alternative shock series described in Section II.C.2 leads to very similar estimates of the effect of monetary shocks on output. For example, using as the shock series the residuals from the regression of the intended funds rate on Federal Reserve forecasts estimated separately before and after 1983 leads to an estimated peak effect of monetary policy on output of -4.4% (after 22 months) with t-statistic of -2.7.

Fourth, we examine the effects of controlling for a measure of supply shocks. We describe this experiment in Section C below.

4. Broader Measures of Policy

The main motive for developing our measure of policy is that broader measures may include endogenous movements and policy changes that the FOMC makes in response to information it has about likely future economic developments. It is therefore important to compare the results using our measure with those using broader measures. A finding that the estimated effects of policy on output are similar using both our new measure and broader measures would suggest that the broader measures are not severely contaminated, and thus would allow researchers to use those measures with more confidence. A finding that the estimated effects are very different, on the other hand, would suggest that using a narrower measure such as ours is important.

As described above, the two broader measures of policy that we consider are the change in the intended funds rate around FOMC meetings and the actual federal funds rate. We reestimate equation (3) using both of these alternative measures.

Figure 3 displays the cumulative responses of output to a 100-basis-point change in the intended funds rate and in the actual funds rate. With both broader measures, the output effects of policy are slower than with our measure. The estimated cumulative impact of policy on output does not turn consistently negative until month 11 when we use the change in the FOMC's intended funds rate. For comparison, it turns negative in month 5 with our measure. When we use the change in the funds rate, the estimated effect

becomes consistently negative beginning in month 6. Over months 8 through 16, however, the effect is only about a third as large as it is using our measure. This difference between the results based on our new measure and on more conventional ones suggests that using broad measures leads one to overstate the lag with which monetary policy affects the economy.

The effects of monetary policy on industrial production using the broader measures are also substantially smaller than those estimated using the new measure. The estimated maximum effect is -2.9% (with a standard error of 1.3%) in month 32 using the change in the intended funds rate. With the change in the actual funds rate, the effect reaches -3.0% (1.8%) in month 32 and is essentially flat thereafter. With our measure, in contrast, the estimated effect peaks at -4.8% (1.4%) in month 22 and then declines toward zero. The contrast between the results using the broader measures and those using our measure strongly suggests that there is an important forward-looking component of policy, and that not accounting for it biases estimates of the effects of policy substantially.

B. Prices

1. Methodology and Results

We now turn to the impact of monetary policy on inflation and the price level. Because we want a monthly measure and because interest rates enter the CPI for much of our sample period, we use the PPI for finished goods as our basic price measure.¹⁴ Our approach parallels the one we use to examine the impact of policy on output. The one change is that because there appear to be longer lags in the impact of policy on prices, our basic specification includes 48 rather than 36 lags of the policy measure. Thus our baseline regression is

$$(4) \quad \Delta p_t = a_0 + \sum_{k=1}^{11} a_k D_{kt} + \sum_{i=1}^{24} b_i \Delta p_{t-i} + \sum_{j=1}^{48} c_j S_{t-j} + e_t,$$

where p is the log of the PPI for finished goods. The estimates are reported in Table 4.

Figure 4 shows the estimated cumulative impact on the price level of a realization of our policy measure of 100 basis points, together with one-standard-error confidence bands. The estimated impact is

virtually zero for the first 20 months after the shock. The price level rises for the first 8 months, but the maximum impact is just 0.3% and is not close to statistically significant. Twenty months after the contractionary policy shock, prices begin to fall substantially. The estimated impact is -1.9% after 30 months and -5.9% after 48 months. The effect becomes progressively more statistically significant. The t-statistic reaches 2 (in absolute value) in month 29, 4 in month 37, and 5 in month 43. The two-standard-error confidence interval for the effect after 48 months is (-7.9%, -3.8%).

Figure 5 summarizes the same information in terms of inflation instead of the price level. The effects on inflation in individual months are choppy and not estimated very precisely. They fluctuate around zero for the first 19 months and are never significant. Beginning in month 20, however, almost all the estimated effects are negative. They average -2.4%, and about half of them are significant. Thus, our estimates suggest that a contractionary monetary policy shock results in a sharp reduction in inflation after a substantial delay.

2. Robustness

These results do not depend on the large swings in our policy measure in the early Volcker period. Treating the measure as missing from October 1979 through May 1981 does not change the basic pattern of the results. The most noteworthy change is that the estimated time of the sharp fall in inflation is about three months later than when the full sample is used.

Using the shock series derived from the alternative specifications of the regression on Federal Reserve forecasts has little impact on the estimated effect of monetary policy on the price level. For example, a 100-basis-point innovation in the shock series derived using separate regressions on Federal Reserve forecasts before and after 1983 has a cumulative impact on the price level of -6.6% after 48 months. At the same time, using these alternative shock series typically increases the standard errors, though never by enough to render the estimated impact insignificantly different from zero.

The finding that inflation slows only after a substantial delay in all specifications, like the earlier finding of a positive point estimate for the very short-run output effect, has two candidate interpretations. Our policy measure could still have a component that reflects responses to information about the economy,

so that the true effect of policy is faster and larger than our estimates imply. Or there could genuinely be long delays in the impact of monetary policy on inflation, with the point estimates over the first 18 months representing sampling error around a true effect of roughly zero.

Two considerations suggest that the second explanation is probably the more important one. First, the possibility that the FOMC has important information about inflation beyond what is in its forecasts seems most plausible for very short horizons. If the FOMC were setting policy on the basis of additional information about the very near term, one would expect to see a clear positive estimated impact of policy on inflation at short horizons followed by a negative impact. But instead, we find no clear effect on inflation or the price level for a year and a half. Second, as described below, when we add commodity prices -- which is the series most often thought to provide additional information about future inflation -- to the inflation regression, the estimated effects of policy on prices are no faster or stronger than before. Indeed, if anything, the estimated effects are weaker.¹⁵

3. Broader Measures of Policy

We again compare the results using our new policy measure with those obtained using broader measures. Figure 6 shows the estimated cumulated responses of the price level to 100-basis-point changes in the intended funds rate and in the actual funds rate. The results provide strong evidence that important parts of the movements in these broader measures represent either endogenous changes or Federal Reserve responses to information about anticipated economic developments. With both broader measures, the price level rises after a contractionary move. In the case of the intended funds rate, the price level rises irregularly for two years after the change, reaching a peak of +1.4% at month 23, and then falls slightly and inconsistently. The estimated effects are statistically significant in months 5, 7-8, and 15-23. For the actual funds rate, the price level rises by about 1% over the first two years and is then essentially constant. The response is statistically significant in months 1, 4-7, 12, and 14-23.

This finding that prices typically rise rather than fall after Federal Reserve tightenings when broad measures of policy are used is representative of the “price puzzle” found by many previous studies. The fact that there is a strong price puzzle when broad measures are used, but not when our new measure is used,

suggests that broad measures of monetary policy are indeed contaminated by anticipatory movements. As a result, they yield inaccurate estimates of the effects of policy, at least in the simple specifications that we consider. The next two sections address the question of whether the broad measures can nevertheless yield accurate estimates in more complicated specifications.

C. Supply Shocks

1. Motivation

We have attempted to remove anticipatory movements from our measure of monetary policy shocks by controlling for the Federal Reserve's internal forecasts. However, it is obviously possible that some such movements are still present in our measure and could be affecting our estimates of the effects of policy. Remaining anticipatory policy moves could be the result of the Federal Reserve having additional information about either supply shocks or demand shocks that is not included in the forecasts.

The literature on the effects of monetary policy has tended to emphasize the consequences of uncaptured responses to supply shocks. If some of the changes that an econometrician interprets as policy shocks are in fact responses to supply shocks that will lower output in the future, this would lead to an overestimate of the strength of the negative relationship between contractionary policy shocks and real output. Likewise, because a supply shock will raise inflation in the future, uncaptured responses to supply shocks would lead to an underestimate of the negative effect of contractionary policy on prices and, in extreme cases, to a finding of a positive correlation between prices and monetary contraction.

This literature has suggested that an index of world commodity prices is a particularly timely indicator of supply shocks. Adding world commodity prices to our basic regression therefore provides a test of whether our new measure still includes some policy moves taken in response to supply shocks. If adding a measure of supply shocks makes the estimated impact of policy on prices stronger (that is, more negative) and its estimated impact on output weaker (less negative), this would indicate that our new measure is positively correlated with supply shocks. This would suggest that our measure is still somewhat contaminated by unmeasured anticipatory movements. But if controlling for a broad measure of supply

shocks has no important effect on the estimates, this would strongly suggest that our measure largely reflects independent changes in policy.

2. Including Commodity Prices in Our Basic Specification

To investigate the effects of controlling for commodity prices, we add twelve lags of the percentage change in world commodity prices to our basic output and price regressions.¹⁶ The results are shown in the top panels of Figures 7 and 8. They give no hint that unmeasured responses to supply shocks are affecting our results. The idea that the Federal Reserve has important additional information about supply shocks is most plausible for short horizons. Yet the estimated short-run effects of policy are virtually unaffected by controlling for commodity prices. For output, there is no discernible change in the impact of policy for the first five months. For prices, this is true for the first 20 months.

Controlling for commodity prices does change the estimated impacts moderately thereafter. For output, the estimated impacts are slightly smaller than before. The estimated cumulative effect is -2.0% rather than -2.3% after 12 months, and -3.9% rather than -4.8% at the maximum in month 22. These differences, though small and delayed, are in the direction one would expect if a portion of what we identify as policy shocks are actually responses to supply shocks.

For prices, however, the estimated impact of policy after the first year in fact falls moderately when we control for commodity prices. It is -0.2% rather than -0.5% after 24 months, -2.3% rather than -3.3% after 36, and -4.4% rather than -5.9% after 48. This is the opposite of what one would expect if our measure were contaminated by responses to supply shocks. In short, the impact of controlling for commodity prices is small and does not fit the pattern one would expect if our new measure still included important responses to supply shocks.

3. Including Commodity Prices in Regressions Using Broader Measures of Policy

As described above, the previous literature has suggested that an index of commodity prices captures the most important additional information to which the Federal Reserve responds. It therefore argues that including this measure of supply shocks in regressions estimating the effects of monetary policy using broad policy indicators is enough to deal with the problem of anticipatory movements. And, indeed,

previous work has found that including world commodity prices does largely eliminate the price puzzle.

But, the fact that the estimates have the anticipated sign does not mean they are free of bias. There are clearly other possible sources of uncaptured anticipatory policy movements. Most obviously, the Federal Reserve surely responds to anticipated inflation caused by demand shocks as well as by supply shocks. In addition, there could be indicators of supply shocks other than commodity prices that the Federal Reserve responds to. As a result, the estimates of the effect of monetary policy derived using broad measures of policy controlling for world commodity prices may still yield inaccurate results. To address this issue, we add commodity prices to our regressions that use the broader measures of policy. As before, we include twelve lags of the change in commodity prices.

The results of this exercise are presented in the second and third panels of Figures 7 and 8. They provide strong evidence that controlling for commodity prices is not enough to solve the difficulties with the broader measures. The estimates of the impact of monetary policy move in the direction one would expect: both the estimated declines in industrial production and the estimated rises in producer prices in response to contractionary monetary policy become slightly weaker when commodity prices are controlled for. This supports the standard view that broad policy measures include a component that represents responses to supply shocks rather than independent changes in policy.

Crucially, however, the estimated effects of policy when commodity prices are included in the regressions continue to be very different with the broader measures than with our new measure. For output, the estimated impact of policy remains about two to three times stronger when our measure is used than when the broader measures are used. For prices, for our particular specification and sample, controlling for commodity prices does not even eliminate the price puzzle from the results that use the broader measures: the estimated impact of policy on prices remains positive (though it is no longer significantly different from zero). With our measure, in contrast, the estimated effects of policy are negative, large, and statistically significant either with or without controlling for commodity prices. We take this as strong evidence that conventional measures are contaminated by anticipatory movements even when commodity prices are controlled for.

D. Vector Autoregressions

1. Motivation

VARs are often used to estimate the effects of policy. It is therefore useful to embed our new measure in a VAR so that we can compare our results more directly with those from earlier studies. VARs also have the advantage of controlling for the past behavior of all the variables in the system.

The interpretation of the impulse response functions from a VAR is complicated, however (Cochrane, 1998). An impulse response function for output or prices to a monetary policy innovation reflects both the effect of the initial innovation and the effect of the predictable subsequent moves in the policy measure. In the case where only unanticipated changes affect output or prices, the impulse response function simply shows the impact of the innovation. But anticipated movements in interest rates almost surely affect output and prices. For example, the response of output to a surprise change in our measure would surely be different if a surprise change were typically followed quickly by additional shifts in policy in the same direction than if it were typically followed by large offsetting policy moves. Similarly, no reasonable model implies that prices do not respond to forecastable policy changes.

Thus, what the VAR impulse response functions actually capture are the combined effects of the initial innovation and the later policy moves that are forecastable based on the innovation. In our VARs, we find that an innovation in our policy measure is normally followed by gradual offsetting moves. This implies that compared with our earlier approach, which considers a one-time permanent change in policy, the impulse response functions of a VAR will tend to yield smaller and shorter-lived effects of policy.

2. VARs Using Our New Measure of Monetary Policy Shocks

The specific VAR we consider is a variant of the one examined by Christiano, Eichenbaum, and Evans (1996). Our basic VAR has three variables: the log of industrial production, the log of the PPI for finished goods, and a measure of monetary policy. Following Christiano, Eichenbaum, and Evans, we also consider a VAR that adds commodity prices. Throughout, we use Christiano, Eichenbaum, and Evans's recursive identification strategy: monetary policy is assumed to respond to, but not to affect, the other variables contemporaneously. Christiano, Eichenbaum, and Evans's VAR includes only a year of lags.

Thus, monetary policy is not allowed to have any direct impact on the economy at horizons beyond a year. Since this assumption is very strong and highly questionable, we do not impose it. Instead, we include three years of lags in our baseline specification.

Our key difference from Christiano, Eichenbaum, and Evans is our measure of monetary policy. Our basic specification employs our measure of policy shocks, whereas Christian, Eichenbaum, and Evans use the actual funds rate. Since standard VARs enter the federal funds rate in levels, we cumulate our shock to produce a comparable series.

Figure 9 shows the response of the cumulated shock, output, and the price level to a 100-basis-point monetary policy shock, together with the one-standard-error bands. The top panel shows that the cumulated shock falls to about half its initial level after about a year and is then fairly flat. Thus the experiment considered here involves a less persistent change than the permanent, one-time shock considered above.

The other two panels of the figure show that the responses of output and prices implied by the VAR are broadly similar to those we found in the simple regressions reported above. Output rises by a small amount for the first two months, then falls sharply through month 22, and then returns toward its initial level. The maximum t-statistic is roughly 3. For output, the main difference from our earlier findings is that the estimated effect is smaller here. For example, the peak effect is 3.2% here, as opposed to 4.8% in the single-equation regressions above. Presumably this reflects the fact that in the experiment considered here, a substantial part of the interest rate movement is undone quickly. Also, output returns essentially all the way to its initial level here, as opposed to three-quarters of the way in the earlier results.

The response of prices implied by the VAR is small, irregular, and insignificant for eight months, and then negative. The monetary policy innovation lowers the price level by 0.7% after 18 months, 2.5% after 30, and 4.8% after 48. The t-statistic reaches 2 in month 19, 3 in month 25, and 4 in month 27. This response is somewhat faster than what we found in our simple regression, where the price level was essentially unaffected until 20 months had passed.

Adding commodity prices to the system has little impact on the patterns or magnitudes of the responses of output and the price level to an innovation in the policy measure. Once again, this suggests

that our policy measure controls adequately for the Federal Reserve's information about supply shocks.¹⁷

3. VARs Using Broader Measures of Monetary Policy

We also estimate the same VAR specification discussed above using both the change in the intended funds rate around FOMC meetings (cumulated) and the actual funds rate as the indicator of monetary policy. Figure 10 shows the results derived using these broader measures of policy. With either the intended or the actual funds rate, the estimated impact of policy on output is much slower and smaller than with our measure. And with either broader measure, the price puzzle reemerges strongly: in both cases, the price level does not fall below its initial level until about two years after the shock. All of this supports our earlier conclusion that the broader measures are contaminated by responses to anticipated economic developments.

As in other VARs, adding commodity prices to the systems that use the broader policy measures largely eliminates the price puzzle. With both broader measures, there is now never any noticeable rise in the price level following an interest rate innovation. When the intended funds rate is used, the effect becomes consistently negative starting in month 9; when the actual rate is used, this does not occur until month 23. Crucially, however, with either broader measure the fall is dramatically weaker than with the new measure. For example, the effect of a monetary shock on the price level after 48 months in the VAR controlling for commodity prices is -3.7% using our new measure, -2.0% using the intended funds rate, and -0.7% using the actual funds rate. Similarly, the output effects remain much smaller with the broader measures than with our measure even when commodity prices are controlled for. The maximum effect of a shock on industrial production in the VAR controlling for commodity prices is -2.2% using our measure, -1.6% using the intended funds rate, and -1.0% using the actual funds rate. This suggests once again that including commodity prices is only a partial solution to the problem of forward-looking policymaking.

The magnitude of the output response we find using the funds rate is similar to those estimated in previous VAR studies.¹⁸ Since we obtain considerably larger estimates using a measure of policy shocks that is largely purged of endogenous and anticipatory movements, this suggests that policy has a larger impact on output than traditionally believed.

In terms of timing, however, our VARs using the funds rate yield a somewhat slower response of output than those estimated in previous VAR studies. Sims (1992), Christiano, Eichenbaum, and Evans (1996), and Bernanke and Mihov (1998) all find that output begins falling three to six months after a shock, which is similar to what we find using our new measure. Thus, our results do not suggest appreciably shorter lags in the real effects of monetary policy than those estimated in earlier studies.

For prices, our results suggest both a larger and a faster response than current estimates imply. Sims, Christiano, Eichenbaum, and Evans, and Bernanke and Mihov find that when commodity prices are controlled for, a 100-basis-point innovation in the funds rate has little effect on prices for about a year and a half, and then causes a decline of one to two percent over the next few years. This is similar to what we obtain in our VAR using the funds rate. But the VARs with our new measure suggest a much stronger response: regardless of whether commodity prices are controlled for, the price effect is consistently negative after 9 months, and the price level is roughly four percent lower after four years.

IV. CONCLUSION

Determining how monetary policy affects the economy is critically important both for distinguishing between competing theories of fluctuations and for conducting policy. Unfortunately for economists interested in estimating the effects of policy, monetary policy is not conducted as a randomized experiment. There is no unique instrument of policy, such as the federal funds rate, that the Federal Reserve always focuses on. As a result, any candidate measure of policy sometimes moves in response to outside economic developments rather than to decisions by the Federal Reserve. More importantly, in deciding how to move its instruments, the Federal Reserve considers a tremendous amount of information about likely future movements in macroeconomic variables. Because of these features of policy, estimating the effects of policy is extremely difficult.

To address these difficulties, this paper proposes and implements a new method for isolating monetary policy shocks. Our approach considers only changes in the federal funds rate that are the result

of deliberate decisions by the Federal Reserve made at meetings for which there is a forecast prepared by the staff. We then remove the portions of these moves in the intended funds rate that represent the Federal Reserve's usual response to the forecasts. Our resulting series should be largely free of interest rate movements that are either endogenous responses to economic developments or attempts by policymakers to counteract expected future developments. The movements in output and inflation in the wake of our new measure of monetary shocks should therefore reflect the impact of monetary policy, and not other factors.

Estimates of the effects of policy using the new shock series indicate that monetary policy has large and statistically significant effects on real output. In our baseline specification, a shock of 100 basis points starts to reduce industrial production after 5 months, with a maximum fall of 4.8% after 22 months. The peak effect is highly statistically significant. For prices, we find that the 100-basis-point shock has little effect for about a year and a half, but then lowers the inflation rate by 2 to 3 percentage points. As a result, the price level is about 6% lower after 4 years. This estimate is overwhelmingly significant. The results are quite robust to variations in how we control for forecasts, sample periods, control variables, and specifications. The most important uncertainty concerns the lag in the impact of policy on prices: in some specifications, the price level begins falling less than a year after the policy shock.

Qualitatively, our findings are very consistent with textbook views of the effects of monetary policy. Contractionary monetary policy reduces both output and inflation. Both effects occur with a lag, with output moving before inflation. Quantitatively, the results suggest that the lags in the output effects are fairly short, while the lags in the inflation effects are harder to determine. More importantly, the results indicate that the impacts of monetary policy on both output and inflation are large.

TABLE 1

Determinants of the Intended Change in the Federal Funds Rate

	<u>Coefficient</u>	<u>Standard Error</u>
Constant	0.171	0.141
Initial Level of Intended Funds Rate	-0.021	0.012
Forecasted Output Growth, <u>Lag:</u>		
-1	0.007	0.010
0	0.003	0.019
1	0.010	0.032
2	0.022	0.032
Change in Forecasted Output Growth since Previous Meeting, <u>Lag:</u>		
-1	0.050	0.030
0	0.152	0.030
1	0.021	0.046
2	0.021	0.051
Forecasted Inflation, <u>Lag:</u>		
-1	0.021	0.024
0	-0.044	0.029
1	0.010	0.044
2	0.052	0.047
Change in Forecasted Inflation since Previous Meeting, <u>Lag:</u>		
-1	0.057	0.045
0	0.003	0.064
1	0.031	0.074
2	-0.062	0.081
Forecasted Unemployment Rate (Current Quarter)	-0.048	0.021

$R^2 = 0.28$, D.W. = 1.84, s.e.e. = 0.39, N = 263. The sample is FOMC meetings over the period 1969:3-1996:12.

TABLE 2

New Measure of Monetary Policy Shocks

(In Percentage Points)

	<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1969	0.0	0.0	-0.245	0.405	0.204	-0.020	0.181	0.309	0.029	0.088	-0.005	0.065
1970	-0.160	-0.360	-0.140	-0.145	0.300	-0.180	-0.243	-0.483	-0.272	-0.009	-0.346	-0.229
1971	-0.682	-0.025	-0.065	0.461	0.003	0.343	-0.117	0.0	0.0	-0.322	-0.342	-0.920
1972	-0.234	-0.086	0.252	-0.104	-0.115	-0.050	0.0	0.0	0.0	0.0	0.036	-0.027
1973	0.279	0.225	0.064	-0.063	0.317	0.409	0.115	0.318	-0.571	-0.848	-0.095	-0.165
1974	-0.206	0.201	0.733	0.387	0.392	0.280	-0.091	-0.022	-0.430	-0.284	0.336	-0.229
1975	-0.354	0.243	-0.499	-0.637	0.136	0.170	0.070	-0.136	-0.114	-0.200	-0.281	0.280
1976	-0.091	-0.469	-0.239	0.139	-0.298	-0.038	-0.139	-0.044	0.019	-0.041	0.030	-0.131
1977	-0.097	-0.085	-0.228	-0.049	-0.051	-0.146	-0.240	0.030	0.073	-0.026	-0.048	-0.122
1978	-0.205	0.106	0.042	-0.069	-0.216	0.243	-0.142	-0.064	-0.156	0.133	0.168	-0.042
1979	0.0	-0.152	0.133	-0.064	0.105	0.0	0.761	0.322	-0.224	0.0	0.045	0.0
1980	-0.011	0.197	1.422	-3.221	-0.764	0.0	0.403	-0.198	0.771	1.218	1.871	-0.634
1981	0.0	-0.783	0.307	0.0	1.515	0.0	-0.611	-0.041	0.0	-0.574	-0.356	0.100
1982	0.0	1.021	-0.435	0.0	-0.056	0.0	-0.196	-0.211	0.0	-0.242	0.125	0.651
1983	0.0	0.185	0.145	0.0	-0.019	0.0	-0.008	-0.234	0.0	0.282	-0.172	0.217
1984	0.257	0.0	-0.101	0.0	0.173	0.0	0.327	-0.061	0.0	0.035	-0.546	-0.144
1985	0.0	-0.158	0.201	0.0	-0.104	0.0	0.060	0.186	0.0	0.104	0.021	-0.069
1986	0.0	-0.110	0.0	0.207	0.076	0.0	-0.168	-0.234	0.001	0.0	0.021	-0.082
1987	0.0	0.176	0.191	0.0	0.238	0.0	-0.041	-0.021	-0.147	0.0	-0.085	-0.180
1988	0.0	-0.224	0.018	0.0	0.188	0.308	0.0	-0.182	-0.067	0.0	-0.009	0.446
1989	0.0	0.297	0.061	0.0	0.153	0.0	0.075	-0.139	0.0	-0.087	0.108	-0.067
1990	0.0	0.313	-0.094	0.0	0.044	0.0	-0.066	0.150	0.0	-0.119	-0.018	-0.159
1991	0.0	-0.251	0.227	0.0	0.262	0.0	-0.077	0.140	0.0	-0.035	-0.121	0.113
1992	0.0	-0.004	-0.126	0.0	0.148	0.0	-0.088	-0.003	0.0	-0.175	-0.029	-0.237
1993	0.0	0.094	-0.063	0.0	0.335	0.0	0.009	0.044	0.159	0.0	-0.087	-0.163
1994	0.0	0.224	0.313	0.0	0.287	0.0	0.070	0.417	0.041	0.0	0.549	-0.248
1995	0.0	0.501	0.241	0.0	0.209	0.0	-0.006	-0.091	0.025	0.0	0.052	-0.171
1996	0.073	0.0	0.056	0.0	-0.027	0.0	-0.040	-0.065	-0.042	0.0	0.048	-0.029

TABLE 3

The Impact of Monetary Policy Shocks on Industrial Production

<u>Monetary Policy Shock</u>			<u>Change in Industrial Production</u>		
<u>Lag</u>	<u>Coefficient</u>	<u>Standard Error</u>	<u>Lag</u>	<u>Coefficient</u>	<u>Standard Error</u>
1	0.0044	0.0018	1	0.070	0.063
2	0.0013	0.0018	2	0.038	0.063
3	-0.0049	0.0018	3	0.126	0.062
4	-0.0011	0.0018	4	0.047	0.062
5	-0.0038	0.0018	5	0.053	0.062
6	0.0012	0.0019	6	-0.133	0.062
7	-0.0002	0.0019	7	-0.014	0.063
8	-0.0035	0.0019	8	0.022	0.062
9	-0.0028	0.0019	9	0.014	0.061
10	-0.0057	0.0019	10	-0.039	0.061
11	-0.0021	0.0019	11	0.096	0.058
12	-0.0023	0.0019	12	0.330	0.059
13	-0.0026	0.0019	13	-0.007	0.060
14	-0.0016	0.0019	14	-0.208	0.060
15	-0.0005	0.0019	15	-0.091	0.060
16	0.0004	0.0019	16	-0.170	0.061
17	-0.0007	0.0019	17	0.175	0.062
18	-0.0027	0.0019	18	0.113	0.063
19	-0.0025	0.0019	19	0.072	0.062
20	-0.0006	0.0019	20	-0.027	0.062
21	-0.0024	0.0019	21	-0.030	0.062
22	-0.0016	0.0019	22	-0.125	0.062
23	0.0040	0.0019	23	-0.045	0.062
24	0.0006	0.0019	24	0.114	0.062
25	-0.0002	0.0019			
26	0.0008	0.0019			
27	-0.0016	0.0019			
28	0.0033	0.0019			
29	0.0023	0.0019			
30	0.0030	0.0019			
31	0.0016	0.0019			
32	0.0003	0.0018			
33	0.0015	0.0018			
34	0.0051	0.0018			
35	0.0020	0.0018			
36	0.0036	0.0018			

$R^2 = 0.89$, D.W. = 2.02, s.e.e. = 0.009, N = 324. The sample period is 1970:1-1996:12. Coefficients and standard errors for the constant term and monthly dummies are not reported.

TABLE 4

The Impact of Monetary Policy Shocks on Prices

<u>Monetary Policy Shock</u>			<u>Change in Producer Price Index</u>		
<u>Lag</u>	<u>Coefficient</u>	<u>Standard Error</u>	<u>Lag</u>	<u>Coefficient</u>	<u>Standard Error</u>
1	0.0006	0.0009	1	0.192	0.065
2	0.0001	0.0009	2	0.002	0.065
3	-0.0005	0.0009	3	-0.038	0.065
4	0.0010	0.0009	4	-0.098	0.065
5	0.0014	0.0009	5	0.009	0.065
6	-0.0006	0.0009	6	0.107	0.065
7	0.0001	0.0009	7	-0.056	0.065
8	0.0005	0.0009	8	0.050	0.065
9	-0.0013	0.0009	9	0.074	0.065
10	0.0009	0.0009	10	-0.049	0.065
11	-0.0016	0.0009	11	0.087	0.065
12	-0.0003	0.0009	12	0.127	0.065
13	0.0001	0.0009	13	-0.071	0.065
14	-0.0002	0.0009	14	-0.020	0.064
15	0.0010	0.0009	15	-0.019	0.064
16	-0.0004	0.0009	16	-0.018	0.063
17	0.0003	0.0009	17	0.056	0.063
18	-0.0012	0.0009	18	0.029	0.063
19	0.0005	0.0009	19	0.009	0.062
20	-0.0020	0.0009	20	0.093	0.063
21	0.0002	0.0009	21	0.004	0.063
22	-0.0001	0.0009	22	-0.004	0.063
23	-0.0013	0.0009	23	-0.057	0.062
24	-0.0019	0.0009	24	0.045	0.061
25	-0.0024	0.0009			
26	-0.0025	0.0010			
27	-0.0017	0.0010			
28	-0.0002	0.0010			
29	-0.0022	0.0010			
30	-0.0033	0.0010			
31	-0.0031	0.0010			
32	-0.0006	0.0010			
33	-0.0013	0.0010			
34	-0.0010	0.0010			
35	-0.0015	0.0010			
36	-0.0033	0.0010			
37	-0.0019	0.0010			
38	-0.0016	0.0010			
39	0.0001	0.0010			
40	-0.0017	0.0010			

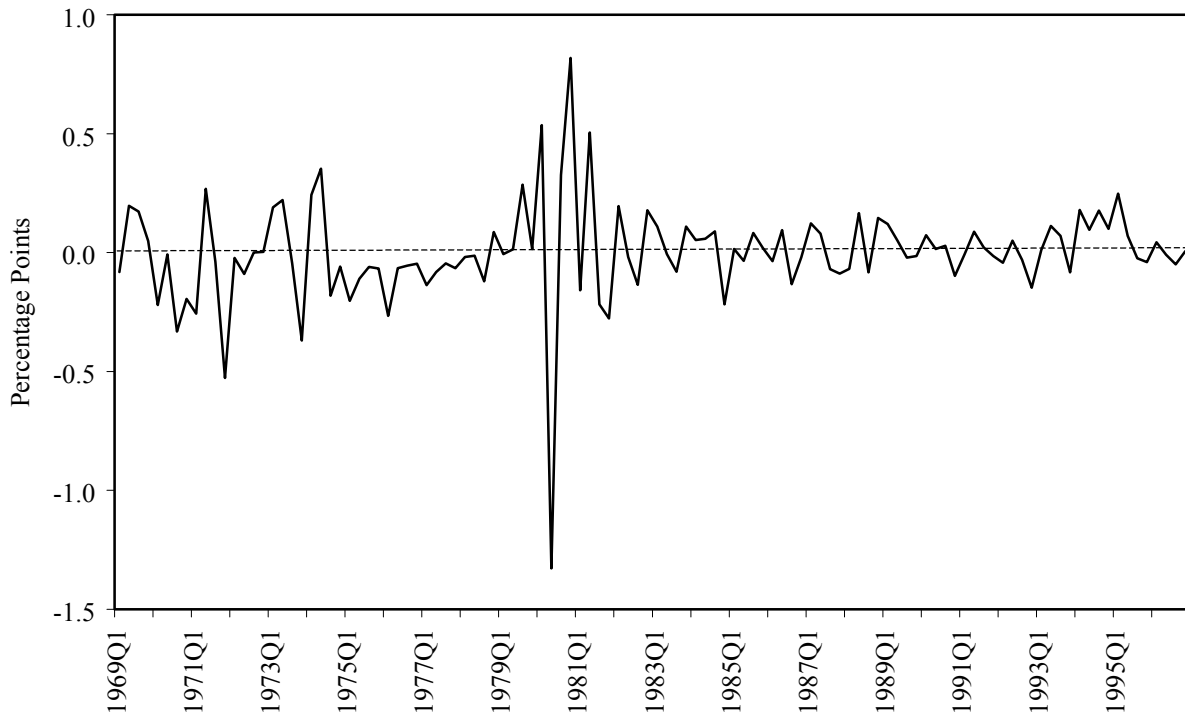
TABLE 4 (continued)

<u>Monetary Policy Shock</u>		
<u>Lag</u>	<u>Coefficient</u>	<u>Standard Error</u>
41	-0.0007	0.0010
42	-0.0029	0.0010
43	-0.0013	0.0010
44	-0.0003	0.0009
45	-0.0014	0.0009
46	0.0001	0.0009
47	-0.0015	0.0009
48	-0.0008	0.0009

$R^2 = 0.57$, D.W. = 2.00, s.e.e. = 0.005, N = 324. The sample period is 1970:1-1996:12. Coefficients and standard errors for the constant term and monthly dummies are not reported.

Figure 1
Measures of Monetary Policy Shocks

a. New Measure of Monetary Policy Shocks



b. Broader Measures of Monetary Policy

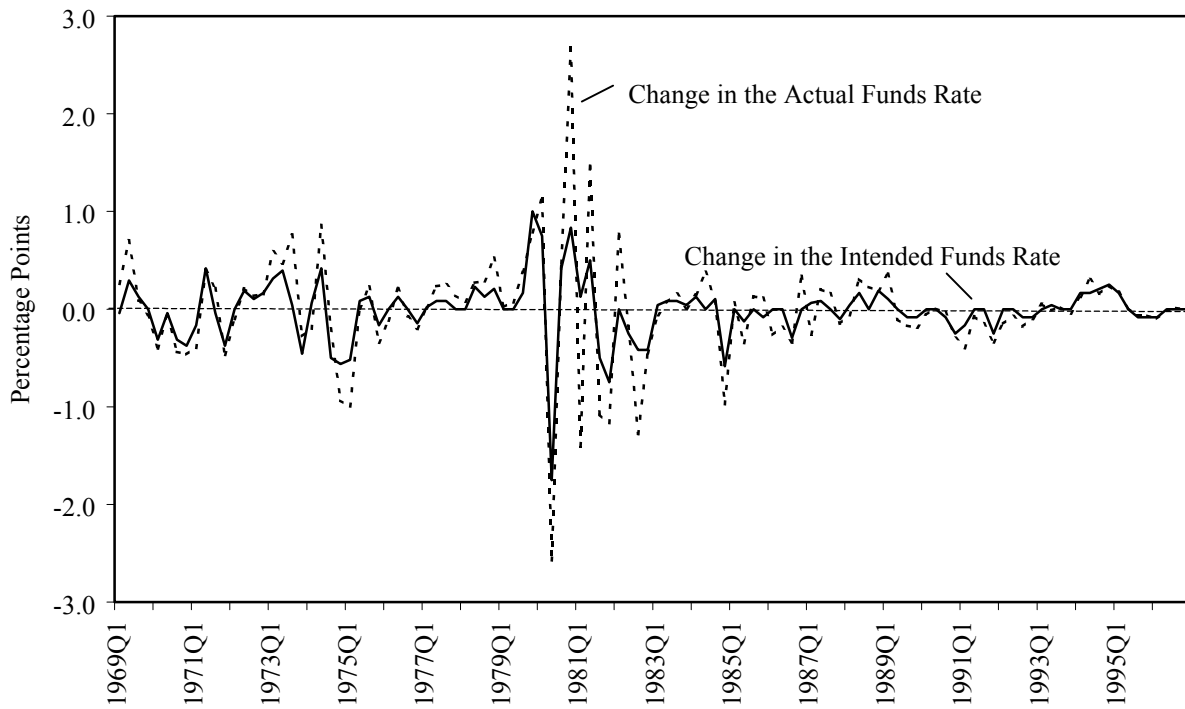


Figure 2

The Effect of Monetary Policy on Industrial Production

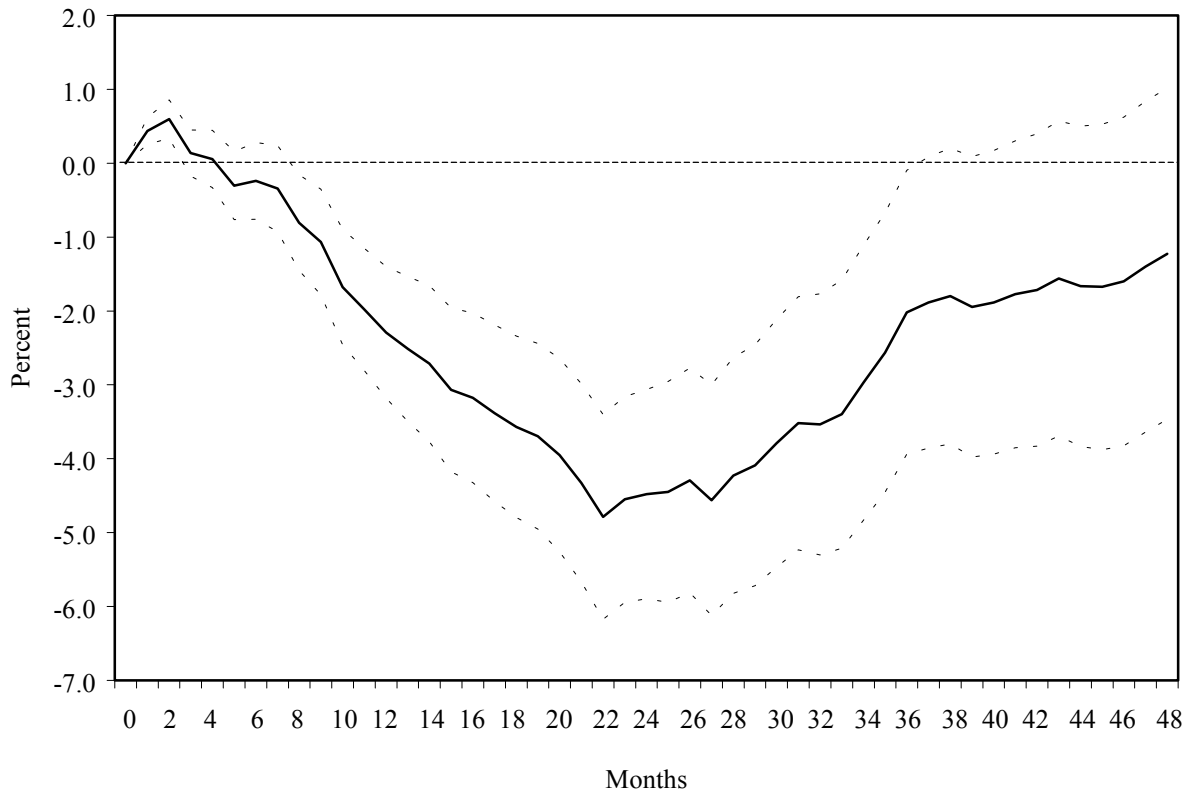


Figure 3

The Effect of Monetary Policy on Industrial Production
Using Broader Measures of Monetary Policy

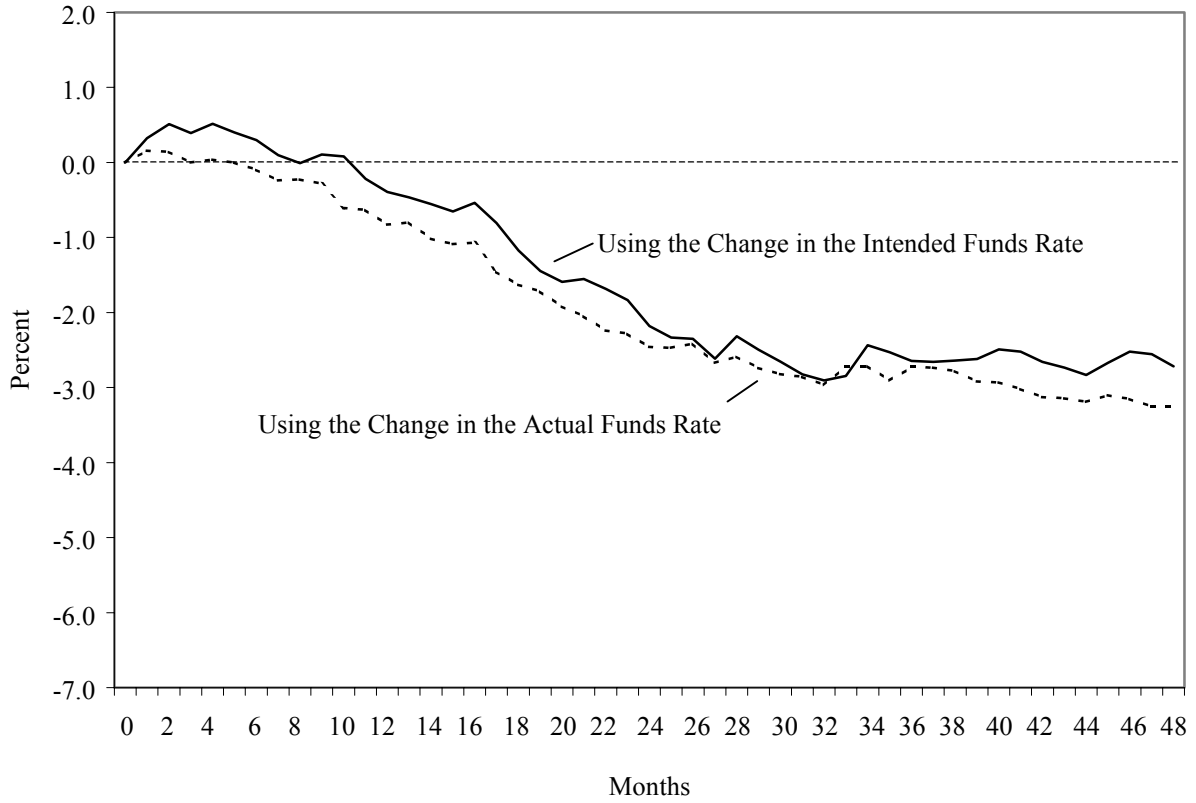


Figure 4

The Effect of Monetary Policy on the Price Level

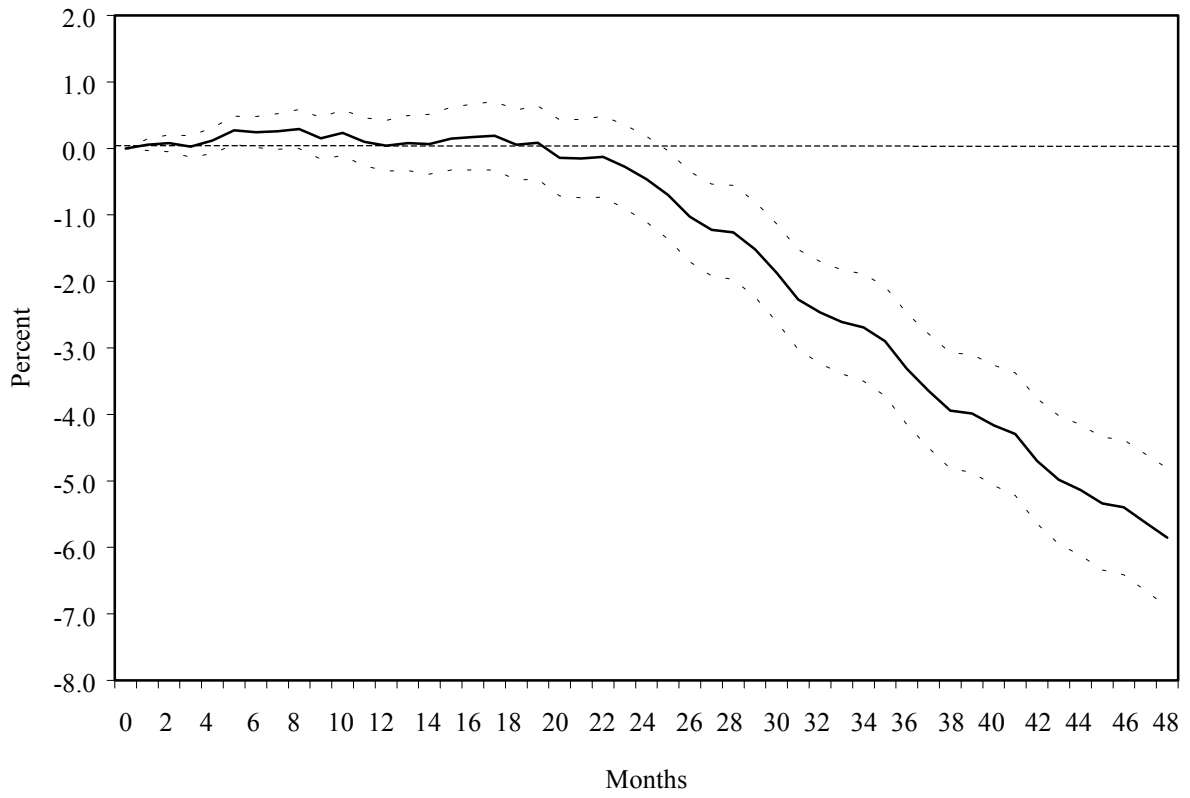


Figure 5

The Effect of Monetary Policy on Inflation

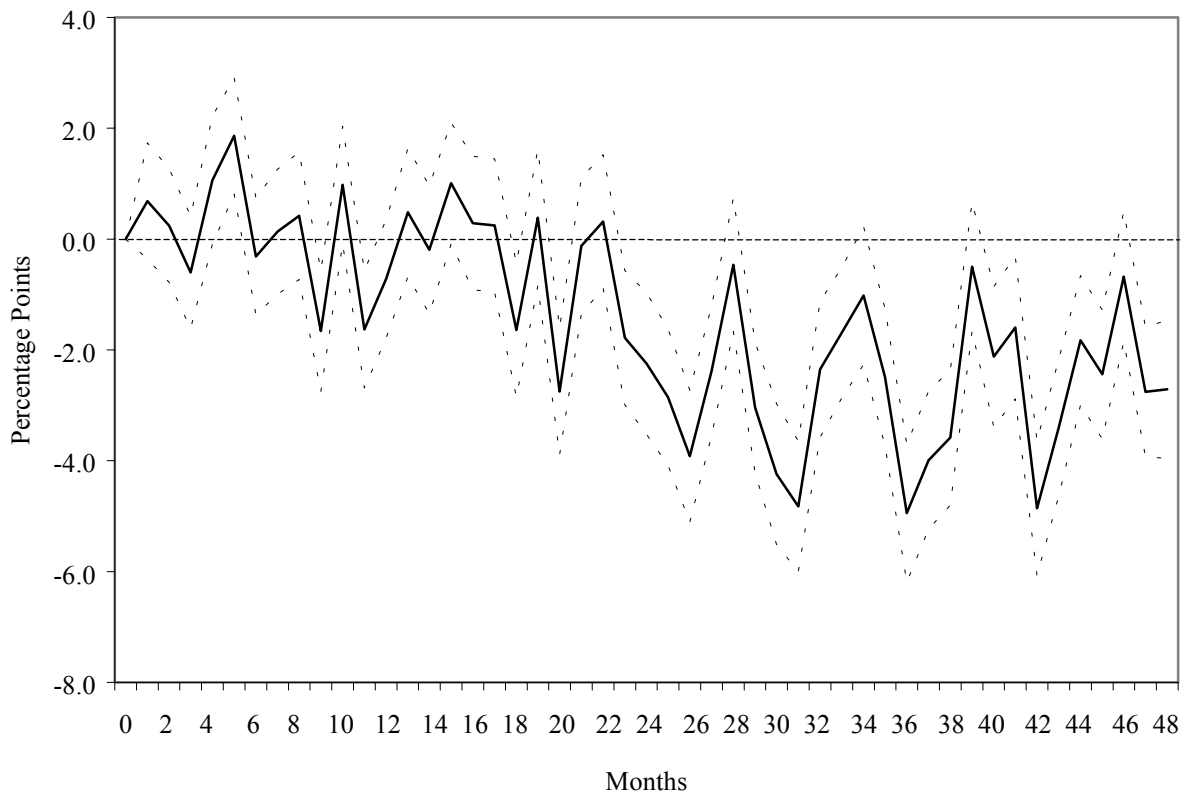


Figure 6

The Effect of Monetary Policy on the Price Level
Using Broader Measures of Monetary Policy

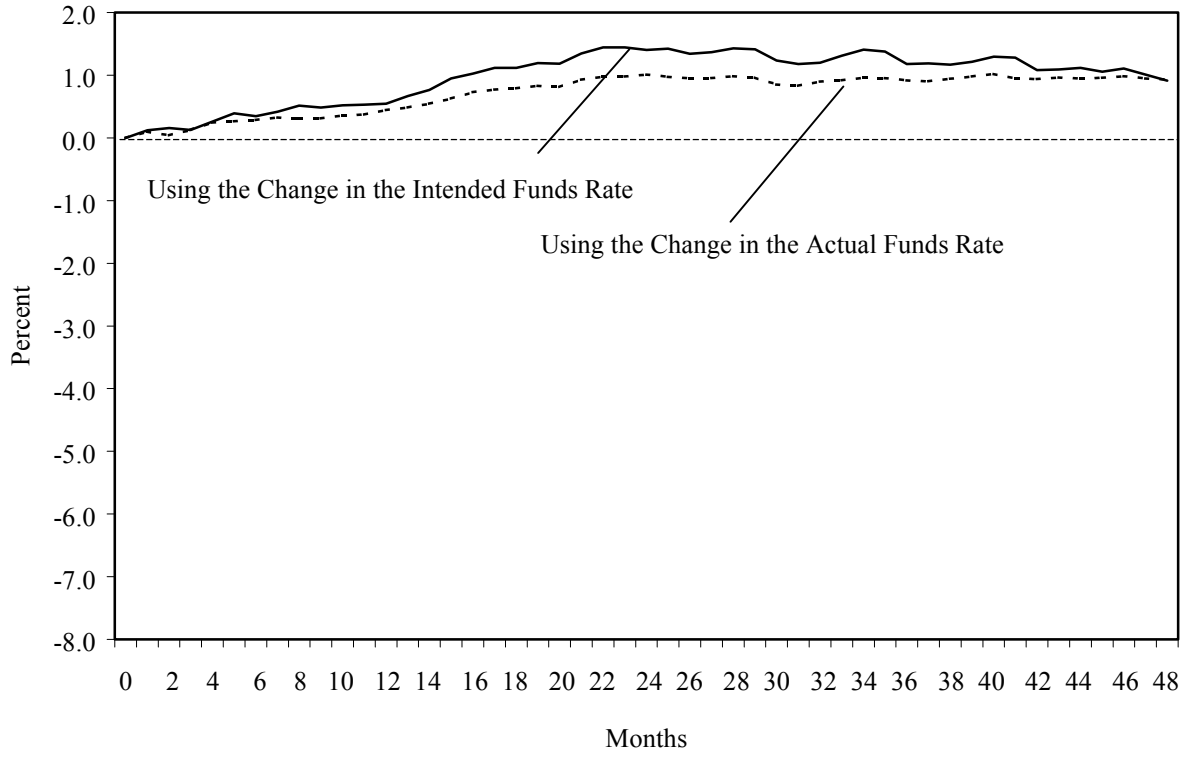
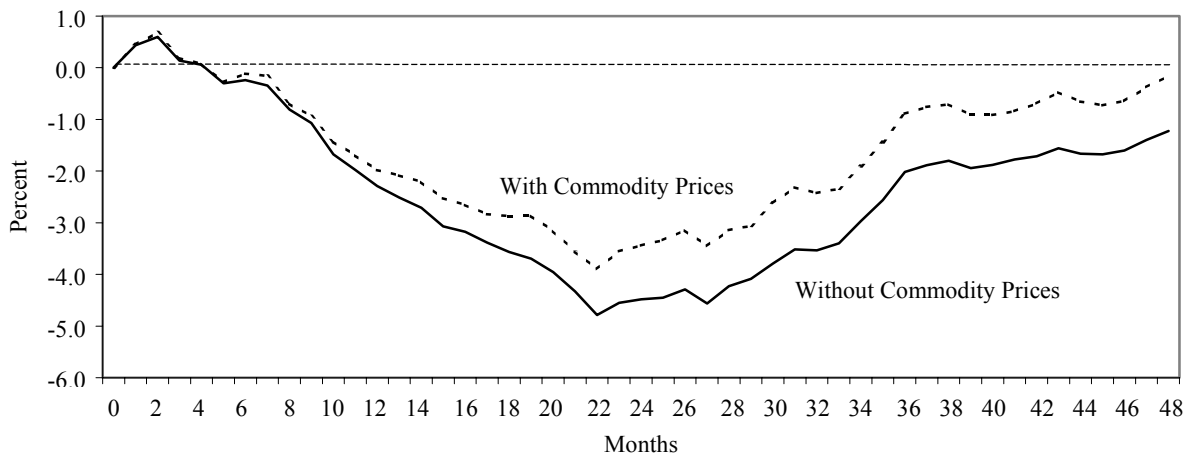


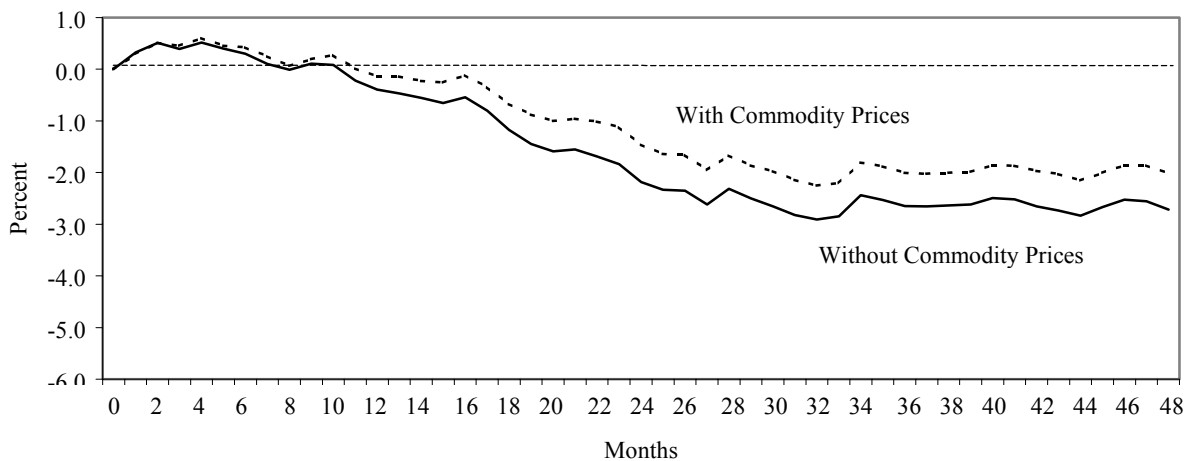
Figure 7

The Effect of Monetary Policy on Industrial Production
With and Without Commodity Prices

a. Using the New Measure of Monetary Shocks



b. Using the Change in the Intended Funds Rate



c. Using the Change in the Actual Funds Rate

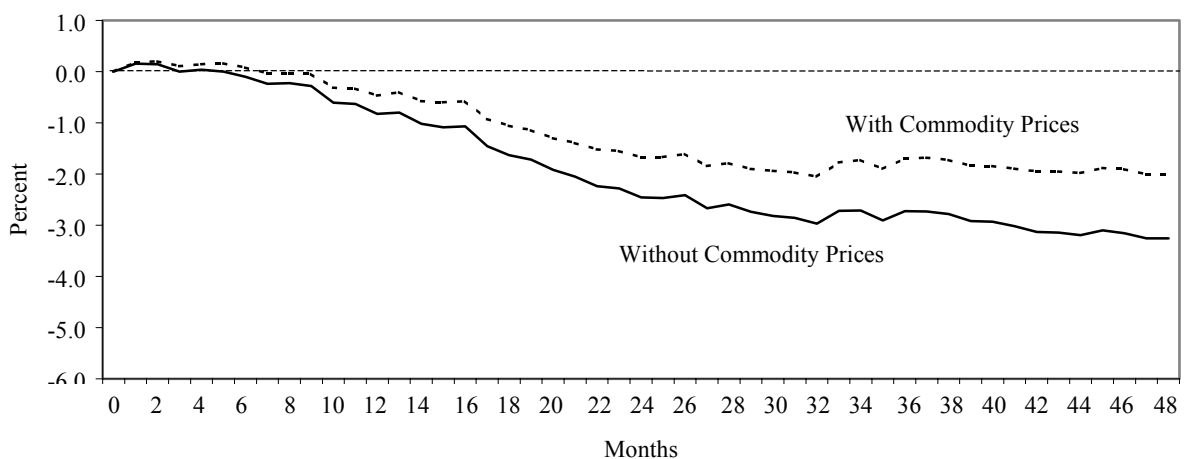
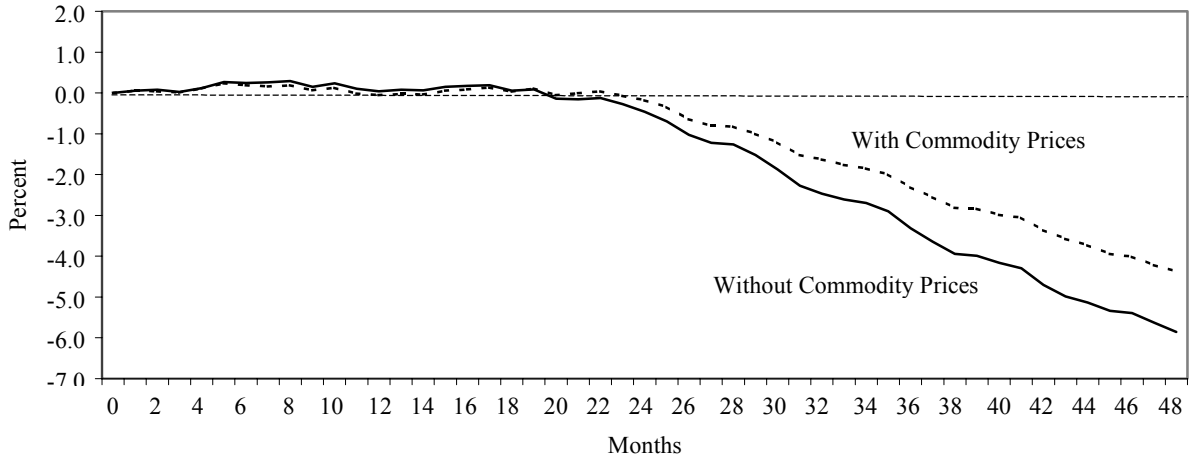


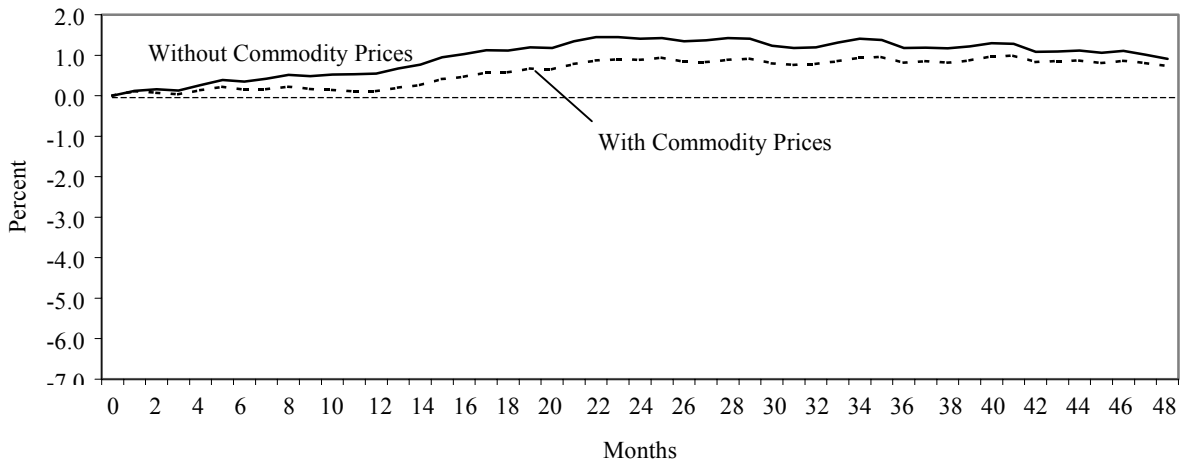
Figure 8

The Effect of Monetary Policy on the Price Level
With and Without Commodity Prices

a. Using the New Measure of Monetary Shocks



b. Using the Change in the Intended Funds Rate



c. Using the Change in the Actual Funds Rate

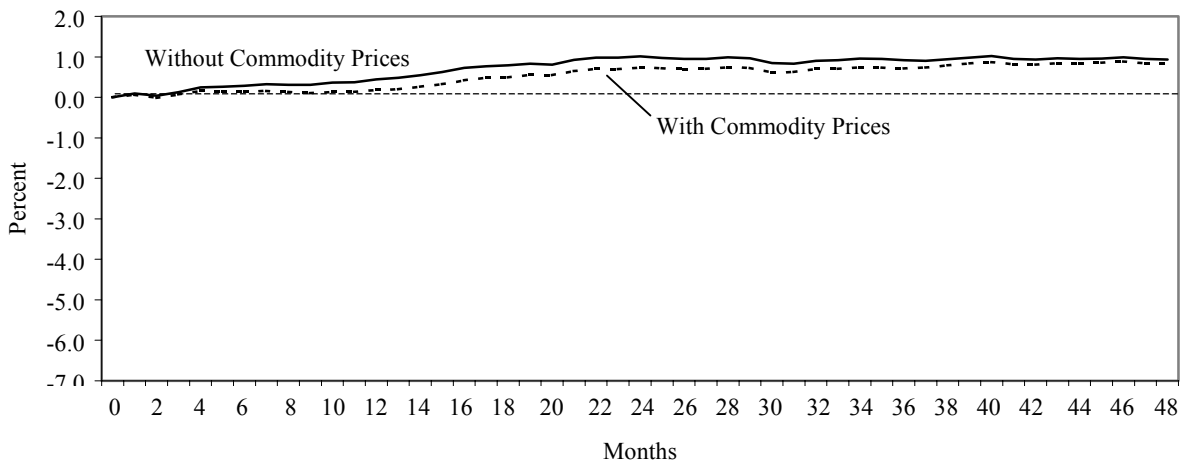
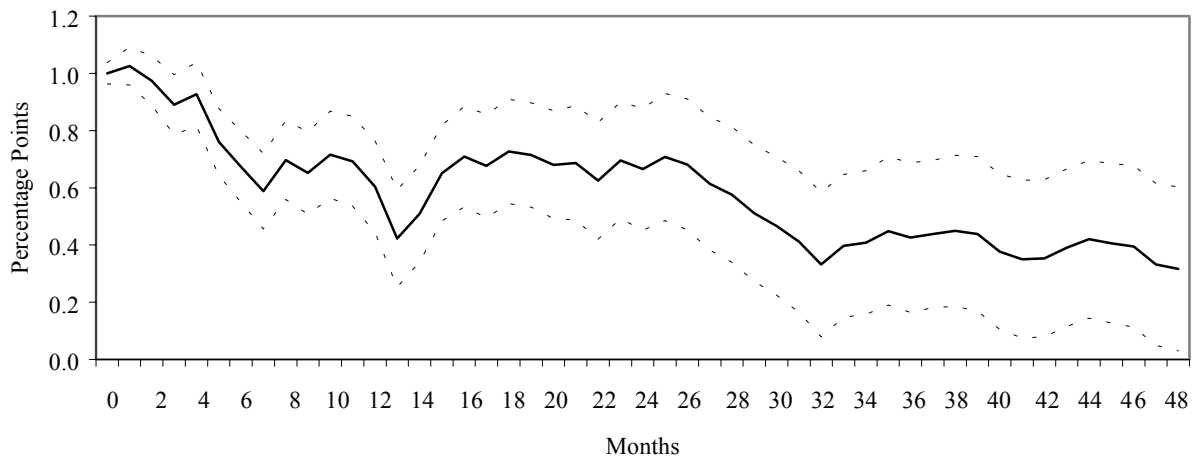


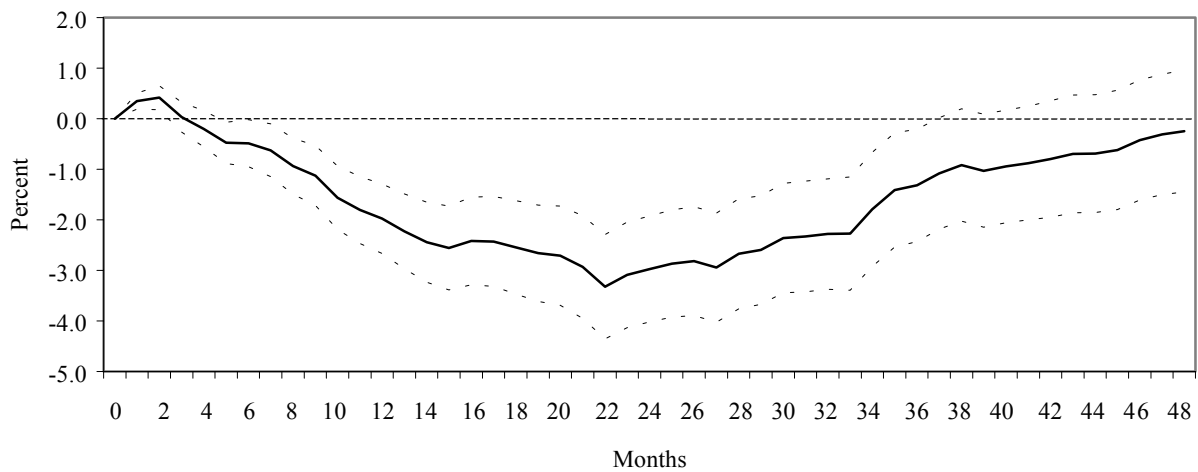
Figure 9

The Effect of Monetary Policy in a VAR
Using the New Measure of Monetary Policy

a. Effect on Measure of Monetary Policy



b. Effect on Industrial Production



c. Effect on the Price Level

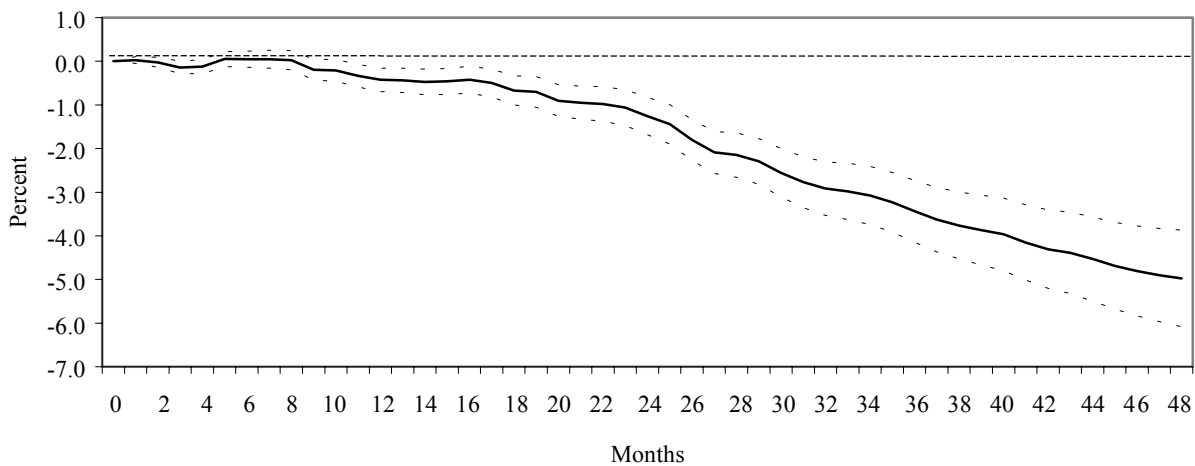
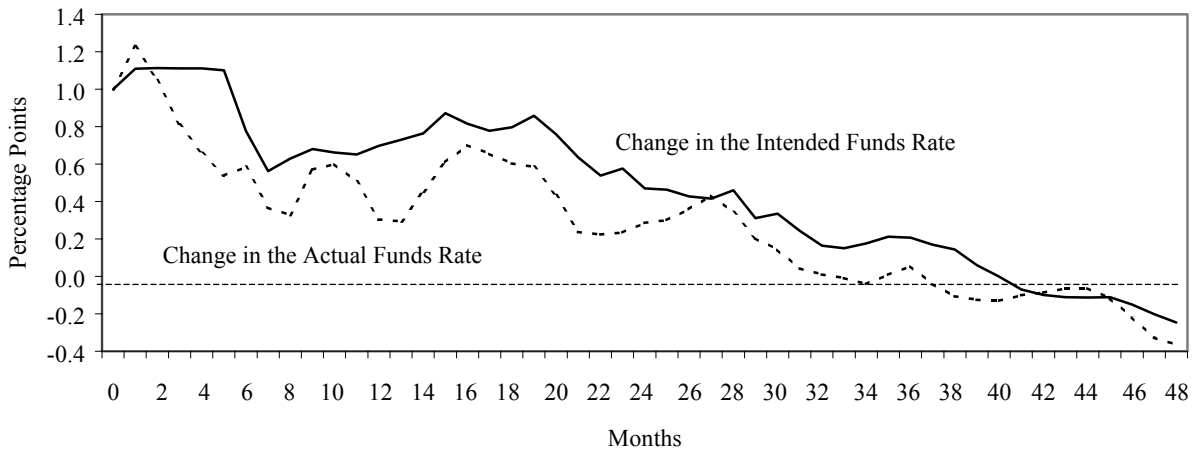


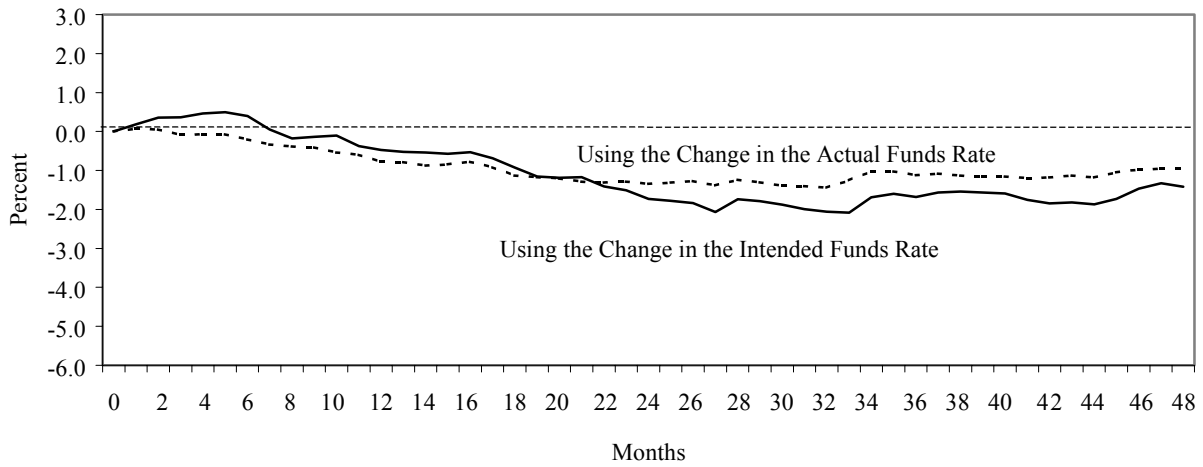
Figure 10

The Effect of Monetary Policy in a VAR
Using Broader Measures of Monetary Policy

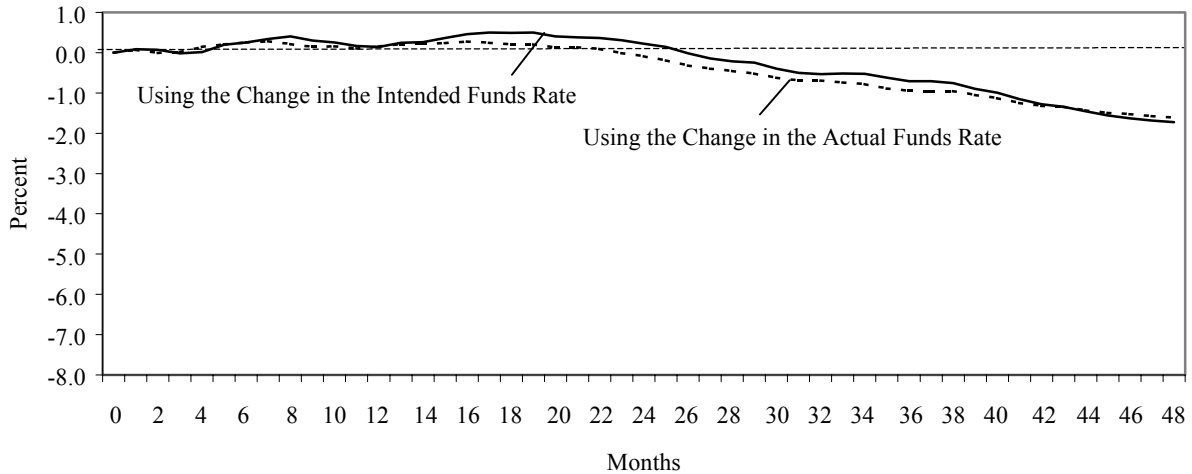
a. Effect on Measures of Monetary Policy



b. Effect on Industrial Production



c. Effect on the Price Level



APPENDIX

This appendix documents the derivation of our measure of the intended funds rate around FOMC meetings for the period 1969 to 1996. The date refers to the date of the meeting of the Federal Open Market Committee.¹⁹ The first number is the level of the federal funds rate that the FOMC intended to prevail at the time of the forecast. The second number is the level of the funds rate that the FOMC intended on the basis of its decision at that meeting. For each observation we give a brief summary of the reasoning behind our identification of the intended level. Section II.A of the paper describes the sources and general criteria we use in making these decisions.

1969

1/14/69	6.4375, no change. The FOMC agrees that open-market operations should attempt to maintain current credit market conditions.
2/4/69	6.4375, no change. The FOMC again agrees that open-market operations should attempt to maintain current credit market conditions. There is a suggestion of a slight asymmetry toward easing, but not enough to point to a noticeable expected fall in the funds rate.
3/4/69	6.75 to 6.625. The FOMC again agrees to attempt to maintain current monetary conditions. But there is an explicit asymmetry toward easing: conditions should be eased if bank credit appears to be contracting any more rapidly than projected, but tightened only if bank credit appears to be growing substantially faster than projected. The asymmetry suggests an expected reduction of roughly 1/8 point (since a typical move is 1/4 point and the asymmetry does not guarantee a move).
4/1/69	6.75 to 7.25. The FOMC agrees that it wants the funds rate to rise by roughly the same amount as the pending increase in the discount rate, which is 1/2 point.
4/29/69	7.6875 to 7.9375. The meeting summary states that open-market operations were modified in the direction of greater firmness during the intermeeting period, and that one consequence was a rise in the funds rate late in the month. Thus there was a rise in the desired rate between the time of the forecast and the time of the meeting. Although the magnitude is difficult to gauge, a rise of 1/8 point seems roughly correct. At the meeting, the FOMC agrees to maintain at least the current degree of restraint, but with a clear asymmetry toward tightening. Thus there is an additional expected increase in the funds rate of roughly 1/8 point.
5/27/69	8.5 to 8.625. The FOMC agrees to attempt to maintain current conditions in money and credit markets, but with a clear asymmetry toward tightening.
6/24/69	9, no change. The FOMC again agrees to attempt to maintain current conditions in money and credit markets. There is some discussion of continued asymmetry toward tightening, but the summary of the meeting states that the consensus is against asymmetry.
7/15/69	9 to 9.125. The FOMC agrees to attempt to maintain current conditions in money and credit markets, but with a clear asymmetry toward tightening.
8/12/69	9.5 to 9.75. The meeting summary states that the funds rate has risen by more than a point over the two weeks prior to the meeting. At the meeting, the FOMC agrees to attempt to maintain current conditions in money and credit markets, with no clear asymmetry in either direction. Thus policy is clearly aiming for a higher funds rate than prior to the forecast. The exact magnitude is difficult to gauge. Given how much the actual rate rose prior to the meeting, a rise of 1/8 point in the desired rate appears too small. But there is nothing dramatic enough in the meeting summary to warrant an inference of a rise of 1/2 point or more.
9/9/69	9, no change. The FOMC decides to make no change in policy.
10/7/69	9.125, no change. The FOMC decides to attempt to maintain current conditions in money and credit markets.
10/28/69	9.125, no change. There is a marginal rise in the funds rate sought by policy between the time of the forecast and the time of the meeting. But at this meeting, the FOMC agrees to no

- change in policy with an asymmetry toward easing. The net effect of these two decisions is no change.
- 11/25/69 9.125, no change. The FOMC agrees on no change in policy. There is a suggestion of a slight asymmetry toward easing, but not enough to point to a noticeable expected fall in the funds rate.
- 12/16/69 9, no change. Same as previous meeting.

1970

- 1/15/70 9 to 8.75. The FOMC agrees to aim for a funds rate of 8.75-9%, with a clear asymmetry toward additional easing.
- 2/10/70 9.125 to 8.625. The FOMC agrees to ease somewhat immediately and ease further after that, with an objective of moving the funds rate down cautiously and gradually to somewhere in the range of 8-9%. This suggests that a reasonable expectation of the funds rate is slightly over 8.5%.
- 3/10/70 8.3125 to 8.125. The FOMC agrees to aim for a funds rate in the range of 8-8.5%, with a clear asymmetry toward ease.
- 4/7/70 7.75, no change. The FOMC agrees to aim for growth rates of money and the bank credit proxy that correspond to the staff's projections under the assumption of no change in money market conditions.
- 5/5/70 8.25 to 8.375. The FOMC agrees to aim for growth rates of money and the bank credit proxy that correspond to the staff's projections under the assumption of unchanged or slightly firmer money market conditions. However, the FOMC's interest in raising the funds rate slightly is tempered by concern about Treasury financing and financial market disruptions. Thus, the decision corresponds to a small expected tightening, or roughly 1/8 point.
- 5/26/70 8, no change. The FOMC agrees to attempt to keep interest rates approximately unchanged in light of recent problems in financial markets.
- 6/23/70 7.875 to 7.625. The FOMC agrees that it wants to give greater priority to moderating pressures on financial markets, and that it is willing to accept temporarily high growth of money and the bank credit proxy. It therefore desires to nudge interest rates down, with an asymmetry toward further easing.
- 7/21/70 7.3125 to 7.0625. The FOMC again agrees to attempt to reduce interest rates slightly, with an asymmetry toward further easing.
- 8/18/70 6.75 to 6.25. The FOMC agrees to aim for a funds rate of 6-6.75%, with an asymmetry toward ease. Thus it appears to be agreeing on a direct reduction in the expected funds rate of roughly 3/8 point, plus an additional expected reduction of roughly 1/8 point from the asymmetry.
- 9/15/70 6.375 to 6.1875. The FOMC agrees that some easing in credit market conditions is appropriate, and that it desires a growth rate of the money stock consistent with staff projections of a funds rate toward the low end of 6.125-6.5%.
- 10/20/70 6.25 to 6.125. The FOMC agrees to a slight and gradual easing, but still wants the funds rate to remain in the range of 6-6.5%.
- 11/17/70 5.75 to 5.125. The FOMC agrees to aim for a funds rate in the lower half of 5-5.75%, with a possibility of letting the rate go below 5% if circumstances warrant.
- 12/15/70 5.125 to 4.75. The FOMC agrees to aim for a funds rate of 5%, with a strong asymmetry toward further ease. Given the volatility of the funds rate in this period, the asymmetry suggests an additional expected fall in the funds rate of roughly 1/4 point.

1971

- 1/12/71 4.5 to 4. The FOMC agrees to aim for a funds rate around 4.25% immediately, with a strong asymmetry toward further easing. The lower bound of its range for the funds rate is 3.75%. Given the volatility of the funds rate in this period and the strength of the asymmetry, this suggests an additional expected reduction of roughly 1/4 point.
- 2/9/71 3.75 to 3.625. The FOMC agrees on no immediate change, but a clear asymmetry toward ease.
- 3/9/71 3.5 to 3.625. The FOMC agrees on no immediate change, but a clear asymmetry toward tightening.
- 4/6/71 3.75 to 4.125. The FOMC agrees to tighten. There is no explicit discussion of the magnitude. But the summary of the next meeting implies that most but not all of the overall rise of 1/2 point in the intermeeting period was an implementation of the policy agreed to at this meeting.
- 5/11/71 4.25 to 4.5. The FOMC had been seeking a funds rate of around 4.25%, but the actual rate had been around 4.5% despite its efforts. At this meeting, the FOMC decides that it wants the rate to remain around its current level of 4.5%. In addition, there is a complicated asymmetry: the FOMC wants to move aggressively to reduce rates if money growth is less than expected, and to raise them moderately if money growth is greater than or roughly equal to expected. This does not point to an expected rate clearly above or below 4.5%.
- 6/8/71 4.75 to 5.125. The FOMC agrees to tighten gradually. The Federal Reserve Bank of New York open-market desk's series for the expected funds rate rises immediately by 1/4 point; this suggests an expected tightening of somewhat more than this. Further, the summary of the next meeting does not attribute any of the moves in the Desk's expected rate in the intermeeting period, which total 3/8 point, to news.
- 6/29/71 5.125 to 5.375. The FOMC agrees to tighten policy. The Committee's focal rate for the funds rate is 5-5.5%, with a clear expectation that it will be in the upper half of the range.
- 7/27/71 5.5 to 5.625. The FOMC agrees that it wants more moderate money growth. But there is no explicit reference to any firming of money market conditions. Thus there appears to be a slight expected tightening. The behavior of the Desk's expected rate is consistent with this: there is no immediate change, and then a rise from "5-5.5, upper end" to "5.5-5.75, upper end."
- 8/24/71 5.625, no change. The FOMC agrees on no change in policy, with a slight asymmetry toward tightening. The asymmetry is quite weak, however, and the range for the Desk's expected rate in fact moves down slightly.
- 9/21/71 5.5 to 5.25. The FOMC agrees to ease. The Committee appears to want the funds rate to be in the lower half of 5-5.625%, suggesting a rate around 5.1875%. But in the face of low money growth over the intermeeting period, the Desk's expected rate falls only to "5.25, or a shade under." Balancing these somewhat conflicting pieces of evidence suggests an expected rate of about 5.25% on the basis of the policy adopted at this meeting.
- 10/19/71 5.1875 to 5.0625. The FOMC agrees that some easing might be indicated. The Committee wants the funds rate to stay above 5% barring unexpected developments, and the Blue Book for the next meeting suggests that the level of the funds rate expected on the basis of this meeting was about 5.0625%. Consistent with this, the Desk's expected rate falls to 5-5.125% over the two weeks after the meeting.
- 11/16/71 4.75 to 4.375. The FOMC agrees to seek appreciably easier money market conditions. The Committee appears to want a funds rate in the lower half of the range 4.25-4.875%, and the material from the next meeting suggests that the fall in the funds rate to 4.375% over the intermeeting period was not a response to adverse news.
- 12/14/71 4.375 to 3.75. The FOMC in effect adopts a lower bound for the funds rate of 3.625%, with a policy that is expected to lower the rate to near this bound with substantial probability.

1972

- 1/11/72 3.625 to 3.3125. The FOMC agrees to seek a large increase in total reserves to support faster monetary growth. The Committee appears to want to reduce the funds rate immediately to around 3.25%, with a possibility of lowering it further. The Desk's expected rate, however, moves only to slightly below 3.5% and remains there for two weeks despite favorable news about money and reserve growth. Balancing these conflicting considerations suggests an expected funds rate of slightly above 3.25%.
- 2/15/72 3.25, no change. The FOMC agrees that it wants to avoid large changes in money market conditions in either direction. The Committee agrees to seek a rate of growth of reserves available to support private nonbank deposits (RPD's) that the staff projection suggests may possibly be associated with some firming. But one member dissents on the grounds that he believes the policy will in fact lead to easing. Thus, the Committee does not appear to be agreeing on any clear expected change in the funds rate. The Desk's expected rate is not available for the two weeks after the meeting, and is therefore not informative.
- 3/21/72 3.9375 to 4.25. The FOMC agrees not to let the funds rate exceed 4.25% without consultation, but also adopts a goal for RPD's that the staff projects will be likely to require a rate over 4.25%. This suggests that 4.25% is a reasonable estimate for the likely outcome for the funds rate.
- 4/18/72 4.25 to 4.375. The FOMC agrees to a goal for RPD's that the staff projects will lead to a funds rate of 4-5%. But it also agrees to aim to keep the funds rate around 4.25% unless reserve and money growth appear likely to be outside the Committee's desired ranges. These considerations suggest an expected funds rate between 4.25% and 4.5%.
- 5/23/72 4.25 to 4.5625. The FOMC adopts a range for the funds rate of 4.25-5.5%, but with a desire to avoid a large increase and a strong reluctance to let it exceed 5%. This suggests an expected rate slightly below the midpoint of 4.25-5%. Consistent with this, the Desk's expected rate rises gradually over the intermeeting period to just under 4.5% despite low RPD growth.
- 6/19-20/72 4.4375 to 4.5625. The FOMC agrees to a goal for RPD's that the staff projection suggests might be associated with some firming. The Committee appears to want a funds rate above its current level and below 4.75%. The Desk's expected rate rises marginally soon after the meeting.
- 7/18/72 4.625, no change. There is a clear sense that little or no change in interest rates is needed. There is more sentiment on the FOMC for a slight updrift than a slight downdrift, but no important support for any significant change. Further, there is essentially no change in the Desk's expected rate for two weeks after the meeting, and the summary of the next meeting suggests that the small change that did occur after two weeks was a response to high RPD growth.
- 8/15/72 4.75 to 4.875. The FOMC adopts a range for the funds rate of 4.5-5.25%, with a focus on the narrower range 4.75-5%. Consistent with this, the Desk's expected rate rises quickly by 1/8 point; it then rises gradually by another 1/8 point in response to high RPD growth.
- 9/19/72 5 to 5.1875. The FOMC adopts a range for the funds rate of 4.75-5.375%, but with an expectation that the rate is unlikely to go below 5%. The Desk's expected rate moves immediately to 5.125%, and at the next meeting the open-market manager reports that at the time he believed that it was very likely that additional firming would be needed.
- 10/17/72 5.0625 to 5.1875. The FOMC agrees that a fair amount of emphasis should be put on interest rates in implementing policy. It also agrees to seek no immediate change in interest rates, but with a clear asymmetry toward tightening.
- 11/20-21/72 5.0625 to 5.1875. There is again a clear asymmetry toward tightening: the FOMC agrees that the funds rate is unlikely to go below 5% or above 5.5%. This suggests an expected rate between its current level and the midpoint of 5-5.5%.
- 12/19/72 5.375 to 5.625. The funds rate had risen by about 1/8 point between the time of the forecast and the time of the meeting. At the meeting, the FOMC agrees to a range for the funds rate of

5.125-5.875%. But the Committee is clearly reluctant for the rate either to fall from its current level of around 5.5% or to exceed 5.75%.

1973

- 1/16/73 5.75 to 6.25. The FOMC agrees to a range for the funds rate of 5.75-6.375%, but with a clear sense that the rate will move to between 6.125% and 6.375%.
- 2/13/73 6.375 to 6.6875. The FOMC agrees to a range for the funds rate of 6-6.75%, but with a clear sense that the rate will be in the upper part of this range, and with an asymmetry to further tightening. This suggests an expected rate slightly above the midpoint of the upper half of this range, which is 6.5625%.
- 3/19-20/73 7 to 7.125. The FOMC agrees to a range for the funds rate of 6.75-7.5%, with a focus on the narrower range of 7-7.25%.
- 4/17/73 7 to 7.1875. The FOMC adopts a range for the funds rate of 6.875-7.5%, but with money and RPD targets the staff projects are most likely to be consistent with a funds rate in the lower part of this range. The Desk's expected rate moves immediately to 7.25%, however. Balancing these somewhat conflicting pieces of evidence suggests an expected rate of around 7.1875%.
- 5/15/73 7.5 to 8. The FOMC adopts a stated range for the funds rate of 7.25-7.875%, but with a fairly explicit acknowledgement that the range is probably too low to be consistent with its money and RPD targets, and that intermeeting adjustments may be needed. The Desk's expected rate moves immediately to 7.875%, and then gradually to 8.5% over the intermeeting period in response to high money growth. At the next meeting, the open-market manager comments that the stated upper limit of 7.875% had little impact on how policy was conducted. These considerations suggest an expected rate slightly above 7.875%.
- 6/18-19/73 8.5 to 9. The FOMC agrees to a lower target range for RPD growth than the one the staff analysis suggests would be associated with little change in money market conditions, and agrees that money market conditions might be permitted to vary more in the intermeeting period than previously. The Committee adopts a range for the funds rate of 7.75-9.25%, but with a clear expectation that interest-rate increases are likely.
- 7/17/73 9.75 to 10. The FOMC adopts money and RPD targets that the staff projects will be associated with little change in interest rates, but with an asymmetry toward tightening and a willingness to accept non-trivial fluctuations in interest rates.
- 8/21/73 10.5 to 10.75. The FOMC adopts a range for the funds rate of 10-11%, but with a clear expectation that the rate will be in the upper part of the range.
- 9/18/73 10.75 to 10.375. The FOMC agrees to seek a funds rate of 10.5% immediately, with a modest asymmetry toward further easing.
- 10/16/73 10.5 to 9.75. The FOMC agrees to seek a funds rate of 9.75-10%, with a modest asymmetry toward further easing.
- 11/19-20/73 10.125, no change. The FOMC agrees to a range for the funds rate of 9-10.5%, with a focus on the narrower range of 10.125-10.25%. Given the asymmetry of 9-10.5% around 10.125-10.25%, this suggests an expected rate slightly below the midpoint of 10.125-10.25%.
- 12/17-18/73 10.25 to 9.625. The FOMC agrees that in general it will place more emphasis on money market conditions. It also agrees to seek a funds rate of 9.75% initially, with an asymmetry toward further ease.

1974

- 1/21-22/74 9.75 to 9.375. The FOMC agrees to attempt to move the funds rate promptly to 9.25-9.5%.
- 2/20/74 9 to 8.875. The FOMC agrees to seek no immediate change in the funds rate, but with a modest asymmetry toward ease.

- 3/18-19/74 9.1875 to 9.875. The FOMC agrees to seek a funds rate of 9.75% after a few days, with a modest asymmetry toward further tightening.
- 4/15-16/74 9.875 to 10.5. The Desk's expected rate rose from "9.75, or a shade higher" to "10, or somewhat above" between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to seek a funds rate of 10.25-10.5%, with a modest asymmetry toward further tightening.
- 5/21/74 11 to 11.375. The Desk's expected rate rose from 11% to 11.25% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to a range for the funds rate of 11-11.5%, with a modest asymmetry toward tightening.
- 6/18/74 11.625 to 11.875. The Desk's expected rate rose from roughly 11.625% to roughly 11.75% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to a range for the funds rate of 11.25-12.25%, with a focus on the narrower range of 11.75-12%.
- 7/16/74 12.75 to 12.25. Although the stated upper limit of the FOMC's target range remained at 12.25% over the entire intermeeting period, the actual rate was generally over 13% and the FOMC decided in an intermeeting teleconference not to press hard to bring the rate within the target range. Thus it appears that initially the FOMC was aiming for a rate between 12.25% and 13-13.5%. At this meeting, the FOMC agrees to ease, and chooses a new target range centered on 12.25%. The Desk's expected rate moves quickly to around 12.25% and remains there.
- 8/20/74 12.25 to 11.875. The FOMC agrees to a range for the funds rate of 11.5-12.5%, with a focus on 11.75-12%. The Desk's expected rate goes quickly to "12, or a shade below."
- 9/10/74 11.75 to 11.125. The FOMC agrees to seek a funds rate of about 11.25% if money growth rates are within its target ranges, with an asymmetry toward further ease.
- 10/14-15/74 10.4375 to 9.625. The FOMC agrees to seek a funds rate of about 9.75% if money growth rates are within its target ranges, with an asymmetry toward further ease.
- 11/19/74 9.5 to 9.25. The FOMC agrees to ease slightly further, and agrees to a target range for the funds rate of 8.5-10% with no asymmetry.
- 12/16-17/74 8.875 to 8.25. The Desk's expected rate fell from around 8.875% at the time of the forecast to around 8.75% at the time of this meeting. At the meeting, the FOMC agrees to some further easing, with a range for the funds rate of 7.5-9% and an emphasis on the midpoint of the range. The Desk's expected rate falls immediately to 8.25%.

1975

- 1/20-21/75 7.25 to 6.6875. The Desk's expected rate fell from around 7.25% to around 7.125% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to a range for the funds rate of 6.5-7.25%, but with a focus on the bottom part of the range. The Desk's expected rate moves immediately to 6.75-7%, and then gradually to 6.25% over the intermeeting period in response to news. The midpoint of the bottom half of the FOMC's range seems a reasonable estimate of the expected funds rate based on this meeting.
- 2/19/75 6.25 to 5.75. The FOMC agrees that money market conditions will probably have to ease further for its money growth targets to be achieved, and it chooses a range for the funds rate centered on 5.75%. At the next meeting, the open-market manager reports that he had expected to move the funds rate to roughly 5.75% over the intermeeting period.
- 3/18/75 5.75 to 5.25. The FOMC agrees to seek a funds rate of 5.5% immediately. It also agrees that in all likelihood it will soon seek a rate of 5.25%, although unusual circumstances could cause it to aim either higher or lower. At the next meeting, the open-market manager reports that he had expected to move the rate to 5.25%.

- 4/14-15/75 5.5 to 5.375. The FOMC chooses a range for the funds rate of 4.75-5.75%. But it agrees to initially seek a range around 5.5%, and then to let the rate drift gradually down toward 5.25% but to avoid aggressive efforts to reach that rate.
- 5/20/75 5.125, no change. The FOMC agrees to emphasize money market conditions more than before, and to seek to attempt to maintain conditions similar to those now prevailing. There is a hint of a slight asymmetry toward ease, but not enough to point to a noticeable expected fall in the funds rate.
- 6/16-17/75 5.25 to 5.625. The FOMC agrees to a range for the funds rate of 5-6% and to initially seek a rate of 5.5%, but with an asymmetry toward further tightening.
- 7/15/75 6 to 6.125. The FOMC agrees to seek roughly unchanged money market conditions, with an asymmetry toward tightening. Its new range for the funds rate is centered on 6.125%.
- 8/19/75 6.1875, no change. The FOMC agrees to seek a funds rate in its current range of 6.125-6.25%, with no asymmetry.
- 9/16/75 6.125 to 6.375. The FOMC agrees to a range for the funds rate of 6-7%, but not to go above 6.75% without consultation. The Desk's expected rate moves quickly to 6.25-6.5%.
- 10/21/75 5.75 to 5.5. The FOMC agrees that in the absence of significant news, it will seek a funds rate of around 5.5%.
- 11/18/75 5.25 to 5. The FOMC agrees to a range for the funds rate of 4.5-5.5%, and to seek to move the rate to 5% barring unusual developments. At the next meeting, the open-market manager reports that he had expected to move the rate to 5%.
- 12/16/75 5.25, no change. The FOMC agrees to seek to keep the funds rate around its current level of 5.25%. There is a slight asymmetry toward ease, but not enough to point to a noticeable expected fall in the funds rate.

1976

- 1/20/76 4.75, no change. The FOMC agrees to seek to keep the funds rate around its current level of 4.75%.
- 2/17-18/76 4.75, no change. Same as previous meeting.
- 3/15-16/76 4.75, no change. Same as previous meeting.
- 4/20/76 4.75 to 4.875. The FOMC agrees to seek a funds rate around 4.875%, and the Desk's expected rate moves promptly to this level.
- 5/18/76 5.125 to 5.375. The Desk's expected rate rose from 5.125% to 5.25% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to a policy that is likely to involve some modest further firming, and to a range for the funds rate centered on 5.375%. The Desk's expected rate moves promptly to this level.
- 6/22/76 5.5, no change. Although there is some sentiment in the FOMC for a slight tightening, the Committee agrees to a range of 5.25-5.75% for the funds rate, and the Desk's expected rate does not change.
- 7/19-20/76 5.25, no change. There is slightly more sentiment on the FOMC for tightening than for easing, but not enough to point to a noticeable expected rise in the funds rate. Further, the Committee agrees to a range for the funds rate centered on 5.25%, and the Desk's expected rate does not change.
- 8/17/76 5.25, no change. The FOMC agrees to seek to keep the funds rate around its current level of 5.25%.
- 9/21/76 5.25, no change. There is slightly more sentiment on the FOMC for easing than for tightening, but not enough to point to a noticeable expected fall in the funds rate. The midpoint of the new range is 5.125%. However, the Desk's expected rate does not change initially, and the summary of the meeting indicates that the later fall was a response to news.
- 10/19/76 5 to 4.875. The FOMC agrees to seek a funds rate of around 4.875%. In fact, however, the Desk never lowers its expected rate, because the money growth data on 10/21 are unexpectedly high. Nonetheless, the expected reduction agreed to at this meeting is 1/8 point.

- 11/16/76 5 to 4.75. The FOMC agrees to seek a reduction of the funds rate in two steps to 4.75% unless money growth is surprisingly strong. The Desk's expected rate makes these falls.
- 12/20-21/76 4.6875 to 4.625. The Desk's expected rate fell from 4.625-4.75% to 4.625% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to seek to keep the funds rate around its current level.

1977

- 1/17-18/77 4.625 to 4.6875. The FOMC agrees to seek a funds rate between 4.625% and 4.75%.
- 2/15/77 4.6875, no change. The FOMC agrees to seek to keep the funds rate around 4.625-4.75%.
- 3/15/77 4.6875, no change. Despite some sentiment for a slight tightening, the FOMC agrees to seek to keep the funds rate in the area of 4.625-4.75%.
- 4/19/77 4.6875 to 4.8125. The Desk's expected rate rose from 4.625-4.75% to 4.75% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to seek a funds rate of about 4.75%. There is some discussion of a target of 4.875%, however, and the Committee's new range for the rate is centered on 4.875%. The Desk's expected rate moves promptly to "4.75, or a shade higher."
- 5/17/77 5.25 to 5.375. The FOMC agrees to seek a funds rate around 5.375%.
- 6/21/77 5.375, no change. The FOMC agrees to seek to keep the funds rate around its current level of 5.375%.
- 7/19/77 5.375, no change. Although there is a little sentiment for tightening, the FOMC agrees to seek to maintain the funds rate at its current level of 5.375%. The summary of the next meeting states that the change in the targeted rate later in the month was a response to news.
- 8/16/77 5.875 to 6. The Desk's expected rate rose from 5.875% to 6% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to seek to maintain the funds rate at about the prevailing level of 6%.
- 9/20/77 6.125 to 6.25. The FOMC agrees to seek a funds rate of about 6.25%, and the Desk's expected rate rises promptly to this level.
- 10/17-18/77 6.5, no change. Although there is a little sentiment for tightening, the FOMC agrees to seek to maintain the funds rate around its current level of 6.5%. The Desk's expected rate does not change.
- 11/15/77 6.5, no change. The FOMC agrees to seek to maintain the funds rate around its current level of 6.5%.
- 12/19-20/77 6.5, no change. Same as previous meeting.

1978

- 1/17/78 6.75, no change. The FOMC agrees to maintain the funds rate around its current level of 6.75%. There is a slight asymmetry toward tightening, but not enough to point to a noticeable expected rise.
- 2/28/78 6.75, no change. Similar to previous meeting, though the asymmetry appears even milder.
- 3/21/78 6.75, no change. Similar to the January meeting. When money growth is unexpectedly high during the intermeeting period, the Desk does not act to raise the funds rate; this supports the view that the intended policy is not strongly asymmetric.
- 4/18/78 6.75 to 7. The FOMC agrees to seek a funds rate slightly above its current level of 6.75%. The Desk's expected rate moves immediately to 7%, and the summary of the next meeting states that this move was taken in accordance with the Committee's decision at this meeting.
- 5/16/78 7.3125 to 7.5. The FOMC agrees to seek a funds rate slightly higher than its current level, which is described as between 7.25% and 7.375%, or as slightly above 7.25%. The Desk's expected rate moves immediately to 7.5%, and the summary of the next meeting states that this move was taken in accordance with the Committee's decision at this meeting.

- 6/20/78 7.5 to 7.75. The FOMC agrees to seek a funds rate of 7.75%, and the Desk's expected rate moves promptly to this level.
- 7/18/78 7.75 to 7.875. The FOMC agrees to seek a funds rate between 7.75% and 8%, and the Desk's expected rate moves promptly to 7.875%.
- 8/15/78 7.875 to 8. The FOMC agrees to seek a funds rate of around 8%, and the Desk's expected rate moves promptly to this level. Somewhat surprisingly, its expected rate then moves to 8-8.125% on 8/21; there is no evidence that this is a response to a decision reached at this meeting, however.
- 9/19/78 8.375 to 8.5. The FOMC agrees to seek a funds rate of around 8.5%, and the Desk's expected rate moves promptly to this level. There is a little sentiment for more tightening, but it is not strong and no asymmetry is agreed to. The Desk's expected rate rises to 8.625% on 9/22, but there is no evidence that this is a response to a decision reached at this meeting, and the summary of the next meeting suggests that it may have been a response to news.
- 10/17/78 8.75 to 9. The FOMC agrees to seek a funds rate around 9%, and the Desk's expected rate moves promptly to this level.
- 11/21/78 9.6875 to 9.875. The FOMC agrees to seek a funds rate of around 9.875%, and the Desk's expected rate moves promptly to this level.
- 12/19/78 9.875 to 10.0625. The FOMC agrees to seek a funds rate of 10% or slightly higher, and the Desk's expected rate moves promptly to "10, preferring slightly above to below."

1979

- 2/6/79 10.0625, no change. The FOMC agrees to seek to maintain the funds rate at about its current level of 10% or slightly higher, and the Desk's expected rate remains unchanged at "10, or slightly above."
- 3/20/79 10.0625, no change. Same as previous meeting.
- 4/17/79 10.0625, no change. Same as previous meeting.
- 5/22/79 10.25, no change. The FOMC agrees to seek to maintain the funds rate at about its current level of 10.25%, and the Desk's expected rate is unchanged at this level.
- 7/11/79 10.25, no change. Same as previous meeting.
- 8/14/79 10.625 to 11. The FOMC agrees to seek a funds rate of about 11%, and the Desk's expected rate moves promptly to this level.
- 9/18/79 11.375 to 11.5. The FOMC agrees to seek a funds rate of about 11.5%, and the Desk's expected rate moves promptly to this level.
- 10/6/79 11.5 to 14.5. As part of its change in operating procedures, the FOMC widens its range for the funds rate to 11.5-15.5%, and agrees to place much less emphasis on the funds rate. The Committee anticipates that the policy adopted at this meeting will lead to a prompt increase in the funds rate. Two pieces of evidence suggest that 14.5% is a reasonable estimate of the expected level of the rate implied by the policy adopted at this meeting. First, the Committee believes that the rate is much more likely to be in the upper half of its target range than in the lower half; the midpoint of the upper half is 14.5%. Second, the Desk's expected rate moves immediately to 13%, and then to "might be pushed into upper portions of 11.5-15.5." It then rises to 15.5% or above, but the summary of the next meeting makes it clear that this was in part a response to news.
- 11/20/79 13.5, no change. The FOMC agrees to keep the range of 11.5-15.5%, which is centered on the current level of 13.5%, with no indication that it expects the funds rate to move in one direction or the other. The Desk's expected rate remains steady at 13-14%.

1980

- 1/8-9/80 13.5, no change. The FOMC agrees to keep the range for the funds rate at 11.5-15.5%, and there is no indication that it desires any change in the rate from the generally prevailing recent level, neglecting transitory factors, of around 13.5%. The Desk's expected rate is "down somewhat from the 14 recent level."
- 2/4-5/80 13.5 to 14. The FOMC agrees that the monetary aggregates are more or less on course, and agrees to keep the range for the funds rate at 11.5-15.5%. But it wants money growth to slow, and does not appear to think that this will happen on its own. Thus there appears to be a modest tightening. In light of the volatility of the funds rate, this suggests an expected move of roughly 1/2 point. The Desk's expected rate is missing for the two weeks after the meeting, and is then 14.5-15%. The summary of the next meeting suggests that there was significant news by mid-February, however.
- 3/18/80 16.5 to 18.25. It is clear that the FOMC is choosing a policy that it anticipates will produce a funds rate higher than the current level of both the actual rate and the Desk's expected rate of about 16.5%. The Committee raises the lower limit of its range for the rate by 1.5 points and the upper limit by 2, suggesting an expected tightening of about 1.75 points. Similarly, the average of the current level of the rate and the upper limit of the range is 18.25%. The Desk's expected rate is not very informative: it is missing for a week, then 16-18%, and then suggests that the rate could go close to 20%.
- 4/22/80 18.375 to 14.5. It is clear that the FOMC expects a substantial fall in the funds rate. For example, the one member who wants only a moderate loosening dissents on the grounds that he believes that policy adopted will lead to an excessive fall in rates. The Desk's expected rate moves immediately to 14-15%.
- 5/20/80 10.875 to 9.5. Again, it is clear that the FOMC expects the funds rate to fall. The Desk's expected rate moves immediately to "decline .. to not below 9.5%," and the summary of the next meeting does not attribute any of the decline in the rate to about 9.375% in the intermeeting period to news. Similarly, the average of the current rate and the bottom of the Committee's range is 9.6875%, and the midpoint of the lower half of the Committee's range is 9.875%. All of this suggests an expected fall to the vicinity of 9.5%.
- 7/9/80 9.375, no change. There is no discussion of expectations about the funds rate in the meeting summary, and the Desk's expected rate is missing around this meeting. But the fact that the Committee leaves the lower end of its range unchanged at 8.5%, only moderately below the current level, suggests that it does not expect a noticeable decline in the rate. And the fact that the summary indicates that the Committee will accept higher money growth if demand rises suggests that it does not expect a noticeable rise.
- 8/12/80 9.625 to 9.875. Most members support a policy that would not be expected to lead to any clear change in the funds rate in either direction. But a few members favor a more restrictive policy, and the FOMC adopts objectives for money growth marginally lower than those the majority had been discussing. This suggests a slight tightening. Consistent with this, the Desk's expected rate rises slightly.
- 9/16/80 10.25 to 11.25. The funds rate rose from about 10.25% to about 10.75% between the time of the forecast and the time of this meeting. At the meeting, the FOMC expresses a strong desire to reduce money growth, although it thinks that this may not require an immediate change in money market conditions. Thus there appears to be a clear asymmetry toward tightening. In light of the volatility of the funds rate, this suggests an additional expected increase of roughly 1/2 point. Broadly consistent with this, the Desk's expected rate changes little initially but ends up rising above 12% in response to news.
- 10/21/80 12.125 to 13.625. The Desk's expected rate rose from "12, or somewhat higher" to 12.5-13% between the time of the forecast and the time of this meeting. At the meeting, the FOMC adopts targets for money growth somewhat lower than ones it believes would lead to little expected change in money market conditions. This suggests some immediate tightening.

- Consistent with this, the Desk's expected rate rises immediately to "13, or somewhat higher." Further, there is a clear asymmetry toward tightening. In light of the volatility of the funds rate, this suggests an additional expected increase in the rate of roughly 1/2 point.
- 11/18/80 14.5 to 16.25. The funds rate rose from about 14.5% to about 16.25% between the time of the forecast and the time of this meeting; much of this rise was associated with an increase in the discount rate on November 14. At the meeting, the FOMC gives no clear indication of any noticeable expected additional change in the rate in either direction. Surprisingly, the Desk's expected rate goes directly from 14-15% to "might go above 17." In light of the discussion at this meeting and the fact that the Committee chooses an upper end of 17% for its range, however, it is not possible to attribute all of this move to a decision made at this meeting.
- 12/18-19/80 18.75 to 18. Shortly before the forecast, the FOMC agreed to not be precisely bound by its upper limit for the funds rate of 18%, and the actual rate rose to around 18.75% at the time of the forecast. By the time of this meeting, the rate had risen to around 19.75%. At the meeting, the FOMC wants and expects the rate to fall from its recently prevailing level of 18.75-19.75%. The Desk's expected rate is missing for a week and then falls to 17-18%. The summary of the next meeting attributes some of this decline to news, however. All of this suggests an expected fall to the vicinity of 18%.

1981

- 2/2-3/81 17.5 to 17. The Desk had been expecting a funds rate of 17-18%, neglecting some transitory factors. At this meeting, there is little discussion of the funds rate, though the tone of the discussion suggests that the FOMC thinks a fall is much more likely than a rise. In addition, the FOMC adopts a borrowings target that both the open-market manager and the staff expect to be associated with a small decline in the funds rate. The Desk's expected rate goes promptly to 16-18%.
- 3/31/81 15 to 15.875. The FOMC agrees to a range for the funds rate centered on 15.5%, and to a policy that the staff expects will be associated with some increase in interest rates. In addition, there is a clear asymmetry toward additional tightening; given the volatility of the funds rate, this suggests a non-negligible further expected increase in the funds rate. The Desk's expected rate is missing for a week, but then moves to "some firming above 15.5."
- 5/18/81 18.5 to 20. The FOMC agrees that it wants to maintain restraint, and to reduce money growth rather quickly. The staff expects a funds rate of 19-20%. However, the FOMC agrees to an asymmetry toward further tightening, and the Desk's expected rate moves immediately to 20%. The summary of the next meeting indicates that the news in the intermeeting period suggested low money growth, so it is not possible to attribute any of the move to 20% to news.
- 7/6-7/81 18.5 to 17.5. The FOMC lowers its range for the funds rate despite the fact that the current rate is near the middle of the initial range, and chooses a borrowings target that the staff expects to produce a funds rate of 17-18%. The Desk's expected rate, neglecting some temporary factors, falls from 18-19% to 17-18%.
- 8/18/81 18 to 17.5. The summary of the meeting suggests that no major change in policy is intended. But there are indications of a modest loosening. Some Committee members want policy to focus more on interest rates and explicitly advocate a small decline. And the Committee agrees to discount the rapid growth in M2. The Desk's expected rate is missing for a week and then falls to 17%; the summary of the next meeting indicates that some of this fall was a response to news, however.
- 10/5-6/81 15.5 to 14.5. There again appears to be a modest loosening without a major change in policy. In particular, the Committee wants money growth to rise. The FOMC adopts a borrowings target that the staff expects will lead to a funds rate of 14.5-15.5%, with an asymmetry toward further easing. The Desk's expected rate moves promptly to 14.5-15.5%.

- 11/17/81 13.5 to 12.5. The FOMC agrees that it wants interest rates to fall. It agrees to a borrowings target that it expects will produce a funds rate around 13%, and to an asymmetry toward further easing.
- 12/21-22/81 12.125 to 11.875. The FOMC agrees not to seek an immediate change in the funds rate, but with a mild asymmetry toward easing.

1982

- 2/1-2/82 14 to 14.5. The FOMC adopts reserve and money targets slightly tighter than ones the staff expects would be associated with little change in interest rates, and the Desk's expected rate rises immediately to 14-15% and remains there.
- 3/29-30/82 14.75 to 14.25. The Desk's expected rate moves from "close to 15" at the time of the forecast, to 14-15% before this meeting, and to 14% and then to 14-14.5% after the meeting. The discussion at this meeting does not point to any large expected change in interest rates in either direction from the level prevailing at the time of the meeting, though there appears to be more support for lower than for higher interest rates.
- 5/18/82 14 to 13.25. The FOMC adopts a reserves target that the staff expects will be associated with a funds rate around 13.5%, with a mild asymmetry toward further easing. The Desk's expected rate falls from 14% before the forecast, to "14, or somewhat under" at the time of the meeting, to 13.5% immediately after.
- 6/30-7/1/82 14 to 13.5. The FOMC adopts a borrowings target that it expects will lead to a funds rate of 13.5-14%, with an asymmetry toward further easing.
- 8/24/82 10.25 to 9.5. The FOMC appears to desire a funds rate in the 9-10% range. The Desk's expected rate is unclear for a week, but is then "around 9.5."
- 10/5/82 10.25 to 9.5. Beginning roughly with this meeting, credit market conditions play a more prominent role in discussions of policy. Here, the FOMC agrees that it wants somewhat reduced pressures in credit markets, and is willing to accept money growth above its target. It adopts a range for the funds rate of 7-10.5%, but with an expectation that the rate is more likely to be above than below the middle of the range. The Desk's expected rate falls quickly to 9.5%.
- 11/16/82 9.5 to 9. The FOMC agrees to ease; a funds rate around 9% is often mentioned. The Desk's expected rate falls quickly to 9%.
- 12/20-21/82 8.5, no change. Although there is slight sentiment for some easing, it is not enough to point to a noticeable expected fall in the funds rate. The Desk's expected rate is steady at 8.5%.

1983

- 2/8-9/83 8.5, no change. The FOMC agrees to maintain the existing degree of restraint on reserve positions. The Desk's expected rate is steady at 8.5%.
- 3/28-29/83 8.5 to 8.625. Policy shifted to a slightly less accommodate stance between the time of the forecast and the time of this meeting. Here the FOMC agrees to a policy that it expects to yield a funds rate of 8.5-8.75%, and the Desk's expected rate is steady at "slightly above" 8.5%.
- 5/24/83 8.625 to 8.875. The FOMC votes for a policy of marginally more restraint. The Desk's expected rate rises from "8.5, close to or slightly above" to "8.75, or somewhat higher."
- 7/12-13/83 9.0625 to 9.375. The FOMC agrees to seek a funds rate above its current level but below 9.5%. The Desk's expected rate moves from "9, or somewhat higher" to 9.25-9.5%.
- 8/23/83 9.5625 to 9.5. The FOMC agrees to a policy that it expects will produce a funds rate around 9.5%
- 10/4/83 9.375, no change. The FOMC agrees to make no further adjustment in the degree of reserve restraint.

- 11/14-15/83 9.375, no change. Although there is some sentiment for slight tightening, the FOMC agrees to maintain the current degree of restraint, and the Desk's expected rate is steady at 9.25-9.5%.
- 12/19-20/83 9.5 to 9.625. The FOMC agrees to maintain at least the existing degree of restraint, with a strong asymmetry toward tightening. The Committee expects that if there is a tightening, it will be 1/4 point. This suggests an expected increase in the funds rate of roughly 1/8 point.

1984

- 1/30-31/84 9.375, no change. The FOMC agrees to seek to maintain the existing degree of restraint. There is a slight asymmetry toward loosening, but not enough to point to a noticeable expected fall in the funds rate.
- 3/26-27/84 10.125 to 10.5. The FOMC adopts a policy that it expects will yield a funds rate of around 10.25-10.5% if the Board of Governors does not increase the discount rate, and around 10.5-10.75% if it does. The FOMC appears quite uncertain about whether the discount rate will rise; thus a reasonable estimate of the likely funds rate is 10.5%.
- 5/21-22/84 10.5, no change. The FOMC agrees that no change should be made in the degree of pressure on reserve positions.
- 7/16-17/84 11 to 11.375. The Desk's expected rate rose from 11 to "11, or a touch higher" between the time of the forecast and the time of this meeting, and the actual rate rose to around 11.25%. At the meeting, the FOMC agrees to maintain the existing degree of restraint on reserve positions, with a clear asymmetry toward further tightening. This suggests an expected level of the funds rate slightly above its current level of 11.25%. The Desk's expected rate rises immediately to 11.25%, and then further over the course of the intermeeting period.
- 8/21/84 11.5625 to 11.5. The evidence from this meeting reveals no signs of a clear desire to move the funds rate in a particular direction, but does suggest some preference for a marginal easing. Thus the evidence is consistent with a slight fall in the expected funds rate. Both the behavior of the Desk's expected rate and the open-market manager's discussion at the next meeting suggest the same conclusion.
- 10/2/84 11.25 to 10.875. The Desk's expected rate fell from 11.25% to 11% immediately after the forecast. At this meeting, the FOMC agrees to maintain the lesser degree of pressure on reserve positions attained in recent weeks, but with a modest asymmetry toward further easing.
- 11/7/84 10 to 9.25. The FOMC agrees to ease, and most members favor doing so in steps. The Desk's expected rate falls immediately to 9.5%, then to 9% two weeks after the meeting, then to 8.75% two weeks after that. The summary of the next meeting suggests, however, that some of this overall reduction was a response to news. This suggests that the expected reduction as of this meeting was roughly 3/4 point.
- 12/17-18/84 8.75 to 8.125. The FOMC agrees to seek a funds rate of 8.5% or somewhat lower. In addition, the Committee believes that a cut in the discount rate is likely, and that this will lead to a further reduction in the funds rate. The Desk's intended funds rate falls quickly to 8.5%, then to 8-8.25% a week later following a cut in the discount rate.

1985

- 2/12-13/85 8.5, no change. The FOMC agrees to seek to keep the funds rate around its current level of 8.5%.
- 3/26/85 8.5, no change. Similar to previous meeting.
- 5/21/85 8.125 to 7.75. The Desk appears to have been aiming for a funds rate of about 8-8.25% before the forecast, but lowered its intended rate to 7.75% between the time of the forecast and the time of this meeting. At this meeting, the FOMC agrees to maintain the current degree of restraint.

- 7/9-10/85 7.625, no change. The FOMC agrees to maintain the current degree of pressure on reserve positions. There is a slight asymmetry toward tightening, but not enough to point to a noticeable expected rise in the funds rate. The immediate reduction in the Desk's intended rate from 7.75% to 7.625-7.75% appears to be simply an alignment of the intended rate with how policy was being conducted.
- 8/20/85 7.8125, no change. The FOMC agrees to maintain the slightly firmer degree of reserve restraint sought in recent weeks. The Desk's intended rate in fact rises immediately from 7.75% to 7.75-8%. The summary of the meeting suggests, however, that the change is simply an alignment of the intended rate with how policy was being conducted.
- 10/1/85 7.875, no change. The FOMC agrees to maintain the degree of reserve pressure sought in recent weeks.
- 11/4-5/85 8 to 7.9375. The FOMC agrees to maintain about the current degree of reserve restraint, but with the expectation of a slight downdrift in the funds rate and a slight asymmetry toward further ease. The Desk's intended rate moves from 8% to "8-."
- 12/16-17/85 7.9375 to 7.75. The FOMC agrees to a slight easing, and the Desk's intended rate falls immediately from "8-" to 7.75%. There is a slight asymmetry toward further easing, but not enough to point to an expected funds rate noticeably below 7.75%.

1986

- 2/11-12/86 7.8125, no change. The FOMC agrees to seek unchanged conditions of reserve availability.
- 4/1/86 7.375, no change. Similar to previous meeting.
- 5/20/86 6.875, no change. The FOMC agrees to seek no change in the degree of pressure on reserve conditions. There is a slight asymmetry toward tightening, but not enough to point to a noticeable expected rise in the funds rate. The immediate rise in the Desk's intended rate from 6.75% to 6.75-6.875% appears to be an alignment of the intended rate with how policy was being conducted.
- 7/8-9/86 6.875 to 6.375. The FOMC agrees to ease in conjunction with the pending 1/2 point cut in the discount rate, and the Desk's intended rate falls from 6.75-7% to 6.25-6.5% on July 11.
- 8/19/86 6.3125 to 5.9375. The FOMC agrees to some slight easing. It clearly wants the funds rate to decline by less than the pending reduction of 1/2 point in the discount rate. The Desk's intended rate falls to 5.75-6%. Since the FOMC expresses a clear desire for a fall of less than 1/2 point, we conclude that it wanted the Desk to aim for the upper part of this range.
- 9/23/86 5.875, no change. The FOMC agrees to seek no change in the degree of pressure on reserve conditions. There is a slight asymmetry toward tightening, but not enough to point to a noticeable expected rise in the funds rate.
- 11/5/86 5.875, no change. The FOMC agrees to seek no change in the degree of pressure on reserve conditions.
- 12/15-16/86 6, no change. The FOMC agrees to seek no change in the degree of pressure on reserve conditions, with a very slight asymmetry toward ease.

1987

- 2/11-12/87 6, no change. The FOMC agrees to seek no change in the degree of pressure on reserve conditions. There is a slight asymmetry toward tightening, but not enough to point to a noticeable expected rise in the funds rate.
- 3/31/87 6.0625 to 6.25. The FOMC agrees that it wants the funds rate to remain around its current level of about 6.25%, rather than at the Desk's intended level of around 6-6.125%. The Desk's reported intended funds rate does not change for several weeks, but the open-market manager reports at the next meeting that reserve provision immediately became more cautious.

- 5/19/87 6.5 to 6.75. The FOMC agrees that it wants the funds rate to remain around its current level of about 6.75%, rather than at the Desk's intended level of 6.5%. The Desk's intended rate rises immediately to 6.75%.
- 7/7/87 6.75, no change. The FOMC agrees to seek no change in the degree of pressure on reserve positions. Although the Desk's intended rate fell from 6.75% to 6.5-6.75% shortly before the meeting, the actual rate did not fall, and at this meeting the baseline level is clearly viewed as 6.75%.
- 8/18/87 6.625, no change. The FOMC agrees to seek no change in the degree of pressure on reserve conditions. There is a slight asymmetry toward tightening, but not enough to point to a noticeable expected rise in the funds rate.
- 9/22/87 7.25, no change. The Desk had been seeking a funds rate of 7.25% since early September, although the actual rate had generally been somewhat lower. The FOMC agrees that it wants to achieve the degree of reserve pressure sought in recent weeks, clearly implying that it wants the Desk to continue to aim for a rate around 7.25%.
- 11/3/87 7.125 to 6.8125. The Desk's intended rate was reduced from 7-7.25% at the time of the forecast to 7% at the time of this meeting. At the meeting, the FOMC agrees that it would like the rate to fall to 6.75-6.875%, with a slight asymmetry toward further ease. The Desk's intended rate immediately falls to 6.75-6.875%.
- 12/15-16/87 6.8125, no change. The FOMC agrees to seek to maintain the degree of reserve pressure sought in recent days. The Desk's intended rate of 6.75-6.875% does not change.

1988

- 2/9-10/88 6.625 to 6.5. The FOMC agrees to a borrowings target that it expects will produce a funds rate of around 6.5%.
- 3/29/88 6.5 to 6.75. The FOMC agrees to a slight increase in the degree of pressure on reserve positions, and the Desk's intended rate rises immediately from 6.5% to 6.75%.
- 5/17/88 7 to 7.25. The FOMC agrees to a slight firming after a short interval unless there are significant unexpected developments, with a slight asymmetry toward further tightening. The Desk's intended rate moves from 7% to 7.25% on May 25.
- 6/29-30/88 7.375 to 7.625. The FOMC agrees to a policy that it expects will lead to a funds rate of 7.5% or a shade higher, with a slight asymmetry to further tightening.
- 8/16/88 8.125, no change. The FOMC agrees to maintain the current degree of pressure on reserve positions. There is a slight asymmetry toward tightening, but not enough to point to a noticeable expected rise in the funds rate.
- 9/20/88 8.125, no change. The FOMC agrees to a policy that it expects will keep the funds rate around 8.125%. There is an asymmetry toward tightening, but the Committee feels that it is unlikely to be acted on before the next meeting.
- 11/1/88 8.25, no change. The FOMC agrees to maintain roughly the current degree of pressure on reserve positions. There is a somewhat complicated asymmetry. On the one hand, the stated policy is asymmetric toward tightening, though to a degree that is explicitly less than at the previous meeting. On the other hand, policy is still to some extent being formulated in terms of its implications for borrowings, and some members believe that the policy agreed to is more likely to lead to a slight decline than to a slight rise in the funds rate. In any event, the evidence does not point to any clear expected change in the funds rate.
- 12/13-14/88 8.4375 to 9. The FOMC agrees to seek some immediate firming, followed by some further tightening at the start of 1989 unless there are significant unexpected developments. The Committee expects the funds rate to end up either slightly above or slightly below 9% by the end of the intermeeting period. The Desk's intended rate rises gradually to 9% by early January.

1989

- 2/7-8/89 9 to 9.1875. The FOMC agrees that, depending on circumstances, policy should aim either to maintain the funds rate around its current level of 9-9.125% (rather than at the Desk's intended level of 9%) or to increase it by roughly 1/4 point from that level.
- 3/28/89 9.75 to 9.875. The FOMC agrees to maintain the current degree of pressure on reserve positions, but with a clear asymmetry toward tightening.
- 5/16/89 9.8125, no change. The FOMC agrees to seek no change in the degree of pressure on reserve positions.
- 7/5-6/89 9.5625 to 9.3125. The FOMC agrees to attempt to reduce the funds rate from 9.5-9.625% to 9.25-9.375%.
- 8/22/89 9.0625, no change. The FOMC agrees to maintain the current degree of pressure on reserve positions. There is a slight asymmetry toward easing, but not enough to point to a noticeable expected fall in the funds rate.
- 10/3/89 9, no change. Similar to previous meeting.
- 11/14/89 8.5, no change. Similar to previous meeting.
- 12/18-19/89 8.5 to 8.25. The FOMC agrees to a slight easing, and the Desk's intended rate falls immediately from 8.5% to 8.25%.

1990

- 2/6-7/90 8.25, no change. The FOMC agrees to seek an unchanged degree of pressure on reserve positions, with no asymmetry.
- 3/27/90 8.25, no change. Same as previous meeting.
- 5/15/90 8.25, no change. Same as previous meeting.
- 7/2-3/90 8.25 to 8. The FOMC agrees to seek no immediate change, but to seek to lower the funds rate by 1/4 point fairly soon in the absence of unexpected developments. The Desk's intended rate falls from 8.25% to 8% on July 13.
- 8/21/90 8, no change. The FOMC agrees to seek an unchanged degree of pressure on reserve positions. There is an asymmetry toward ease, but the FOMC agrees that policy will not change unless something relatively unexpected occurs.
- 10/2/90 8 to 7.75. The FOMC agrees that it will not seek any immediate change, but that there is a presumption that it will seek to lower the funds rate by 1/4 point if the anticipated budget agreement between Congress and the President is reached. The Desk's intended rate falls from 8% to 7.75% on October 29, immediately after the agreement.
- 11/13/90 7.75 to 7.5. The FOMC agrees to seek to lower the funds rate by 1/4 point, with a modest asymmetry toward further easing. The Desk's intended rate immediately falls from 7.75% to 7.5%.
- 12/18/90 7.25 to 7. The FOMC agrees to seek to lower the funds rate by 1/4 point, and the Desk's intended rate immediately falls from 7.25% to 7%. There is a slight asymmetry toward further easing, but not enough to point to an expected rate noticeably below 7%.

1991

- 2/5-6/91 6.75 to 6.25. The Desk's intended rate was lowered from 6.75% to 6.25% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to seek an unchanged degree of pressure on reserve positions, with a slight asymmetry toward ease.
- 3/26/91 6, no change. The FOMC agrees to seek an unchanged degree of pressure on reserve positions, with no asymmetry.
- 5/14/91 5.75, no change. Same as previous meeting.
- 7/2-3/91 5.75, no change. Same as previous meeting.

- 8/20/91 5.5, no change. The FOMC agrees to seek an unchanged degree of pressure on reserve positions, with a slight asymmetry toward ease.
- 10/1/91 5.25, no change. Same as previous meeting.
- 11/5/91 5.25 to 4.75. The Desk's intended rate was lowered from 5.25% to 5% between the time of the forecast and the time of this meeting. At the meeting, the FOMC agrees to lower its target for the funds rate to 4.75%, and the intended falls rate immediately falls to 4.75%. There is also a slight asymmetry toward further ease.
- 12/17/91 4.5 to 4.25. The FOMC agrees to seek no immediate change, but with a strong presumption that there will be a subsequent easing of 1/4 point. The Desk's intended rate in fact falls from 4.5% to 4% on December 20. The account of the next meeting indicates, however, that this move was prompted by news that arrived after the meeting.

1992

- 2/4-5/92 4, no change. The FOMC agrees to seek no change in policy, with a slight asymmetry toward ease.
- 3/31/92 4, no change. The FOMC agrees to seek no change in policy, with a slight asymmetry toward ease. The summary of the next meeting attributes the cut in the Desk's intended rate to 3.75% on April 9 to news.
- 5/19/92 3.75, no change. The FOMC agrees to seek no change in policy, with no asymmetry.
- 6/30-7/1/92 3.75 to 3.625. The FOMC agrees to seek no change, but with a clear asymmetry toward ease. The Desk in fact reduces its intended rate to 3.25% on July 2, but this is the result of highly unexpected news.
- 8/18/92 3.25 to 3.125. The FOMC agrees to seek no change, but with a clear asymmetry toward ease.
- 10/6/92 3 to 2.75. The FOMC agrees that it will seek no immediate change, but that it will ease in the absence of unexpected developments. In fact, the Desk's intended rate remains unchanged; the summary of the next meeting attributes this to unexpected news, however.
- 11/17/92 3, no change. The FOMC agrees to seek no change, with a slight asymmetry toward ease.
- 12/22/92 3, no change. The FOMC agrees to seek no change, with no asymmetry.

1993

- 2/2-3/93 3, no change. Same as previous meeting.
- 3/23/93 3, no change. Same as previous meeting.
- 5/18/93 3 to 3.125. The FOMC agrees to seek no change. But there is substantial support for an immediate tightening, and the Committee agrees to an asymmetry toward tightening with an expectation that it is more likely than not that the Committee will at least confer during the intermeeting period.
- 7/6-7/93 3, no change. The FOMC agrees to seek no change, with a slight asymmetry toward tightening.
- 8/17/93 3, no change. The FOMC agrees to seek no change, with no asymmetry.
- 9/21/93 3, no change. Same as previous meeting.
- 11/16/93 3, no change. Same as previous meeting.
- 12/21/93 3, no change. Same as previous meeting.

1994

- 2/3-4/94 3 to 3.25. The FOMC agrees to seek to raise the funds rate by 1/4 point, with no asymmetry. For the first time, the Committee announces the change in the target funds rate.

3/22/94 3.25 to 3.5. The FOMC again agrees to seek to raise the funds rate by 1/4 point, with no asymmetry.

5/17/94 3.75 to 4.25. The FOMC agrees to seek to raise the funds rate by 1/2 point, with no asymmetry.

7/5-6/94 4.25, no change. The FOMC agrees to seek no immediate change, with a slight asymmetry toward tightening.

8/16/94 4.25 to 4.75. The FOMC agrees to seek to raise the funds rate by 1/2 point, with no asymmetry.

9/27/94 4.75 to 4.875. The FOMC agrees to seek no immediate change, but with a clear asymmetry toward tightening and a clear sense that there is a good chance of a tightening during the intermeeting period.

11/15/94 4.75 to 5.5. The FOMC agrees to seek to raise the funds rate by 3/4 point, with no asymmetry.

12/20/94 5.5, no change. The FOMC agrees to seek no immediate change. There is an asymmetry toward tightening, but with a clear sense that an intermeeting move is unlikely.

1995

1/31-2/1/95 5.5 to 6. The FOMC agrees to seek to raise the funds rate by 1/2 point, with no asymmetry.

3/28/95 6, no change. The FOMC agrees to seek no immediate change, with a slight asymmetry toward tightening.

5/23/95 6, no change. The FOMC agrees to seek no immediate change, with no asymmetry.

7/5-6/95 6 to 5.75. The FOMC agrees to seek to lower the funds rate by 1/4 point, with a slight asymmetry toward further ease.

8/22/95 5.75, no change. The FOMC agrees to seek no immediate change, with no asymmetry.

9/26/95 5.75, no change. Same as previous meeting.

11/15/95 5.75, no change. Same as previous meeting.

12/19/95 5.75 to 5.5. The FOMC agrees to seek to lower the funds rate by 1/4 point, with no asymmetry.

1996

1/30-31/96 5.5 to 5.25. The FOMC agrees to seek to lower the funds rate by 1/4 point, with no asymmetry.

3/26/96 5.25, no change. The FOMC agrees to seek no immediate change, with no asymmetry.

5/21/96 5.25, no change. Same as previous meeting.

7/2-3/96 5.25, no change. The FOMC agrees to seek no immediate change, with a slight asymmetry toward tightening.

8/20/96 5.25, no change. Same as previous meeting.

9/24/96 5.25, no change. Same as previous meeting.

11/13/96 5.25, no change. Same as previous meeting.

12/17/96 5.25, no change. Same as previous meeting.

TABLE A-1

Changes in Intended Federal Funds Rate at FOMC Meetings

Meeting Date	Initial Intended Rate (%)	Change in Intended Rate (%)	Meeting Date	Initial Intended Rate (%)	Change in Intended Rate (%)	Meeting Date	Initial Intended Rate (%)	Change in Intended Rate (%)
1/14/69	6.4375	0.0000	7/18/72	4.6250	0.0000	5/18/76	5.1250	0.2500
2/4/69	6.4375	0.0000	8/15/72	4.7500	0.1250	6/22/76	5.5000	0.0000
3/4/69	6.7500	-0.1250	9/19/72	5.0000	0.1875	7/20/76	5.2500	0.0000
4/1/69	6.7500	0.5000	10/17/72	5.0625	0.1250	8/17/76	5.2500	0.0000
4/29/69	7.6875	0.2500	11/21/72	5.0625	0.1250	9/21/76	5.2500	0.0000
5/27/69	8.5000	0.1250	12/19/72	5.3750	0.2500	10/19/76	5.0000	-0.1250
6/24/69	9.0000	0.0000	1/16/73	5.7500	0.5000	11/16/76	5.0000	-0.2500
7/15/69	9.0000	0.1250	2/13/73	6.3750	0.3125	12/21/76	4.6875	-0.0625
8/12/69	9.5000	0.2500	3/20/73	7.0000	0.1250	1/18/77	4.6250	0.0625
9/9/69	9.0000	0.0000	4/17/73	7.0000	0.1875	2/15/77	4.6875	0.0000
10/7/69	9.1250	0.0000	5/15/73	7.5000	0.5000	3/15/77	4.6875	0.0000
10/28/69	9.1250	0.0000	6/19/73	8.5000	0.5000	4/19/77	4.6875	0.1250
11/25/69	9.1250	0.0000	7/17/73	9.7500	0.2500	5/17/77	5.2500	0.1250
12/16/69	9.0000	0.0000	8/21/73	10.5000	0.2500	6/21/77	5.3750	0.0000
1/15/70	9.0000	-0.2500	9/18/73	10.7500	-0.3750	7/19/77	5.3750	0.0000
2/10/70	9.1250	-0.5000	10/16/73	10.5000	-0.7500	8/16/77	5.8750	0.1250
3/10/70	8.3125	-0.1875	11/20/73	10.1250	0.0000	9/20/77	6.1250	0.1250
4/7/70	7.7500	0.0000	12/18/73	10.2500	-0.6250	10/18/77	6.5000	0.0000
5/5/70	8.2500	0.1250	1/22/74	9.7500	-0.3750	11/15/77	6.5000	0.0000
5/26/70	8.0000	0.0000	2/20/74	9.0000	-0.1250	12/20/77	6.5000	0.0000
6/23/70	7.8750	-0.2500	3/19/74	9.1875	0.6875	1/17/78	6.7500	0.0000
7/21/70	7.3125	-0.2500	4/16/74	9.8750	0.6250	2/28/78	6.7500	0.0000
8/18/70	6.7500	-0.5000	5/21/74	11.0000	0.3750	3/21/78	6.7500	0.0000
9/15/70	6.3750	-0.1875	6/18/74	11.6250	0.2500	4/18/78	6.7500	0.2500
10/20/70	6.2500	-0.1250	7/16/74	12.7500	-0.5000	5/16/78	7.3125	0.1875
11/17/70	5.7500	-0.6250	8/20/74	12.2500	-0.3750	6/20/78	7.5000	0.2500
12/15/70	5.1250	-0.3750	9/10/74	11.7500	-0.6250	7/18/78	7.7500	0.1250
1/12/71	4.5000	-0.5000	10/15/74	10.4375	-0.8125	8/15/78	7.8750	0.1250
2/9/71	3.7500	-0.1250	11/19/74	9.5000	-0.2500	9/19/78	8.3750	0.1250
3/9/71	3.5000	0.1250	12/17/74	8.8750	-0.6250	10/17/78	8.7500	0.2500
4/6/71	3.7500	0.3750	1/21/75	7.2500	-0.5625	11/21/78	9.6875	0.1875
5/11/71	4.2500	0.2500	2/19/75	6.2500	-0.5000	12/19/78	9.8750	0.1875
6/8/71	4.7500	0.3750	3/18/75	5.7500	-0.5000	2/6/79	10.0625	0.0000
6/29/71	5.1250	0.2500	4/15/75	5.5000	-0.1250	3/20/79	10.0625	0.0000
7/27/71	5.5000	0.1250	5/20/75	5.1250	0.0000	4/17/79	10.0625	0.0000
8/24/71	5.6250	0.0000	6/17/75	5.2500	0.3750	5/22/79	10.2500	0.0000
9/21/71	5.5000	-0.2500	7/15/75	6.0000	0.1250	7/11/79	10.2500	0.0000
10/19/71	5.1875	-0.1250	8/19/75	6.1875	0.0000	8/14/79	10.6250	0.3750
11/16/71	4.7500	-0.3750	9/16/75	6.1250	0.2500	9/18/79	11.3750	0.1250
12/14/71	4.3750	-0.6250	10/21/75	5.7500	-0.2500	10/6/79	11.5000	3.0000
1/11/72	3.6250	-0.3125	11/18/75	5.2500	-0.2500	11/20/79	13.5000	0.0000
2/15/72	3.2500	0.0000	12/16/75	5.2500	0.0000	1/9/80	13.5000	0.0000
3/21/72	3.9375	0.3125	1/20/76	4.7500	0.0000	2/5/80	13.5000	0.5000
4/18/72	4.2500	0.1250	2/18/76	4.7500	0.0000	3/18/80	16.5000	1.7500
5/23/72	4.2500	0.3125	3/16/76	4.7500	0.0000	4/22/80	18.3750	-3.8750
6/20/72	4.4375	0.1250	4/20/76	4.7500	0.1250	5/20/80	10.8750	-1.3750

TABLE A-1 (continued)

Meeting Date	Initial Intended Rate (%)	Change in Intended Rate (%)	Meeting Date	Initial Intended Rate (%)	Change in Intended Rate (%)	Meeting Date	Initial Intended Rate (%)	Change in Intended Rate (%)
7/9/80	9.3750	0.0000	12/17/85	7.9375	-0.1875	8/20/91	5.5000	0.0000
8/12/80	9.6250	0.2500	2/12/86	7.8125	0.0000	10/1/91	5.2500	0.0000
9/16/80	10.2500	1.0000	4/1/86	7.3750	0.0000	11/5/91	5.2500	-0.5000
10/21/80	12.1250	1.5000	5/20/86	6.8750	0.0000	12/17/91	4.5000	-0.2500
11/18/80	14.5000	1.7500	7/9/86	6.8750	-0.5000	2/5/92	4.0000	0.0000
12/19/80	18.7500	-0.7500	8/19/86	6.3125	-0.3750	3/31/92	4.0000	0.0000
2/3/81	17.5000	-0.5000	9/23/86	5.8750	0.0000	5/19/92	3.7500	0.0000
3/31/81	15.0000	0.8750	11/5/86	5.8750	0.0000	7/1/92	3.7500	-0.1250
5/18/81	18.5000	1.5000	12/16/86	6.0000	0.0000	8/18/92	3.2500	-0.1250
7/7/81	18.5000	-1.0000	2/12/87	6.0000	0.0000	10/6/92	3.0000	-0.2500
8/18/81	18.0000	-0.5000	3/31/87	6.0625	0.1875	11/17/92	3.0000	0.0000
10/6/81	15.5000	-1.0000	5/19/87	6.5000	0.2500	12/22/92	3.0000	0.0000
11/17/81	13.5000	-1.0000	7/7/87	6.7500	0.0000	2/3/93	3.0000	0.0000
12/22/81	12.1250	-0.2500	8/18/87	6.6250	0.0000	3/23/93	3.0000	0.0000
2/2/82	14.0000	0.5000	9/22/87	7.2500	0.0000	5/18/93	3.0000	0.1250
3/30/82	14.7500	-0.5000	11/3/87	7.1250	-0.3125	7/7/93	3.0000	0.0000
5/18/82	14.0000	-0.7500	12/16/87	6.8125	0.0000	8/17/93	3.0000	0.0000
7/1/82	14.0000	-0.5000	2/10/88	6.6250	-0.1250	9/21/93	3.0000	0.0000
8/24/82	10.2500	-0.7500	3/29/88	6.5000	0.2500	11/16/93	3.0000	0.0000
10/5/82	10.2500	-0.7500	5/17/88	7.0000	0.2500	12/21/93	3.0000	0.0000
11/16/82	9.5000	-0.5000	6/30/88	7.3750	0.2500	2/4/94	3.0000	0.2500
12/21/82	8.5000	0.0000	8/16/88	8.1250	0.0000	3/22/94	3.2500	0.2500
2/9/83	8.5000	0.0000	9/20/88	8.1250	0.0000	5/17/94	3.7500	0.5000
3/29/83	8.5000	0.1250	11/1/88	8.2500	0.0000	7/6/94	4.2500	0.0000
5/24/83	8.6250	0.2500	12/14/88	8.4375	0.5625	8/16/94	4.2500	0.5000
7/13/83	9.0625	0.3125	2/8/89	9.0000	0.1875	9/27/94	4.7500	0.1250
8/23/83	9.5625	-0.0625	3/28/89	9.7500	0.1250	11/15/94	4.7500	0.7500
10/4/83	9.3750	0.0000	5/16/89	9.8125	0.0000	12/20/94	5.5000	0.0000
11/15/83	9.3750	0.0000	7/6/89	9.5625	-0.2500	2/1/95	5.5000	0.5000
12/20/83	9.5000	0.1250	8/22/89	9.0625	0.0000	3/28/95	6.0000	0.0000
1/31/84	9.3750	0.0000	10/3/89	9.0000	0.0000	5/23/95	6.0000	0.0000
3/27/84	10.1250	0.3750	11/14/89	8.5000	0.0000	7/6/95	6.0000	-0.2500
5/22/84	10.5000	0.0000	12/19/89	8.5000	-0.2500	8/22/95	5.7500	0.0000
7/17/84	11.0000	0.3750	2/7/90	8.2500	0.0000	9/26/95	5.7500	0.0000
8/21/84	11.5625	-0.0625	3/27/90	8.2500	0.0000	11/15/95	5.7500	0.0000
10/2/84	11.2500	-0.3750	5/15/90	8.2500	0.0000	12/19/95	5.7500	-0.2500
11/7/84	10.0000	-0.7500	7/3/90	8.2500	-0.2500	1/31/96	5.5000	-0.2500
12/18/84	8.7500	-0.6250	8/21/90	8.0000	0.0000	3/26/96	5.2500	0.0000
2/13/85	8.5000	0.0000	10/2/90	8.0000	-0.2500	5/21/96	5.2500	0.0000
3/26/85	8.5000	0.0000	11/13/90	7.7500	-0.2500	7/3/96	5.2500	0.0000
5/21/85	8.1250	-0.3750	12/18/90	7.2500	-0.2500	8/20/96	5.2500	0.0000
7/10/85	7.6250	0.0000	2/6/91	6.7500	-0.5000	9/24/96	5.2500	0.0000
8/20/85	7.8125	0.0000	3/26/91	6.0000	0.0000	11/13/96	5.2500	0.0000
10/1/85	7.8750	0.0000	5/14/91	5.7500	0.0000	12/17/96	5.2500	0.0000
11/5/85	8.0000	-0.0625	7/3/91	5.7500	0.0000			

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ENDNOTES

¹ The Record of Policy Actions of the Federal Open Market Committee is published in the Annual Report of the Board of Governors of the Federal Reserve System. These brief summaries were renamed the Minutes of Federal Open Market Committee Meetings in 1993. To prevent confusion between the modern, brief Minutes and the very detailed Minutes for the pre-1976 period, we call the brief summaries the Record of Policy Actions in all periods.

² We also have an internal e-mail showing the "intended federal funds rate" from March 1984 to the present, which we use as a check on our analysis after September 1992. Since the Federal Reserve has been targeting the funds rate so closely and explicitly since 1987, this check is of little importance.

³ In addition, a mechanical rule based on the expected funds rate series would not be practical. There are a number of entries for which the expected rate is missing, and for much of the period a range is given rather than a single number. Also, for the period before 1987, the expected series is dated by week rather than by the actual day of change.

⁴ The horizons are relative to the date of the forecast corresponding to meeting m . That is, if the meeting is in early July 1980 and the forecast is in late June 1980, the contemporaneous forecast is for the second quarter of 1980. In computing the forecast innovations, the forecast horizons for meetings m and $m-1$ are adjusted so that the forecasts refer to the same quarter.

⁵ This procedure obviously destroys some information about when in the month the shock occurred. However, the loss is not large because the dating of the shock is inherently somewhat imprecise. We use as the input to our analysis decisions made at FOMC meetings. However, the actual actions may occur as much as two weeks after the decision. Therefore, one would not want to use our indicator to analyze responses to monetary shocks within such short periods that the exact days of the shocks are important.

⁶ Recording these observations as zeroes is appropriate. Our shock series shows changes in Federal Reserve intentions for the federal funds rate decided at FOMC meetings that are not systematic responses to forecasts. If there is no meeting, there is no change in Federal Reserve intentions around an FOMC meeting that is not a response to forecasts. There is, therefore, a shock of zero by our measure, not a missing observation.

⁷ It is important to note that the goal of our regression is not to estimate the Federal Reserve's reaction function as well as possible. What we are trying to do is to purge the intended funds rate series of movements that are correlated with other developments that might affect output and prices in the future. Once we have accomplished this, it is in fact desirable to leave in as much of the remaining variation in the residuals as possible. It is this variation that will allow us to identify the relationship between monetary shocks and other economic developments. The evolution of the behavior of the Federal Reserve is arguably a key source of changes in the intended funds rate that are not correlated with other developments affecting economic conditions, and so should not be removed from the shock series.

⁸ The scale is different in panels a and b of Figure 1. The new monetary shocks series shows much smaller movements than either of the broader measures.

⁹ The federal funds rate data are from the Board of Governors of the Federal Reserve System website. We use series RIFSPFF_N.M. We use the change in the monthly average of the funds rate to minimize the effects of extreme day-to-day variation.

¹⁰ The industrial production data are from the Board of Governors of the Federal Reserve System website. We use series B50001 in its non-seasonally-adjusted form.

¹¹ The standard errors are computed by Monte Carlo methods. Specifically, we repeatedly draw coefficients from a multivariate normal distribution with mean and variance-covariance matrix given by the point estimates and variance-covariance matrix of the regression coefficients. For each draw, we compute the implied response of output to a realization of S of 100 basis points. The standard error for the response at month h is then the standard deviation across the different draws of the estimated responses at month h . The standard errors used in constructing the figures are based on 500 draws.

¹² These results are similar in their essentials to those in our earlier work on the real effects of monetary policy (Romer and Romer, 1989, 1994). In the earlier papers we identified only a very specific type of shock: Federal Reserve decisions to contract aggregate demand in order to reduce inflation from its current level. We found that the maximum impact of such a decision on industrial production was a reduction of 12% after 32 months. Like our new measure, this anti-inflation shock variable is designed to isolate changes in monetary policy not taken in response to anticipated developments. It is, however, not calibrated as the new measure is, and does not include positive shocks. The obvious reason that the earlier studies found a larger effect is that the average shock is much larger: in the seven episodes we identify, the actual monthly funds rate rose an average of 3.6 percentage points (measured as the difference between the low in the six months before the shock to the high in the six months after the shock). The finding that the lags with which policy affects output are longer for these shocks than for our new measure could stem from the fact that important interest rate movements often occurred after the decisions to follow tighter policy that we identify.

¹³ Since it is not plausible that contractionary monetary policy shocks raise output in the short run, restricting the coefficients on the first two lags to zero is likely to improve the accuracy of estimates of the impact of policy on output. Imposing this restriction makes the estimated effect somewhat more rapid and larger than before. The estimated cumulative impact now becomes negative in month 3 rather than month 5. By month 12, the cumulative impact is -3.3% (with a t-statistic of 3.8) rather than -2.3% ($t = 2.6$), and the peak effect is now -5.9% ($t = 3.8$) rather than -4.8% ($t = 3.5$). The estimated effects are statistically significant in months 3 through 34.

¹⁴ The PPI data are from the Bureau of Labor Statistics website. We use series WPUSOP3000, not seasonally adjusted.

¹⁵ As with output, the result that the estimated price effect is slightly positive initially is not important to the results. Restricting the effects on inflation over the first 8 months to zero changes the estimated impact of a 100-basis-point monetary shock on the price level after 18 months from +0.1% to -0.4%, and its estimated impact after 48 months from -5.9% to -6.3%.

¹⁶ The series that we use is the index of world commodity prices from International Financial Statistics.

¹⁷ Restricting the number of lags, as Christiano, Eichenbaum, and Evans do, has mixed effects. When we reestimate our basic VAR with only one year of lags, the estimated response of output to a policy shock tracks the response with three years of lags closely for a year, but then diverges. The response peaks at -1.6% after 12 months; with three years of lags, in contrast, the estimated effect continues rising through month 22 and reaches a maximum of -3.2%. Reducing the number of lags has a smaller effect on the estimated response of prices, though again the estimated impact is smaller when fewer lags are included. These findings suggest that the true response of output and prices to monetary policy is quite drawn out and that forcing the direct effects to be zero after a year leads to underestimates of the effects of policy.

¹⁸ Sims (1992), for example, estimates a maximum impact of a 100-basis-point innovation to the funds rate on industrial production of about one and a half percent. Using real GDP rather than industrial production, Bernanke and Mihov (1998) and Christiano, Eichenbaum, and Evans (1996) find a maximum effect of slightly less than one percent.

¹⁹ We discuss each FOMC meeting that occurs during our sample period. Some of these intentions, however, do not end up being used in the estimation of the shock series because there is no corresponding Greenbook forecast with the appropriate horizon.