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**THE REACTION OF INTEREST RATES TO UNANTICIPATED  
FEDERAL RESERVE ACTIONS AND STATEMENTS, 1977-1984:  
IMPLICATIONS FOR THE MONEY ANNOUNCEMENT CONTROVERSY**

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\*The views expressed in this paper are solely those of the authors and do not necessarily represent those of the Federal Reserve Bank of Richmond or the Federal Reserve System. The authors are grateful to Marvin Goodfriend for many useful discussions on this paper. Helpful comments were also provided by Al Broaddus, Monica Hargraves, Bob King, and Tim Rowe. Any remaining errors are our responsibility.

# THE REACTION OF INTEREST RATES TO UNANTICIPATED FEDERAL RESERVE ACTIONS AND STATEMENTS, 1977-1984: IMPLICATIONS FOR THE MONEY ANNOUNCEMENT CONTROVERSY\*

## I. Introduction

Considerable attention has been devoted to the reaction of interest rates, foreign exchange rates, and stock prices to unanticipated money growth revealed by the weekly M1 money stock announcement.<sup>1</sup> Numerous articles have attempted to explain why nominal interest rates rise following the announcement of an M1 figure higher than expected and fall when an M1 figure is lower than expected. The major controversy in this literature is whether the observed reaction of interest rates reflects changes in the inflation expectations component or in the real rate component of the nominal rate.

Under the inflation expectations hypothesis a higher than expected M1 figure signals market participants that money growth and inflation will be higher in the future than previously expected. Consequently, inflation expectations and the nominal interest rate rise. Alternatively, under the policy anticipations hypothesis the monetary authority reacts to deviations of M1 growth from target by changing the Federal funds rate in order to influence money demand and return money to path. Consequently, the announcement of a higher than expected M1 figure leads market participants to revise upward the expected path for the funds rate. Other interest rates rise in reaction to higher expected values of the funds rate. Under this hypothesis the observed

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<sup>1</sup>For empirical studies of the reaction of interest rates to money announcements, see Hardouvelis [15], Cornell [5] [6] [7], Loeys [16], Roley [21], Roley and Walsh [23], and Urich [25]. Engel and Frankel [8] and Cornell [4] evaluate the reaction of exchange rates to money announcements. Pearce and Roley [19] and Cornell [6] [7] study the reaction of stock prices to money announcements.

rise in nominal interest rates following a higher than expected M1 figure reflects a rise in the real interest rate.<sup>2</sup>

Numerous empirical results from the money announcement literature are inconsistent with the inflation expectations hypothesis. The most widely cited is the significant appreciation of the dollar in the foreign exchange market following the announcement of an M1 figure that is higher than expected.<sup>3</sup> The evidence that has been put forward as inconsistent with the policy anticipations hypothesis is the strong reaction after October 1979 of long-term and forward interest rates as far as five years in the future to unanticipated changes in M1. Cornell [6] and Hardouvelis [15], among others, reject the policy anticipations hypothesis as a consistent explanation for all market reactions to money announcements because of this empirical result.<sup>4</sup> Their

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<sup>2</sup>See Roley and Walsh [23], Urlich [25], and Nichols, Webster and Small [18] for models of the policy anticipations hypothesis. See Roley and Walsh [23] and Engel and Frankel [8] for models of the inflation expectations theory.

<sup>3</sup>According to the model of exchange rate determination in Engel and Frankel [8], a rise in inflation expectations in response to a higher than expected M1 number would be associated with a depreciation of the dollar. For the empirical evidence, see Section III of this paper, Engel and Frankel [8], and Hardouvelis [15]. Additional evidence against the inflation expectations view includes the sharp jump in the reaction of interest rates to money announcements following the October 1979 announcement of the change in Federal Reserve operating procedures. Models of the inflation expectations view cannot account for why the value of M1 announcements in predicting inflation rose sharply at that time. Further, Cornell [4], building on work by Fama [9], points out that because inflation is more closely correlated with growth of the monetary base than with M1 growth, innovations in the base should also have a significant impact on interest rates. However, Cornell finds that announced "innovations in the monetary base had little impact on interest rates." Finally, Frankel and Hardouvelis [12] find that commodity prices fall following the announcement of an M1 figure higher than expected. The decline in these prices would not be expected if inflation expectations rise following M1 announcements.

<sup>4</sup>Hardouvelis [15] uses the inflation expectations hypothesis to  
(Footnote Continued)

rejection of the hypothesis is based on the assumptions that (1) long-term interest rates are determined through an expectations theory of the term structure and (2) the Fed is unable to influence expected real interest rates far in the future (i.e. further than one year). Under these assumptions, an upward revision in the expected funds rate path following a higher than expected M1 figure would not be expected to cause large movements in long-term interest rates or movements in forward interest rates as far as five years in the future. If either of these assumptions is incorrect, however, then the rise in long-term interest rates following a higher than expected M1 figure may reflect an upward revision in the expected funds rate path.

Our goal in this paper is to evaluate whether the reaction of long-term and forward interest rates to money announcements in the period after October 1979 is consistent with the policy anticipations hypothesis. We do this by documenting specific actions and statements of the Federal Reserve from September 1977 through July 1984 that provided the public with new information about the future path of the Federal funds rate. We argue that the actions and statements that cause an upward revision in the expected funds rate path do not raise inflation expectations and those that cause a downward revision in the expected funds rate path do not lower inflation expectations. On these grounds, we view the movement in nominal rates following these events as movements in real rates in response to new information about the future behavior of the funds rate. This enables us to evaluate whether the reaction of long-term and forward rates to announcements of unanticipated changes in M1

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(Footnote Continued)

explain the reaction of forward interest rates to the announcement of unexpected money growth. Cornell [5,6] proposes the inflation expectations theory as a possible explanation of the reaction of spot interest rates. Both authors view the significant reaction of long-term and long-forward interest rates as evidence against the policy anticipations view.

is consistent with the policy anticipations hypothesis by comparing the reaction of rates to these announcements with the reaction of rates to the policy events we document.

Specifically, if policy anticipations underlie the reaction of rates to money announcements we should find that (1) the relative reaction of long- versus short-term rates to the policy events we document is similar to the relative reaction of these rates to unanticipated changes in M1 (i.e. we should see relatively large movements in long-term rates after October 1979), and (2) the reaction of forward rates to these policy events is similar to the reaction of forward rates to unanticipated changes in M1. The behavior of interest rates on days of policy events we document in this paper exhibits both these characteristics. Consequently, we conclude that the reaction of both short- and long-term interest rates to money announcements is consistent with the policy anticipations view that the reaction reflects changes in the real rate component of the nominal rate caused by revisions in the expected funds rate.

## II. Procedures

We use the daily "Credit Market" column in the Wall Street Journal to identify Federal Reserve actions and statements that changed expectations of the future path of the Federal funds rate. The shorthand term we use for these events is "policy surprise." The three classes of events we look at are open market operations, discount rate announcements, and Federal Reserve policy statements. The latter category includes semiannual policy reviews, the release of Federal Open Market Committee directives, and special announcements about policy. We designated a Federal Reserve action or statement a surprise if (1) the action or statement was the headline story and major theme of the "Credit Market" column in the Journal and (2) if the Journal reported as a factual matter that the action or statement caused a reaction in market rates. We used these criteria so that we could follow a specific rule in

choosing surprises that could be verified by others and so that we would include only the most clear cut cases in which a monetary policy event was the major factor affecting rates in a given day.

As an example consider the open market operation of September 8, 1980. Prior to the Fed's daily open market operation, market participants believed that the effective trading range for the Federal funds rate--the range over which the funds rate could vary without causing intervention by the Fed--was 9 1/2 to 10 1/2%, and had expectations of what the Fed was going to do in the market in order to maintain this range. Contrary to these expectations, with the funds rate at 10 1/4% the Desk did an open market operation to drain reserves. This action caused an upward revision in the market's perception of the Federal funds rate range desired by the Fed. The Treasury bill rate, which depends on current and expected levels of the funds rate over the maturity of the bill, rose sharply following the operation. The following day the headline and major theme in the Journal's "Credit Market" column was the unexpected Federal Reserve action and the reaction of interest rates to it. This is one of the events we use in this study.

A critical assumption of this approach is that the Journal has the incentive and the technology to accurately report monetary policy actions and statements that are surprises to the market. We believe this assumption is entirely reasonable. There are thousands of Fed-watchers, financial analysts and traders watching their Telerate monitors each day when the Fed does an open market operation or makes an important announcement. A major unexpected Federal Reserve action or statement is common knowledge throughout the financial markets. The Journal's incentive to accurately report these events and the reaction of interest rates to them is no less than its incentive to accurately report other events.

After identifying Federal Reserve actions and statements that caused a revision in the expected future path of the funds rate, we look at the movement in short-term, long-term and forward rates immediately following these events. The change in rates is calculated using daily 3:30 p.m. data surrounding the event. We stress that we are not using this procedure to identify the magnitude of policy surprises or the magnitude of the reaction of short-term rates to policy surprises; rather we are using it to identify the relative movement in long-term versus short-term interest rates on policy surprise days.

We view the observed response of nominal rates to policy surprises as real interest rate movements. Implicitly, we have made the assumption that a policy surprise which causes an upward revision in the expected funds rate path does not raise inflation expectations and that a surprise which indicates a lower funds rate path does not lower inflation expectations. There are two possible objections to this inflation expectations assumption. First, one could argue that the Fed changes the funds rate path because it receives inflation-related data, not yet released to the public, that indicates that inflation will be higher or lower than previously expected. The policy surprise in this scenario reveals to the public the Fed's inside information on this data. In particular, this inside information might include data compiled by the Fed, such as money supply and industrial production figures.

We have examined the possibility that policy surprises provide the public with new information about unreleased data compiled by the Fed. First, we tested whether policy surprises influenced the market's expectation of the upcoming M1 release by evaluating whether the market's reaction to unexpected M1 growth differed if a policy surprise occurred shortly before the release.

We found no support for this hypothesis.<sup>5</sup> Second, evidence presented in Roley and Troll [22] shows that the unanticipated component of industrial production release did not have a significant announcement effect on short-term interest rates in the post October 1979 period.<sup>6</sup> It is reasonable to assume that if the unexpected component of the industrial production announcement had no effect on interest rates, then the movement of rates on policy surprise days was not caused by the public inferring movement in this variable compiled by the Fed.

Potentially there are other inflation related variables not collected by the Fed that it may have access to before the public and some of these variables may be relevant for the determination of interest rates. Roley and Troll also investigated the announcement effects on short-term interest rates of the unanticipated component of the monthly consumer price index (CPI), the producer price index (PPI), and the unemployment rate. None of these variables were significant in the post-October 1979 period. Using a different interest

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<sup>5</sup>The test was conducted by using a dummy variable in the money announcement regressions reported in Section III that takes a non-zero value on money announcement days when a policy event occurred between the M1 survey day (usually Tuesday) and the money announcement (usually late Friday). The dummy variable is +1 when the policy event indicates a higher funds rate path and -1 when the event indicated a lower funds rate path. The motivation for the test is to determine whether policy surprises alter market participants' estimates of that week's announced M1 figure. If M1 estimates are significantly revised, then the expected sign for the dummy variable coefficient is negative since a Fed tightening would raise the expected M1 figure relative to the available survey number and lower the actual response of interest rates relative to the predicted response. In all regressions for the interest rates and exchanges rates, the coefficient of the dummy variable was not significant with the predicted sign. These regressions are reported in Appendix B.

<sup>6</sup>Roley and Troll [22] employ a three-month Treasury bill interest rate series. All expectation figures are median figures from surveys conducted by Money Market Services. For the period October 1979 to October 1982, the t-statistic for the unanticipated component of the announcement of the industrial production index is less than 1.

rate, Ulrich and Wachtel [26] find that the announcement of the unanticipated component of the PPI did have a significant effect on short-term interest rates over the period from October 1979 to July 1982.<sup>7</sup> However, the magnitude of the response to the unexpected component of the PPI announcement is small relative to the movement in interest rates in response to the policy surprises we have identified. Ulrich and Wachtel report that the standard deviation of the unexpected component of the monthly PPI over this period was 3.6 percent. According to their estimates, an unexpected increase in the PPI of this magnitude caused an 11 basis point movement in short-term rates. The average absolute movement in the six-month bill rate in this period on days of the policy surprises we have catalogued is 41 basis points. In view of the large difference between these numbers it is highly implausible that the reaction of rates to policy surprises reflects revisions in expectations of the PPI.

The second argument against our assumption that a policy surprise which causes an upward revision in the expected funds rate path does not raise inflation expectations relies on the view that the Fed has a superior model of inflation than the public. Under this hypothesis, a policy surprise indicating a higher funds rate target path indicates to the public that the Fed's outlook for inflation has deteriorated. This, in turn, leads to an increase in inflation expectations. However, there is no reason to believe that the Fed has a superior forecasting model of inflation, and we know of no evidence that it does.

Additional evidence against the view that interest rates react to policy surprises because of changes in inflation expectations is the behavior of the

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<sup>7</sup>Ulrich and Wachtel [26] use rates for International Money Market futures contracts on three-month Treasury bills and survey data on expected PPI figures collected by Money Market Services.

dollar exchange rate. As will be shown below, the dollar generally appreciated (depreciated) following policy surprises indicating a higher (lower) funds rate path. If policy surprises were moving nominal interest rates because of their effect on inflation expectations, the dollar would have behaved in the opposite fashion.

The remainder of this paper examines the reaction of market rates to monetary policy surprises and money announcements in three periods. The first period goes from September 1977 to October 6, 1979 when the Fed announced the change to a nonborrowed reserves operating procedure. The second goes from October 6, 1979 through October 9, 1982 when the Fed formally announced the deemphasis of M1 targeting. This announcement is generally regarded as marking the end of the post-October 1979 operating procedures. The third period goes from October 9, 1982 through July 1984. These three periods are called period 1, period 2, and period 3 in the remainder of the paper. Our discussion starts with and emphasizes the period from October 1979 to October 1982 because this is the period focused on in the money announcement controversy.

### III. Period 2 Policy Surprise Data

Period 2 starts with the October 6, 1979 Federal Reserve announcement of the change to operating procedures designed to pay more attention to the quantity of bank reserves in order to gain firmer control over the money stock, and ends with the October 9, 1982 Federal Reserve announcement of the deemphasis of M1. There has been a substantial amount of debate over the actual nature of the operating procedures used by the Fed during this period. The debate is over whether the Fed followed a strict nonborrowed reserves rule in which movements in the funds rate were in some sense "endogenously"

determined or whether the Fed, as in the pre-October 1979 period, continued to control movements in the funds rate through adjustments in the nonborrowed reserves target and through changes in the discount rate. Whatever the appropriate description of Fed procedures in this period, as Poole [20] has emphasized, market participants remained intensely interested in day-to-day actions and statements of the Fed, and viewed these actions and statements as providing information about the future path of the funds rate. Because it is the impact of these day-to-day actions and statements on market rates that we are interested in this paper, we do not discuss Federal Reserve or other descriptions of the operating procedures in any detail here.

Open Market Operations As in the pre-October 1979 period, open market operations in the post-October 1979 period were viewed by market participants as providing information about the future path of the funds rate. The difference from the pre-October 1979 period was that the Fed's effective range for the funds rate--the range over which the funds rate could vary without causing intervention by the Fed--was viewed by market participants as being considerably larger and subject to more uncertainty after October 1979. However, market participants still closely scrutinized daily open market operations to pick up movements in this trading range and reacted strongly to these movements.

The criteria described above for choosing policy surprises yielded 27 open market operation surprises in this period. For each of these surprises Table A1 shows the Journal headline and a quote describing the development that changed market expectations of the future path of the funds rate. Many of these surprises occurred either when the funds rate moved out of its perceived trading range and the Fed took no action, or when the Fed took an unexpected action when the funds rate was within its perceived trading range.

Table 1 shows the movement of spot interest rates, forward rates and the dollar/mark exchange rate on all the policy surprises days in period 2.<sup>8</sup>

The average increase in bill rates on days of surprise open market operations indicating a higher funds rate path was 19 basis points, while the average decrease on days indicating a lower funds rate path was 38 basis points. The corresponding averages for the 20-year maturity were 11 and 15 basis points, respectively. With only three exceptions, bond rates moved in the same direction as the expected funds rate path on days of open market operation surprises. The 3-year ahead 2-year forward rate moved in the same direction as the open market operation surprise in 20 out of 27 cases. The average increase was 7 basis points when surprises indicated a higher funds rate path and -9 basis points when surprises indicated a lower funds rate path. The 5-year ahead 2-year forward rate showed no tendency to move systematically with open market operation surprises.

Federal Reserve Policy Announcements      The criteria for policy surprises yielded five announcements that were surprises in the October 1979 to October 1982 period. These included three special policy announcements, one release of an FOMC directive, and one semiannual policy review before Congress. Table A2 shows the Journal headline and a quotation describing each announcement and

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<sup>8</sup> Appendix C contains a description of the data used in this paper. In calculating the forward rates from coupon bonds, we use the duration weighted approach presented in Shiller, Campbell and Schoenholtz [24]. In Appendix A, we show that the day-to-day change in the forward rates calculated by this method are extremely sensitive to errors in the spot data used in the calculations. Since the constant maturity series is constructed from a daily yield curve drawn by the Treasury, it is possible that small errors in this data are not uncommon. When calculating changes in forward rates from spot rates with long maturities, small errors in the spot data can yield errors 15 times as large (for the 20-year ahead 10-year forward rate) in the forward rate data. For this reason, we have not presented any forward rates further than 5 years ahead.

TABLE 1

The Movement in Interest Rates and the Exchange Rate  
on Policy Surprise Days in Period 2

| OPEN<br>MARKET<br>OPERATIONS   | DATE*     | DAY    | END DATE* | -OR+ | SPOT RATES |       |       |       |        |        | FORWARD RATES |        | DM*   |
|--------------------------------|-----------|--------|-----------|------|------------|-------|-------|-------|--------|--------|---------------|--------|-------|
|                                |           |        |           |      | 6Month     | 3Year | 5Year | 7Year | 20Year | 30Year | F(3,2)        | F(5,2) |       |
|                                | 11-Feb-80 | Mon    | 11-Feb-80 | +    | 0.30       | 0.21  | 0.15  | 0.12  | 0.24   | 0.22   | 0.03          | 0.01   | 0.03  |
|                                | 29-Apr-80 | Tue    | 29-Apr-80 | -    | -0.42      | -0.12 | 0.00  | 0.02  | 0.04   | 0.03   | 0.24          | 0.10   | -0.13 |
|                                | 02-May-80 | Fri    | 02-May-80 | -    | -0.82      | -0.59 | -0.55 | -0.48 | -0.29  | -0.25  | -0.47         | -0.21  | -1.10 |
|                                | 06-May-80 | Tue    | 06-May-80 | -    | -0.50      | -0.49 | -0.37 | -0.24 | -0.23  | -0.12  | -0.12         | 0.26   | 0.07  |
|                                | 08-May-80 | Thu    | 08-May-80 | +    | -0.11      | 0.15  | 0.12  | 0.01  | 0.18   | 0.15   | 0.06          | -0.41  | -0.64 |
|                                | 10-Jun-80 | Tue    | 10-Jun-80 | +    | 0.11       | 0.11  | 0.10  | 0.11  | 0.14   | 0.13   | 0.08          | 0.15   | -0.09 |
|                                | 11-Jun-80 | Wed    | 11-Jun-80 | -    | -0.30      | -0.08 | -0.10 | -0.11 | -0.09  | -0.09  | -0.14         | -0.15  | -0.11 |
|                                | 31-Jul-80 | Thu    | 31-Jul-80 | +    | 0.31       | 0.39  | 0.28  | 0.25  | 0.21   | 0.29   | 0.05          | 0.13   | -0.34 |
|                                | 02-Sep-80 | Tue    | 02-Sep-80 | -    | -0.27      | -0.35 | -0.21 | -0.22 | -0.19  | -0.19  | 0.08          | -0.25  | 0.39  |
|                                | 03-Sep-80 | Wed    | 03-Sep-80 | -    | -0.22      | -0.36 | -0.32 | -0.29 | -0.18  | -0.14  | -0.24         | -0.18  | 0.32  |
|                                | 08-Sep-80 | Mon    | 08-Sep-80 | +    | 0.31       | 0.16  | 0.11  | 0.09  | 0.11   | 0.09   | 0.01          | 0.01   | 0.37  |
|                                | 15-Oct-80 | Wed    | 15-Oct-80 | -    | -0.21      | -0.09 | -0.06 | -0.05 | -0.05  | -0.05  | 0.00          | -0.01  | -0.05 |
|                                | 25-Nov-80 | Tue    | 25-Nov-80 | +    | -0.13      | 0.06  | 0.07  | 0.03  | -0.02  | -0.01  | 0.09          | -0.12  | 0.02  |
|                                | 07-Jan-81 | Wed    | 07-Jan-81 | +    | 0.87       | 0.47  | 0.40  | 0.33  | 0.20   | 0.22   | 0.26          | 0.06   | -0.72 |
|                                | 02-Apr-81 | Thu    | 02-Apr-81 | +    | 0.25       | 0.15  | 0.10  | 0.10  | 0.12   | 0.15   | 0.00          | 0.10   | -1.28 |
|                                | 23-Jun-81 | Tue    | 23-Jun-81 | +    | 0.13       | 0.04  | 0.04  | -0.01 | 0.09   | 0.13   | 0.04          | -0.20  | -0.80 |
|                                | 13-Jan-82 | Wed    | 13-Jan-82 | +    | 0.31       | 0.18  | 0.16  | 0.15  | 0.21   | 0.20   | 0.12          | 0.11   | -1.07 |
|                                | 19-Jan-82 | Tue    | 19-Jan-82 | +    | 0.14       | -0.07 | 0.02  | 0.01  | 0.14   | 0.09   | 0.20          | -0.03  | -0.41 |
|                                | 21-Jan-82 | Thu    | 21-Jan-82 | +    | 0.13       | -0.15 | -0.15 | -0.13 | -0.14  | -0.11  | -0.15         | -0.06  | 0.00  |
|                                | 22-Mar-82 | Mon    | 22-Mar-82 | -    | -0.37      | -0.16 | -0.15 | -0.14 | -0.20  | -0.19  | -0.13         | -0.11  | -0.86 |
|                                | 08-Jul-82 | Thu    | 08-Jul-82 | -    | -0.64      | -0.44 | -0.36 | -0.34 | -0.36  | -0.20  | -0.20         | -0.26  | 0.13  |
|                                | 09-Aug-82 | Mon    | 09-Aug-82 | -    | -0.27      | -0.16 | -0.14 | -0.15 | -0.10  | -0.10  | -0.10         | -0.19  | 0.35  |
|                                | 12-Aug-82 | Thu    | 12-Aug-82 | -    | -0.52      | -0.24 | -0.24 | -0.14 | -0.11  | -0.11  | -0.24         | 0.24   | 0.96  |
|                                | 13-Sep-82 | Mon    | 13-Sep-82 | -    | -0.19      | -0.11 | -0.04 | -0.08 | -0.13  | -0.15  | 0.10          | -0.24  | 0.03  |
|                                | 15-Sep-82 | Wed    | 15-Sep-82 | +    | 0.24       | 0.23  | 0.18  | 0.01  | 0.04   | 0.01   | 0.08          | -0.64  | -0.18 |
|                                | 16-Sep-82 | Thu    | 16-Sep-82 | -    | -0.15      | -0.07 | -0.04 | -0.01 | 0.00   | -0.07  | 0.02          | 0.11   | 0.66  |
|                                | 29-Sep-82 | Wed    | 29-Sep-82 | +    | -0.16      | -0.07 | -0.02 | -0.04 | 0.00   | 0.03   | 0.08          | -0.11  | -0.20 |
|                                |           | MEAN + |           |      | 0.19       | 0.13  | 0.11  | 0.07  | 0.11   | 0.11   | 0.07          | -0.07  | -0.38 |
|                                |           | MEAN - |           |      | -0.38      | -0.25 | -0.20 | -0.17 | -0.15  | -0.13  | -0.09         | -0.07  | 0.05  |
|                                |           |        |           |      |            |       |       |       |        |        |               |        |       |
| DISCOUNT RATE<br>ANNOUNCEMENTS | DATE      | DAY    | END DATE  | -OR+ | 6Month     | 3Year | 5Year | 7Year | 20Year | 30Year | F(3,2)        | F(5,2) | DM    |
|                                |           |        |           |      |            |       |       |       |        |        |               |        |       |
|                                | 06-Oct-79 | Sat    | 09-Oct-79 | +    | 1.07       | 0.55  | 0.55  | 0.46  | 0.29   | 0.25   | 0.55          | 0.12   | -1.46 |
|                                | 15-Feb-80 | Fri    | 15-Feb-80 | +    | 0.67       | 0.37  | 0.33  | 0.27  | 0.27   | 0.21   | 0.25          | 0.04   | -0.07 |
|                                | 25-Sep-80 | Thu    | 26-Sep-80 | +    | 0.51       | 0.17  | 0.13  | 0.10  | 0.15   | 0.15   | 0.05          | -0.01  | -0.34 |
|                                | 14-Nov-80 | Fri    | 17-Nov-80 | +    | 0.88       | 0.37  | 0.25  | 0.29  | 0.16   | 0.15   | 0.01          | 0.44   | -0.96 |
|                                | 04-Dec-80 | Thu    | 05-Dec-80 | +    | 0.46       | 0.16  | 0.02  | 0.00  | -0.08  | -0.10  | -0.26         | -0.07  | -0.53 |
|                                | 04-May-81 | Mon    | 05-May-81 | +    | 0.64       | 0.55  | 0.51  | 0.40  | 0.19   | 0.13   | 0.46          | -0.06  | -0.90 |
|                                | 19-Jul-82 | Mon    | 20-Jul-82 | -    | -0.28      | -0.23 | -0.15 | -0.16 | -0.10  | -0.10  | 0.01          | -0.20  | 1.01  |
|                                | 30-Jul-82 | Fri    | 02-Aug-82 | -    | -0.70      | -0.31 | -0.27 | -0.25 | -0.26  | -0.25  | -0.19         | -0.18  | 1.45  |
|                                | 13-Aug-82 | Fri    | 16-Aug-82 | -    | -0.47      | -0.34 | -0.24 | -0.17 | -0.17  | -0.18  | -0.04         | 0.10   | -0.35 |
|                                |           | 1/     | MEAN +    |      | 0.63       | 0.32  | 0.25  | 0.21  | 0.14   | 0.11   | 0.10          | 0.07   | -0.56 |
|                                |           |        | MEAN -    |      | -0.48      | -0.29 | -0.22 | -0.19 | -0.18  | -0.18  | -0.07         | -0.09  | 0.70  |
|                                |           | 2/     | MEAN +    |      | 0.68       | 0.36  | 0.31  | 0.27  | 0.19   | 0.16   | 0.19          | 0.10   | -0.57 |
|                                |           |        |           |      |            |       |       |       |        |        |               |        |       |
| POLICY<br>ANNOUNCEMENTS        | DATE      | DAY    | END DATE  | -OR+ | 6Month     | 3Year | 5Year | 7Year | 20Year | 30Year | F(3,2)        | F(5,2) | DM    |
|                                |           |        |           |      |            |       |       |       |        |        |               |        |       |
|                                | 06-Oct-79 | Sat    | 09-Oct-79 | +    | 1.07       | 0.55  | 0.55  | 0.46  | 0.29   | 0.25   | 0.55          | 0.12   | -1.46 |
|                                | 07-Oct-82 | Thu    | 07-Oct-82 | -    | -0.59      | -0.71 | -0.71 | -0.63 | -0.46  | -0.40  | -0.71         | -0.32  | 1.92  |
|                                | 09-Oct-82 | Sat    | 12-Oct-82 | -    | -0.57      | -0.43 | -0.31 | -0.27 | -0.37  | -0.34  | -0.06         | -0.12  | 0.53  |
|                                | 03-Apr-81 | Fri    | 06-Apr-81 | +    | 1.22       | 0.48  | 0.39  | 0.43  | 0.31   | 0.34   | 0.21          | 0.58   | -1.43 |
|                                | 10-Feb-82 | Wed    | 10-Feb-82 | -    | -0.13      | -0.11 | -0.13 | -0.13 | -0.11  | -0.16  | -0.17         | -0.13  | 0.21  |
|                                |           | MEAN + |           |      | 1.15       | 0.52  | 0.47  | 0.45  | 0.30   | 0.30   | 0.38          | 0.35   | -1.45 |
|                                |           | MEAN - |           |      | -0.43      | -0.42 | -0.38 | -0.34 | -0.31  | -0.30  | -0.31         | -0.19  | 0.89  |

1/ EXCLUDES 10/6/79

2/ EXCLUDES 10/6/79 AND 12/4/80

\*"Date" is the calendar day of the event. "End Date" is the day to which the change in rates (as of 3:30 p.m.) is calculated. "DM" is the percentage change in the dollar per German mark exchange rate.

the effect it had on anticipations of Fed policy. The rate movements on these days are shown on Table 1.

The first special policy announcement was the October 6, 1979 announcement of the change in Federal Reserve operating procedures. The change in procedures was part of an anti-inflationary package that also included a one percent increase in the discount rate and the establishment of an 8% reserve requirement for certain liabilities of the Fed's member banks and various other institutions. In announcing the program Chairman Volcker said that the growth of money and credit had been "in excess of the amounts we'd like to see" and that the new operating procedures would bring the money supply "under surer control." (October 8, 1979 Journal, p. 1) Numerous stories in the Journal following the announcement reported the widespread view that it signaled a higher funds rate path. Following the announcement, the six-month bill rate increased 107 basis points, the five-year Treasury rate rose 55 basis points, and the twenty-year rate increased 29 basis points. The three- and five-year forward rates rose 55 and 12 basis points, respectively. The dollar rose 1.46 percentage points against the mark.

The next special policy announcement was the announcement by Chairman Volcker on Saturday October 9, 1982 of the deemphasis of M1. This announcement was widely viewed as formally signaling the end of the October 6, 1979 operating procedures. The announcement came at a time when M1 had been growing at a rate well above the annual target range, and was correctly interpreted as indicating that the Fed would not raise the funds rate in order to bring M1 back into the range. For this reason it caused a downward revision in the expected funds rate Path and an upward revision in the expected growth rate of M1. The announcement was leaked by the Journal on the preceding Thursday and there was a very strong market reaction to both the leak and the announcement. Consequently, we treat these as two separate events in

Table 1. On the days of the leak and the announcement the six-month bill rate fell a total of 116 basis points. Intermediate-term rates fell only slightly less, while the twenty and thirty-year bond rates fell 83 and 74 basis points. The three- and five-year forward rates fell 77 and 44 basis points. The dollar fell 2.45 percentage points against the mark.

The surprise directive release occurred on April 3, 1981 when the Fed released the summary of two February 1981 FOMC meetings. The directive showed that the FOMC had voted to maintain a Federal funds rate range of 15 to 20%, when market participants thought that the lower end of the range was well below 15%. In reaction to this information the bill rate increased 122 basis points, intermediate-term rates rose 40 to 50 basis points and long-term rates rose 30 to 35 basis points. The three- and five-year forward rates rose 21 and 58 basis points respectively. The dollar rose 1.43% against the mark.<sup>9</sup>

The policy review surprise occurred on February 10, 1982. At that time the level of M1 was well above the upper bound of its annual target range. In his testimony before Congress the Chairman indicated that the Fed would not raise the funds rate in reaction to this situation. As shown in Table 1, in response to this assurance, short-term, long-term, and forward interest rates fell, and the dollar depreciated.

Discount Rate Announcements Discount rate announcements can be classified into three types: (1) alignment announcements, which indicate the discount rate is being changed to realign it with market rates, (2) policy

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<sup>9</sup>This is a particularly interesting episode because it is totally immune from the view that the reaction of interest rates to policy surprises occurs because the public infers inside inflation-related information. In this case any inside information the Fed had at the time of the FOMC meeting was released well before the release of the directive.

announcements, which indicate the discount rate is being changed because of the Fed's concern over the behavior of the money stock, inflation, or other macroeconomic variables, and (3) hybrid announcements, which contain the language of both alignment and policy announcements. Treasury bill rates moved sharply on the 9 days of discount rate changes accompanied by policy or hybrid announcements in the October 1979 to October 1982 period, and in each case the Journal reported that the movement in rates followed and was caused by the discount rate change.<sup>10</sup> In contrast, rate movements following the six discount rate changes accompanied by alignment announcements were highly variable and in the opposite direction in half the cases.<sup>11</sup> Consequently, in order to get a group of discount rate changes that unambiguously affected expectations of the future funds rate path we use only those accompanied by policy and hybrid announcements. Table A3 provides a record of the nine policy and hybrid discount rate announcements in period 2 and the change in rates on the day of these announcements.

Table 1 shows the changes in spot and forward interest rates and the dollar/mark exchange rate on days of policy and hybrid discount rate announce-

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<sup>10</sup>There was a semi-annual policy review on the day following the hybrid discount rate announcement on late July 19, 1982. The Journal's comments are somewhat ambiguous in that it attributes the movement in rates to the Fed's "credit-easing" moves. In examining Treasury bill futures rate data, however, we found that the movement in rates occurred between the "settle" preceding the late afternoon discount rate announcement and the "open" early the following morning. Hence, the daily rate movement can be safely attributed to the discount rate announcement and not the policy review.

<sup>11</sup>In another paper [2] we offer an explanation for this phenomenon. We studied the Federal Reserve's behavior following different types of discount rate announcements and found that the Fed has systematically used policy and hybrid announcements to signal a forthcoming change in the Federal funds rate. Market participants are aware of this practice and have revised their expectations of the Federal funds rate target path following these types of announcements.

ments. One of these announcements occurred on the same day as the October 6, 1979 policy announcement, so we exclude it from the following discussion. The average increase in the bill rate on days of the other discount rate increases accompanied by policy or hybrid announcements was 63 basis points, while the average decrease on days of discount rate cuts accompanied by policy or hybrid announcements was 48 basis points. In seven out of eight cases the twenty- and thirty-year bond rates moved in the same direction as the bill rate.<sup>12</sup> In these seven cases the average movement in the twenty-year bond rate was 19 basis points. The three-year forward rate moved in the same direction as the discount rate in five cases, in the opposite direction in one case, and was virtually unchanged in two cases. In all but one instance the dollar appreciated (depreciated) against the mark following an increase (decrease) in the discount rate.

In summary, in almost every instance in period 2 long-term rates moved in the same direction as the change in the funds rate path implied by the policy surprises catalogued in this paper and in most cases the movement was substantial. The three-year forward rate moved in the same direction as the policy surprise in 29 cases, in the opposite direction in 5 cases, and was virtually

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<sup>12</sup>In the one case--December 4, 1980--when daily long-term rates moved in the opposite direction from the discount rate there is evidence that this movement was due to some development other than the discount rate change. Data on 20-year Treasury bond future rates from the Chicago Board of Trade are available from the "settle" at the end of one market day--but before the late afternoon discount rate announcements--to the "open" early the following morning, which is a shorter interval than the daily interest rate data used in our paper. The only announcement that was followed by a change in the settle-to-open futures rate in the opposite direction from the change in the daily 20-year spot rate was the December 4, 1980 announcement, when the futures rate rose 7 basis points while the spot rate fell 8 basis points. This indicates that the atypical movement in daily spot long-term rates following this discount rate increase was due to other developments on the day following the announcement. (We report the behavior of Treasury bond future rates following discount rate changes in [2].)

unchanged (i.e., a 0 or 1 basis point change) in 6 cases.<sup>13</sup> These data indicate that long-term and forward interest rates well in the future reacted to policy surprises in the October 1979 to October 1982 period. We compare the reaction of rates to policy surprises and to announcements of unanticipated changes in M1 below.

Comparison of Rate Movements Following Money Announcements and Policy Surprises This section describes two sets of regressions used to compare the relative response of short- and long-term interest rates to announcements of unanticipated changes in M1 with the relative response of rates to the policy surprises we have catalogued.

The first set of regressions are the standard regressions used in the money announcement literature augmented with three dummy variables that measure the response of daily interest rates to the policy surprises discussed above:

$$1. \Delta R_t = a + b*UM_t + c*OMO_t + d*DIS_t + e*ANN_t + u_t$$

The dependent variable,  $\Delta R_t$ , is the change in the interest rate (in basis points) for a Treasury security of a given maturity or the change in the dollar/mark exchange rate (in percentage points) on days of money announcements and policy surprises. The independent variables are  $UM_t$ , the unexpected component of the money stock release measured as a percentage forecast error;  $OMO_t$ , a dummy variable for the open market operations;  $DIS_t$ , a dummy variable for the discount rate announcements; and  $ANN_t$ , a dummy variable for policy announcements.

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<sup>13</sup>The dollar depreciated (appreciated) against the mark following policy surprises indicating a higher (lower) funds rate path in 9 out of 40 cases, and in 4 of these cases the change was very small (.13 of a percentage point or less). As noted earlier, this is evidence that the

(Footnote Continued)

Consider first the coefficients for the money announcement variable. These are shown in the second column of Table 2. The coefficients are significant at the 5% level in all the interest rate and exchange rate regressions. The results show that the two-year rate three and five years forward are responding to the announcement of unanticipated M1 growth. Additionally, the magnitude of the coefficient in the 30-year bond rate regression is large relative to the coefficient in the 6-month bill rate regression: the ratio of the two coefficients is .31. Finally, the coefficient in the dollar/mark exchange rate regression is negative and significant at the 5% level. According to the model of exchange rate determination described in Engel and Frankel [8], the significant appreciation of the dollar following announcements of unanticipated increases in the money stock is support for the policy anticipations hypothesis.<sup>14</sup>

The three dummy variables in the regressions are intended to measure the response of daily interest rates to the unexpected open market operations, discount rate announcements, and other policy announcements we have catalogued. Each dummy variable is equal to +1 on days when a policy surprise in that category indicates a higher funds rate path, -1 on days when the surprise indicates a lower funds rate path, and zero otherwise. The dependent variable on days when any of the three variables is nonzero is the change in interest rates or the percentage change in the exchange rate surrounding the event.

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(Footnote Continued)

interest rate movements following policy surprises catalogued in this paper were not due to the public inferring inflation-related inside information from the Fed.

<sup>14</sup>The results for the money announcement variable are similar to the results in Gavin and Karamouzis [13] and Roley and Walsh [23].

TABLE 2  
PERIOD 2  
10/9/79 - 10/15/82  
NOB 186

| Rate                | Constant          | Unexpected<br>Money | Open<br>Market<br>Operation | Policy<br>Discount Rate<br>Announcement | Other Policy<br>Announcements | SER   | $\bar{R}^2$ | D.W. |
|---------------------|-------------------|---------------------|-----------------------------|-----------------------------------------|-------------------------------|-------|-------------|------|
| 6 month             | 3.76<br>(1.58)    | 36.84*<br>(7.64)    | 28.04*<br>(4.49)            | 55.35*<br>(5.04)                        | 58.35*<br>(3.97)              | 32.47 | 0.40        | 2.04 |
| 3 year              | 0.31<br>(0.19)    | 25.95*<br>(7.75)    | 19.00*<br>(4.37)            | 29.53*<br>(3.87)                        | 37.67*<br>(3.69)              | 22.57 | 0.37        | 2.00 |
| 5 year              | 1.61<br>(1.09)    | 20.58*<br>(6.96)    | 15.31*<br>(4.00)            | 22.76*<br>(3.38)                        | 35.92*<br>(3.98)              | 19.91 | 0.34        | 2.08 |
| 7 year              | 1.43<br>(1.05)    | 18.30*<br>(6.70)    | 12.06*<br>(3.40)            | 19.10*<br>(3.07)                        | 33.40*<br>(4.01)              | 18.41 | 0.31        | 2.03 |
| 20 year             | 1.98<br>(1.53)    | 11.69*<br>(4.51)    | 12.58*<br>(3.75)            | 13.02*<br>(2.21)                        | 27.66*<br>(3.50)              | 17.44 | 0.22        | 1.98 |
| 30 year             | 2.20**<br>(1.83)  | 11.30*<br>(4.68)    | 11.87*<br>(3.79)            | 10.89*<br>(1.98)                        | 27.16*<br>(3.69)              | 16.27 | 0.22        | 1.99 |
| F(3,2) <sup>a</sup> | 4.08*<br>(3.08)   | 11.49*<br>(3.71)    | 7.94*<br>(1.99)             | 8.66<br>(1.19)                          | 32.43*<br>(3.27)              | 20.87 | 0.11        | 2.00 |
| F(5,2)              | 0.99<br>(0.58)    | 8.93*<br>(2.59)     | -0.79<br>(0.11)             | 5.15<br>(0.66)                          | 23.92*<br>(2.27)              | 23.25 | 0.05        | 2.03 |
| DM                  | -0.12**<br>(1.95) | -0.29*<br>(2.32)    | -0.22<br>(1.33)             | -0.56**<br>(1.94)                       | -1.00*<br>(2.60)              | 0.848 | 0.08        | 2.16 |

<sup>a</sup> Cochran-Orcutt correction. RHO = -0.17.

Absolute value of t-statistic in parenthesis.

\*Significant at 5% (2-tailed test)

\*\*Significant at 10% (2-tailed test)

As shown in the third, fourth, and fifth columns in Table 2, the coefficients of the dummy variables are significant at the 5% level in all spot interest rate regressions. While our criteria for choosing policy surprises assured that the response of short term interest rates to these surprises would be significant, the significant response of the longer term interest rates and the magnitude of the coefficients in the longer term rate regressions relative to the coefficients in the bill rate regression would not necessarily be expected. In fact, as noted earlier, the key assumption in much of the money announcement literature is that this response of long-term rates to policy surprises is not possible. The ratio of the coefficient of the open market operation dummy variable in the 30-year bond rate equation to the coefficient in the bill rate regression is .42. The similar ratios for the discount rate and policy announcement variables are .20 and .47, respectively. These ratios bracket the comparable ratio for the money announcement variable. Additionally, the coefficients of the open market operation and policy announcement dummy variables are significant at the 5% level in the 3-year ahead 2-year forward rate regression.

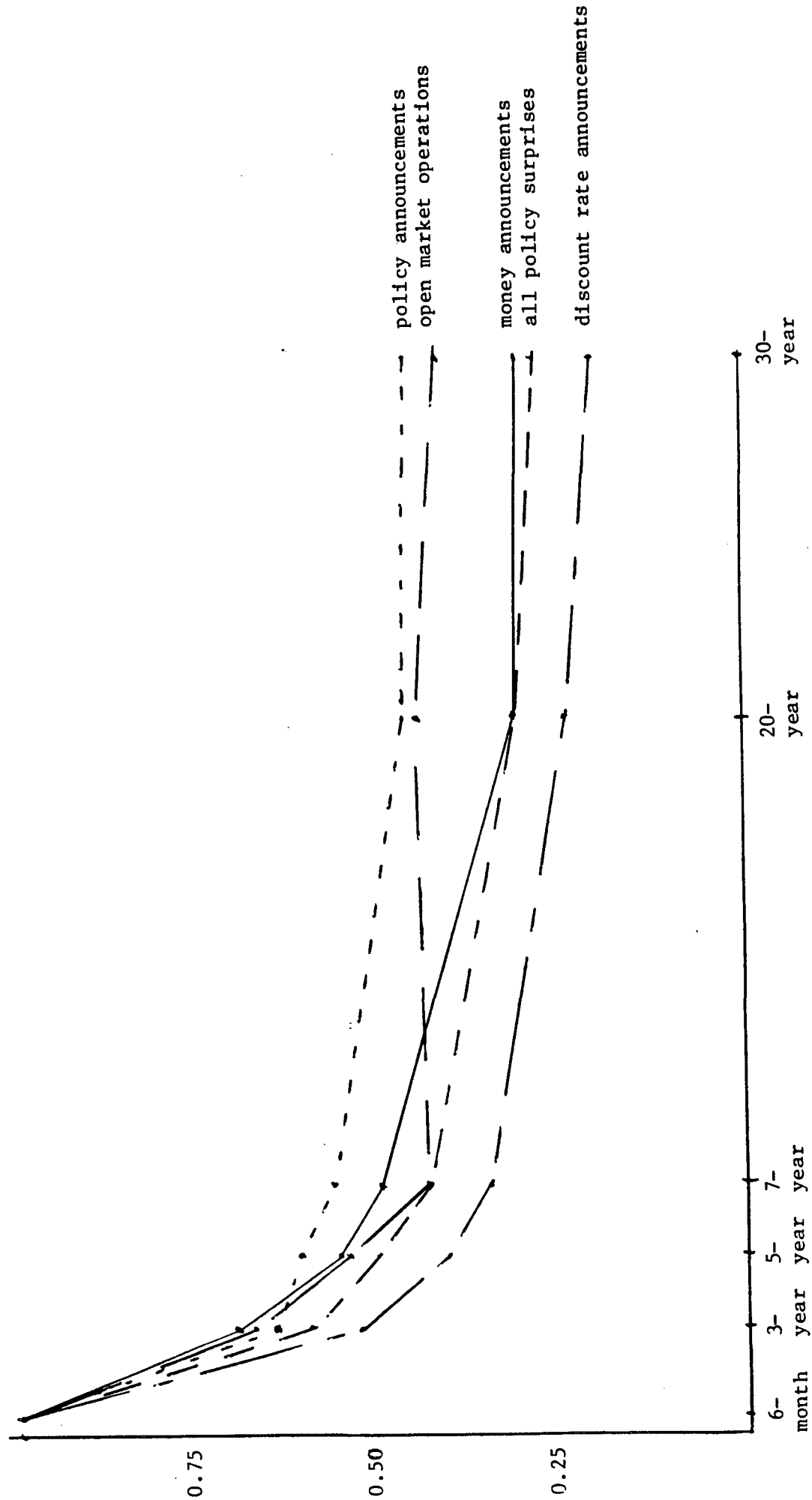
In order to compare the relative response of short- and long-term interest rates to money announcements and to policy surprises, the coefficients of the money announcement variable and the three policy surprise dummy variables in each spot interest rate regression were divided by the comparable coefficient in the six-month rate regression. The four coefficient ratios for each maturity are shown in Chart 1. Overall, the strong response of the longer term rates relative to the bill rate following money announcements is similar to the response of long-term rates relative to the bill rate following the three types of policy surprises.

The first set of regressions have the advantage that they conform to the money announcement regressions, enabling a direct comparison of the relative

# CHART 1

COMPARISON OF THE RESPONSE OF SHORT-TERM AND LONG-TERM INTEREST RATES  
TO POLICY SURPRISES AND MONEY ANNOUNCEMENTS

PERIOD 2



magnitude of coefficients at different maturities. They have the disadvantages that they fragment the policy surprise data and that they treat all surprises within a category as the same. As a check of the results from these regressions we report a second set of regressions that summarize the relationship between changes in long-term and forward interest rates and changes in the bill rate on days of policy surprises. These regressions are of the form:

$$2. \Delta R_t = a + b * \Delta RTB_t + e_t,$$

where  $\Delta R_t$  is the change in the long-term rate, forward rate, or exchange rate on days of policy surprises and  $\Delta RTB_t$  is the change in the six-month Treasury bill rate.<sup>15</sup>

The results are shown in Table 3. The coefficients in the spot rate regressions gradually fall to .28 at the 30-year maturity. Additionally, the coefficient in the three year ahead forward rate regression implies that a one percentage point movement in the bill rate on policy surprise days was accompanied by about a one-third of a percentage point change in the forward rate. The coefficients for the spot rate regressions are plotted in Chart 1. The pattern of the coefficients for different maturities is very similar to the pattern of the coefficients for the money announcement variable from the first set of regressions.

In summary, the evidence from these two sets of regressions indicates that in the period from October 1979 to October 1982 the reaction of long-term and forward interest rates to money announcements was similar to the reaction of these rates to policy events that caused changes in the expected funds rate

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<sup>15</sup>The regressions exclude nine policy surprise days on which there was a money surprise greater than 0.1 percent. These days are February 11, 1980, September 2, 1980, September 8, 1980, November 25, 1980, April 6, 1981, March 22, 1982, August 9, 1982, September 13, 1982, and October 12, 1982. The results are not significantly different when these observations are included.

TABLE 3

| $\Delta R_t = a + b * \Delta RTB_t + e_t$ |                  | Period 2<br>Policy Events<br>NOB 31 |            |                      |             |
|-------------------------------------------|------------------|-------------------------------------|------------|----------------------|-------------|
| $\Delta R_t$                              | <u>a</u>         | <u>b</u>                            | <u>SER</u> | <u>R<sup>2</sup></u> | <u>D.W.</u> |
| DM                                        | -0.001<br>(1.29) | -0.009<br>(4.01)                    | 0.63       | 0.33                 | 1.55        |
| 3 year                                    | -2.84<br>(1.17)  | 0.60<br>(12.22)                     | 13.51      | 0.83                 | 1.75        |
| 5 year                                    | -2.47<br>(1.01)  | 0.51<br>(10.38)                     | 13.59      | 0.78                 | 1.69        |
| 7 year                                    | -2.86<br>(1.37)  | 0.43<br>(10.29)                     | 11.59      | 0.78                 | 1.74        |
| 20 year                                   | -1.16<br>(0.50)  | 0.32<br>(7.87)                      | 11.21      | 0.67                 | 1.54        |
| 30 year                                   | -0.48<br>(0.26)  | 0.28<br>(7.31)                      | 10.49      | 0.64                 | 1.63        |
| F(3,2)                                    | -1.74<br>(0.52)  | 0.34<br>(5.02)                      | 18.48      | 0.45                 | 1.75        |
| F(5,2) <sup>a</sup>                       | -4.19<br>(1.57)  | 0.12<br>(1.89)                      | 20.18      | 0.13                 | 2.10        |

Absolute value of t-statistics in parenthesis.

<sup>a</sup>Corchran-Orcutt correction. RHO = -0.36

path. Hence, these results are consistent with the policy anticipations view that both short- and long-term interest rates react to money announcements because these announcements alter expectations of the future path of the Federal funds rate.

#### IV. Period 1 Policy Surprise Data

In the period from September 1977 to October 6, 1979, the operating procedure of the Fed is accurately characterized as Federal funds rate targeting. Under this procedure, the FOMC gave the desk an initial target for the Federal funds rate. During the inter-meeting period this target was adjusted (within the 1/2 to 1 percentage point range specified by the FOMC) in response to incoming data on money growth and other macroeconomic variables. By changing nonborrowed reserves through open market operations, the funds rate was maintained within a very narrow band (about 1/8 to 1/4 of a percentage point) around the current objective.

Changes in the Federal Funds Rate Objective In this period the funds rate was maintained within such a narrow band around the funds rate objective that the public was able to accurately perceive changes in the objective. Perceived target changes were consistently reported on the following business day in either the money market column or a separate article in the Wall Street Journal.<sup>16</sup> We have used the Journal to compile a record of perceived changes in the target over the September 1977 to October 1979 period. The 30 reported target changes are shown in Table A4, along with headlines and quotations

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<sup>16</sup> Many of the perceived changes in the objectives can be confirmed as actual policy changes by consulting the monetary policy and open market operation summaries published in the Federal Reserve Bank of New York Quarterly Reviews, 1978 to 1980.

from the relevant Journal article reporting these changes. Also shown are the changes in spot interest rates, forward rates, and the exchange rate. The table shows that all reported funds rate changes were positive and that the most frequent adjustment was  $1/8$  of a percentage point. The target rose from  $6\frac{1}{4}\%$  to  $11\frac{1}{2}\%$  over the 24-month period.<sup>17</sup>

Note that in almost all cases the Journal reported the action which indicated that the target had changed. Usually, the Desk either allowed the funds rate to rise to the new objective before adding reserves, or drained reserves when the funds rate was at or slightly above the old objective. These actions clearly signaled changes in the objective.

The reaction of spot rates, forward rates, and the exchange rate to changes in the funds rate objective are shown in a more compact form in the top panel of Table 4. On days of increases in the funds rate objective the six-month bill rate rose in 25 instances, fell in 3 cases, and was unchanged in 2 cases. The bill rate frequently rose sharply on days that the objective was raised: on 7 days the bill rate rose by more than 20 basis points and on 11 days it increased by more than 10 basis points. The 30-year rate also rose following most of the objective changes, but the response was generally weak. The last row in the top panel shows the mean responses of rates to all funds rate objective changes excluding days on which a discount rate or money

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<sup>17</sup> All but one objective change for this period were reported by the Journal. We were unable to find a report of the  $6\frac{5}{8}\%$  percent to  $6\frac{1}{2}\%$  percent target change which occurred between October 31, 1977 and January 9, 1978. In eight cases, there was uncertainty about the magnitude of the target change on the day of the change. In three of those eight cases, the Journal reported a range which was believed to encompass the new objective. The midpoint of that range in all three cases was later confirmed as the new objective. In five of the eight cases, no range was reported. However, the new objective was identified in articles within a few days.

TABLE 4

The Movement in Interest Rates and the Exchange Rate  
on Policy Surprise Days in Period 1

| PERIOD 1                      |           |     |            |         |            |       |       |       |        |        |               |        |       |
|-------------------------------|-----------|-----|------------|---------|------------|-------|-------|-------|--------|--------|---------------|--------|-------|
| FUNDS<br>RATE<br>OBJECTIVE    | DATE *    | DAY | END DATE * | -OR+    | SPOT RATES |       |       |       |        |        | FORWARD RATES |        | DM *  |
|                               |           |     |            |         | 6MONTH     | 3Year | 5Year | 7Year | 20Year | 30Year | F(3,2)        | F(5,2) |       |
|                               |           |     |            |         |            |       |       |       |        |        |               |        |       |
|                               | 30-Sep-77 | Fri | 30-Sep-77  | +       | 0.04       | 0.00  | 0.01  | 0.01  | 0.00   | 0.00   | 0.02          | 0.01   | 0.35  |
|                               | 07-Oct-77 | Fri | 07-Oct-77  | +       | 0.00       | 0.05  | 0.02  | 0.04  | 0.03   | 0.01   | -0.03         | 0.11   | 0.16  |
|                               | 31-Oct-77 | Mon | 31-Oct-77  | +       | 0.21       | 0.10  | 0.06  | 0.06  | 0.02   | 0.02   | -0.02         | 0.06   | 0.79  |
|                               | 09-Jan-78 | Tue | 09-Jan-78  | +       | 0.38       | 0.31  | 0.26  | 0.19  | 0.15   | 0.11   | 0.17          | -0.04  | -0.34 |
|                               | 19-Apr-78 | Wed | 19-Apr-78  | +       | 0.22       | 0.14  | 0.10  | 0.06  | 0.03   | 0.02   | 0.02          | -0.08  | -0.25 |
|                               | 27-Apr-78 | Thu | 27-Apr-78  | +       | 0.09       | 0.02  | 0.02  | 0.01  | 0.02   | 0.02   | 0.02          | -0.02  | 0.85  |
|                               | 18-May-78 | Thu | 18-May-78  | +       | 0.11       | 0.04  | 0.05  | 0.05  | 0.04   | 0.02   | 0.06          | 0.05   | 1.11  |
|                               | 21-Jun-78 | Wed | 21-Jun-78  | +       | 0.05       | 0.10  | 0.04  | 0.04  | 0.04   | 0.04   | -0.07         | 0.04   | 0.17  |
|                               | 20-Jul-78 | Thu | 20-Jul-78  | +       | 0.05       | 0.01  | 0.03  | 0.04  | 0.03   | 0.01   | 0.07          | 0.07   | 0.02  |
|                               | 16-Aug-78 | Wed | 16-Aug-78  | +       | 0.23       | 0.19  | 0.14  | 0.09  | 0.08   | 0.07   | 0.04          | -0.08  | -0.98 |
|                               | 18-Aug-78 | Fri | 18-Aug-78  | +       | 0.07       | 0.02  | 0.00  | -0.01 | 0.00   | -0.02  | -0.03         | -0.05  | -0.89 |
|                               | 28-Aug-78 | Mon | 28-Aug-78  | +       | 0.09       | 0.01  | -0.02 | 0.00  | 0.01   | 0.00   | -0.07         | 0.07   | -0.54 |
|                               | 08-Sep-78 | Fri | 08-Sep-78  | +       | 0.07       | 0.01  | 0.01  | 0.01  | 0.00   | -0.01  | 0.01          | 0.01   | -0.84 |
|                               | 20-Sep-78 | Wed | 20-Sep-78  | +       | 0.08       | 0.03  | 0.02  | 0.06  | 0.07   | 0.06   | 0.00          | 0.19   | 0.61  |
|                               | 25-Sep-78 | Mon | 25-Sep-78  | +       | 0.02       | 0.01  | 0.04  | 0.04  | 0.01   | -0.01  | 0.09          | 0.04   | 0.23  |
|                               | 28-Sep-78 | Thu | 28-Sep-78  | +       | -0.04      | 0.00  | -0.01 | -0.01 | 0.00   | 0.01   | -0.03         | -0.01  | 0.15  |
|                               | 18-Oct-78 | Wed | 18-Oct-78  | +       | -0.06      | 0.04  | 0.01  | 0.03  | 0.01   | 0.00   | -0.05         | 0.10   | 0.22  |
|                               | 20-Oct-78 | Fri | 20-Oct-78  | +       | 0.07       | 0.03  | 0.02  | 0.03  | 0.02   | 0.02   | 0.00          | 0.07   | 1.39  |
|                               | 26-Oct-78 | Thu | 26-Oct-78  | +       | 0.12       | 0.03  | 0.07  | 0.04  | 0.03   | 0.03   | 0.14          | -0.06  | -0.51 |
|                               | 31-Oct-78 | Tue | 31-Oct-78  | +       | 0.33       | 0.27  | 0.23  | 0.09  | 0.02   | 0.03   | 0.15          | -0.38  | -1.79 |
|                               | 01-Nov-78 | Wed | 01-Nov-78  | +       | 0.09       | -0.28 | -0.39 | -0.32 | -0.18  | -0.21  | -0.59         | -0.08  | -6.85 |
|                               | 28-Nov-78 | Tue | 28-Nov-78  | +       | 0.04       | 0.01  | 0.00  | 0.00  | 0.00   | 0.01   | -0.01         | 0.00   | -0.15 |
|                               | 19-Dec-78 | Tue | 19-Dec-78  | +       | 0.07       | 0.03  | 0.00  | 0.01  | 0.01   | -0.02  | -0.05         | 0.04   | 1.04  |
|                               | 15-Jan-79 | Mon | 15-Jan-79  | +       | 0.00       | 0.00  | -0.01 | 0.01  | 0.00   | 0.00   | -0.03         | 0.08   | -0.13 |
|                               | 27-Apr-79 | Fri | 27-Apr-79  | +       | 0.29       | 0.12  | 0.05  | 0.05  | 0.03   | 0.01   | -0.07         | 0.05   | -1.02 |
|                               | 20-Jul-79 | Fri | 20-Jul-79  | +       | 0.14       | 0.04  | 0.00  | -0.03 | -0.01  | -0.04  | -0.07         | 0.13   | -0.34 |
|                               | 15-Aug-79 | Wed | 15-Aug-79  | +       | 0.07       | 0.03  | 0.04  | 0.03  | 0.01   | 0.01   | 0.05          | -0.01  | -0.05 |
|                               | 24-Aug-79 | Fri | 24-Aug-79  | +       | 0.11       | 0.10  | 0.08  | 0.08  | 0.04   | 0.05   | 0.04          | 0.08   | 0.00  |
|                               | 04-Sep-79 | Tue | 04-Sep-79  | +       | 0.26       | 0.13  | 0.06  | 0.07  | 0.06   | 0.05   | -0.07         | 0.10   | -0.22 |
|                               | 19-Sep-79 | Wed | 19-Sep-79  | +       | -0.25      | -0.05 | -0.07 | -0.04 | -0.02  | -0.03  | -0.11         | 0.06   | 0.56  |
|                               |           |     |            | MEAN    | 0.10       | 0.06  | 0.04  | 0.04  | 0.03   | 0.02   | 0.01          | 0.03   | -0.01 |
|                               |           |     |            | 1/ MEAN | 0.08       | 0.05  | 0.04  | 0.03  | 0.02   | 0.02   | 0.01          | 0.02   | 0.07  |
|                               |           |     |            |         |            |       |       |       |        |        |               |        |       |
| DISCOUNT RATE<br>ANNOUNCEMENT | DATE      | DAY | END DATE   | -OR+    | 6Month     | 3Year | 5Year | 7Year | 20Year | 30Year | F(3,2)        | F(5,2) | DM    |
|                               |           |     |            |         |            |       |       |       |        |        |               |        |       |
|                               | 06-Jan-78 | Fri | 9-Jan-78   | +       | 0.38       | 0.31  | 0.26  | 0.19  | 0.15   | 0.11   | 0.17          | -0.04  | -0.34 |
|                               | 18-Aug-78 | Fri | 18-Aug-78  | +       | 0.07       | 0.02  | 0.00  | -0.01 | 0.00   | -0.02  | -0.03         | -0.05  | -0.89 |
|                               | 22-Sep-78 | Fri | 22-Sep-78  | +       | 0.17       | -0.03 | 0.02  | 0.00  | 0.07   | 0.06   | 0.11          | -0.06  | 0.18  |
|                               | 13-Oct-78 | Fri | 16-Oct-78  | +       | 0.21       | 0.04  | 0.10  | 0.11  | 0.05   | 0.06   | 0.21          | 0.14   | 1.04  |
|                               | 01-Nov-78 | Wed | 1-Nov-78   | +       | 0.09       | -0.28 | -0.39 | -0.32 | -0.18  | -0.21  | -0.59         | -0.08  | -6.85 |
|                               | 20-Jul-79 | Fri | 20-Jul-79  | +       | 0.14       | 0.04  | 0.00  | -0.03 | -0.01  | -0.04  | -0.07         | -0.14  | -0.34 |
|                               | 16-Aug-79 | Thu | 17-Aug-79  | +       | 0.05       | 0.03  | 0.01  | 0.01  | 0.00   | 0.00   | -0.03         | 0.01   | -0.06 |
|                               |           |     |            | MEAN    | 0.17       | 0.07  | 0.07  | 0.05  | 0.04   | 0.03   | 0.06          | -0.02  | -0.07 |
|                               |           |     |            | 2/ MEAN | 0.14       | 0.01  | 0.04  | 0.04  | 0.04   | 0.04   | 0.10          | 0.03   | 0.39  |

1/ EXCLUDES DAYS OF DISCOUNT RATE CHANGES AND MONEY ANNOUNCEMENTS  
2/ EXCLUDES DAYS OF FUNDS RATE OBJECTIVE CHANGES

\*"Date" is the calendar day of the event. "End Date" is the day to which the change in rates (as of 3:30 p.m.) is calculated. "DM" is the percentage change in the dollar per German mark exchange rate.

announcement occurred.<sup>18</sup> The average response for the bill rate was 8 basis points, while the average response for the 30-year rate was 2 basis points.

Discount Rate Announcements Table A5 shows the seven policy or hybrid announcements that accompanied discount rate changes over the two-year period prior to October 1979. The lower panel of Table 4 shows the reaction of interest rates and the exchange rate to these announcements.<sup>19</sup> The last row in the lower panel shows the average response across maturities for the three discount rate changes not accompanied by changes in the funds rate objective. The average response was 14 basis points for the bill rate and 4 basis points for the intermediate- and long-term maturities.

Comparison of Rate Movements Following Money Surprises and Funds Rate Target Changes We summarize the response of interest rates and the exchange rate to money announcements and funds rate objective changes with the regression:

$$3. \Delta R_t = a + b \cdot UM_t + c \cdot \Delta FFR_t + e_t,$$

where  $\Delta FFR_t$  is the perceived change in the Federal funds rate objective in percentage points.<sup>20</sup> We do not have an expectations series for changes in the

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<sup>18</sup> On November 1, 1978, a day on which the discount rate was raised and the funds rate objective rose, the Treasury and the Federal Reserve Board announced a program aimed at supporting the dollar on foreign exchange markets. The government indicated that it would sharply increase its available stock of foreign exchange for use in more intensive intervention activities. The dollar appreciated almost 7 percent against the German mark. Additionally, while the bill rate rose, intermediate- and long-term interest rates fell sharply. Because the discount rate and the funds rate change occurred on the same day as this announcement, we have excluded it from the regressions and from the means shown in Table 2.

<sup>19</sup> While many of the discount rate changes were made late in the afternoon (after the 3:30 daily interest data observation), some were made in the morning. The table also indicates the date of the 3:30 observation following the announcement.

<sup>20</sup> The money announcement regression results are not significantly affected when the Federal funds rate variable is excluded.

objective as we do for the money stock release. However, the regressions do yield a measure of the average response of rates to a given change in the funds rate target and indicate whether there was a significant linear relationship between changes in the objective and changes in rates during this period.

The results are presented in Table 5. All spot interest rates rise (fall) following the announcement of an M1 figure higher (lower) than expected. The coefficients in the interest rate regressions from 6 months through 7 years are significant at the 5% level, while the coefficient in the 3-year ahead 2-year forward rate regression is significant at the 10% level. The magnitude of the unexpected money coefficient is largest at the shortest maturities and declines as maturity increases. In response to an unanticipated growth in M1 of 1%, the 6-month rate increases by 4.6 basis points. The corresponding figure for the 20-year rate is less than 1 basis point. The response of the exchange rate to an unexpected increase in M1 is not significant.

In response to a one percentage point change in the funds rate objective, the 6-month bill rate rose about 46 basis points while the 30-year rate rose about 6 basis points. The coefficient of the funds rate variable is positive and significant at the 5% level through the 30-year rate regression. The coefficient in the two forward rate and the exchange rate regressions is not significant at the 10% level.

Chart 2 shows the effect of unanticipated money and changes in the funds rate objective on interest rates of different maturities relative to the effect on the 6-month rate. The points plotted are the regression coefficients shown in Table 5 divided by the 6-month bill rate coefficients. Overall, the chart shows that the relative effects of the two types of events on interest rates in period 1 were similar through the 30-year maturity. This similarity

TABLE 5

PERIOD 1  
9/30/77 - 10/5/79  
NOB 127

| <u>Rate</u>         | <u>Constant</u>  | <u>Unexpected<br/>Money</u> | <u>Funds Rate<br/>Target Change</u> | <u>SER</u> | <u><math>\bar{R}^2</math></u> | <u>D.W.</u> |
|---------------------|------------------|-----------------------------|-------------------------------------|------------|-------------------------------|-------------|
| 6 month             | 1.72*<br>(2.03)  | 4.61*<br>(2.35)             | 46.06*<br>(5.17)                    | 8.34       | 0.22                          | 1.77        |
| 3 year              | 0.85**<br>(1.67) | 2.88*<br>(2.44)             | 31.57*<br>(5.92)                    | 5.00       | 0.26                          | 1.73        |
| 5 year              | 0.53<br>(1.19)   | 2.76*<br>(2.68)             | 23.27*<br>(4.98)                    | 4.37       | 0.22                          | 1.77        |
| 7 year              | 0.66**<br>(1.74) | 2.06*<br>(2.35)             | 15.18*<br>(3.83)                    | 3.71       | 0.15                          | 1.91        |
| 20 year             | 0.61*<br>(2.19)  | 0.90<br>(1.38)              | 9.24*<br>(3.15)                     | 2.75       | 0.08                          | 1.90        |
| 30 year             | 0.54*<br>(1.99)  | 0.77<br>(1.23)              | 5.55*<br>(1.96)                     | 2.66       | 0.03                          | 1.80        |
| F(3,2)              | -0.06<br>(0.09)  | 2.55**<br>(1.72)            | 7.03<br>(1.05)                      | 6.30       | 0.02                          | 2.01        |
| F(5,2) <sup>a</sup> | 1.18**<br>(1.67) | 0.11<br>(0.06)              | -14.14<br>(1.64)                    | 7.95       | 0.04                          | 1.99        |
| DM                  | 0.02<br>(0.35)   | 0.14<br>(1.04)              | -0.49<br>(0.81)                     | 0.57       | 0.0                           | 2.01        |

<sup>a</sup>Cochran-Orcutt Correction.

Absolute value of t-statistic in parenthesis.

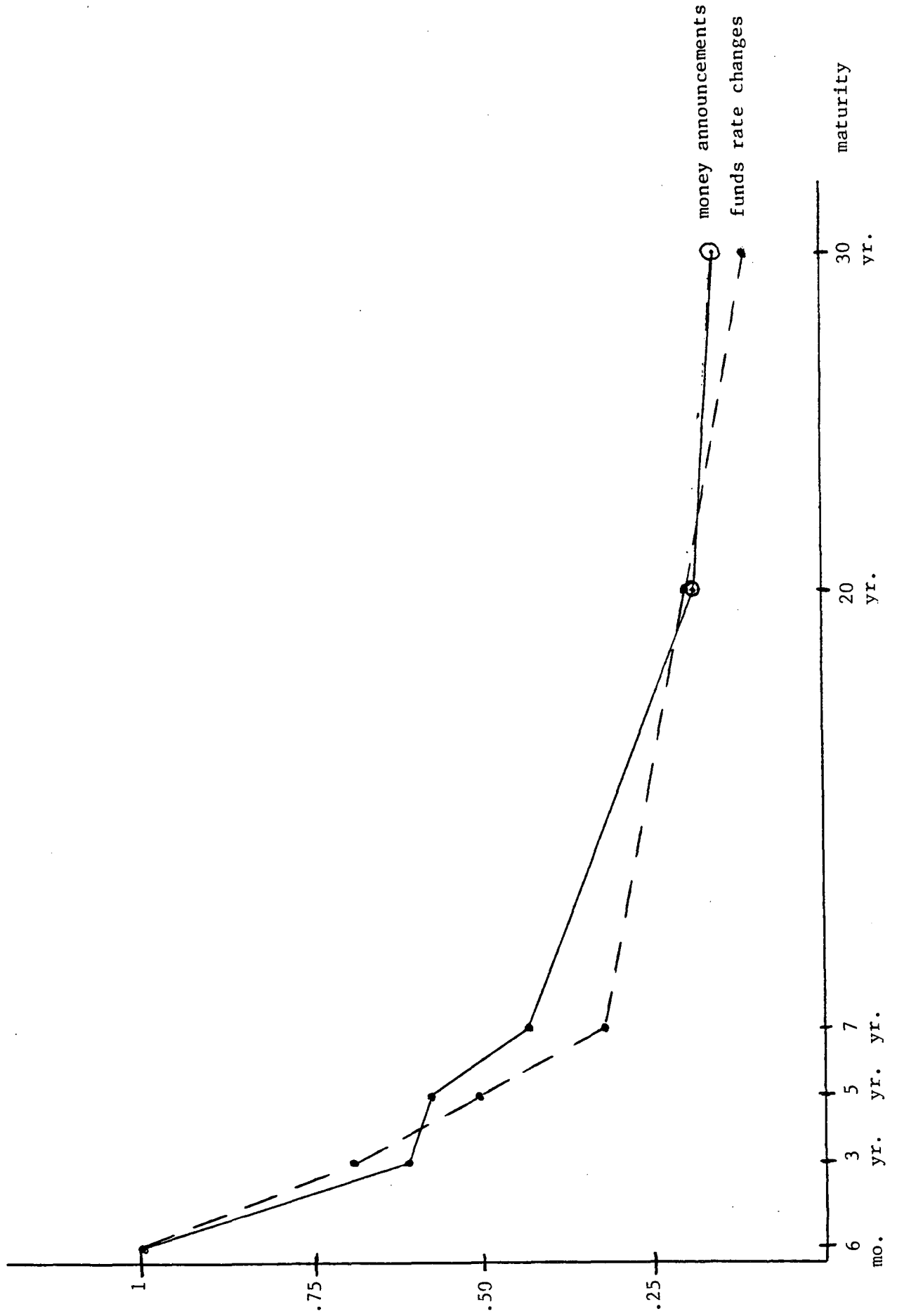
\*Significant at 5% (2-tailed test)

\*\*Significant at 10% (2-tailed test)

• significant at 5%

⊙ not significant at 10%

CHART 2



between the pattern of the coefficients of the money announcement and funds rate target change variables is evidence that, as in period 2, the reaction of interest rates to money announcements in period 1 was consistent with the policy anticipations hypothesis.

#### V. Period 3 Policy Surprise Data

Federal Reserve statements describe the operating procedures in period 3 as "borrowed reserves targeting." Under these procedures the borrowed reserve level set at the FOMC meeting is either retained throughout the intermeeting period or adjusted judgmentally by the Desk in light of incoming information.<sup>21</sup> If incoming information calls for a higher funds rate, the Desk indirectly puts upward pressure on the funds rate by raising the borrowed reserves target. Although this procedure is conceptually similar to that of period 1, in practice there were two differences that created more confusion among market participants regarding Federal Reserve intentions with respect to the funds rate path than in the previous two periods. First, even though there was little trend or cyclical movement in the funds rate in this period, the week-to-week and intra-weekly movements were quite volatile. Second, the relationship between the level of reported borrowing and the spread between the funds rate and the discount rate was weak. Hence, market participants were often confused as to whether a funds rate change signaled a change in the borrowed reserves target and in the funds rate path or whether it was caused by a shift in the borrowed reserves function. If the shift was temporary, the funds rate change would be reversed. Even if the shift was permanent, the Fed

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<sup>21</sup>For discussion of the operating procedure in this period see Axilrod [1], Wallich [27] and Gilbert [14].

could still choose to subsequently override its effect on the funds rate by changing the borrowed reserves target.

Open Market Operations Choosing open market operations in period 3 that fit the criteria outlined earlier for a policy surprise was more difficult than in the earlier periods and we were able to find only 9 incidents that did so. This does not reflect a decrease in interest in daily open market operations nor does it reflect a decrease in the sensitivity of market rates to movements in the funds rate. To the contrary, the Journal credit market stories in this period reflect intense interest among market participants with day-to-day movements in the funds rate. However, these stories generally did not cite a Fed action or lack of action that caused market participants to change their perception of the effective funds rate range. Instead, the stories simply compared the funds rate to the prevailing level in previous days and commented on whether market participants thought the Fed was "easing" or "tightening." This change in the form of the Journal's stories appeared to reflect the substantial confusion in this period about the current stance of Fed policy and the lack of market consensus as to what the Fed's current effective range for the funds rate was.<sup>22</sup> There were scores of stories in this period that attributed movements in market rates to movements in the daily funds rate. However, since these stories did not directly cite a specific Fed action or lack of action we did not use these incidents.

For each of the open market operation surprises in period 3, Table A6 shows the Journal headline, a relevant quote, and the behavior of rates. Table 6 summarizes the movement of spot interest rates, forward rates and the dollar/mark exchange rate on all the policy surprise days in period 3. As in

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<sup>22</sup>For an example of this confusion, see [11].

TABLE 6

The Movement in Interest Rates and the Exchange Rate  
on Policy Surprise Days in Period 3

## PERIOD 3

|              |           |     |           |      | SPOT RATES |       |       |       |        |        | FORWARD RATES |        |       |       |
|--------------|-----------|-----|-----------|------|------------|-------|-------|-------|--------|--------|---------------|--------|-------|-------|
|              | DATE*     | DAY | END DATE* | -OR+ | 6Month     | 3Year | 5Year | 7Year | 20Year | 30Year | F(3,2)        | F(5,2) | DM *  |       |
| OPEN         | 18-Nov-82 | Thu | 18-Nov-82 | -    | -0.11      | -0.06 | -0.13 | -0.14 | -0.14  | -0.21  | -0.27         | -0.18  | 0.57  |       |
| MARKET       | 08-Dec-82 | Wed | 08-Dec-82 | +    | 0.09       | 0.13  | 0.04  | 0.08  | 0.14   | 0.09   | -0.13         | 0.23   | -0.73 |       |
| OPERATIONS   | 09-Dec-82 | Thu | 09-Dec-82 | -    | -0.04      | 0.01  | 0.05  | 0.01  | -0.03  | -0.02  | 0.13          | -0.14  | 0.07  |       |
|              | 07-Jun-83 | Tue | 07-Jun-83 | +    | 0.14       | 0.10  | 0.07  | 0.07  | 0.08   | 0.07   | 0.02          | 0.07   | -0.33 |       |
|              | 25-Aug-83 | Thu | 25-Aug-83 | +    | 0.11       | 0.08  | 0.05  | 0.05  | 0.05   | 0.05   | 0.00          | 0.05   | -0.42 |       |
|              | 19-Sep-83 | Mon | 19-Sep-83 | -    | -0.09      | -0.04 | -0.01 | -0.07 | -0.01  | 0.00   | 0.05          | -0.29  | 0.67  |       |
|              | 20-Sep-83 | Tue | 20-Sep-83 | -    | -0.08      | -0.09 | -0.09 | -0.06 | -0.07  | -0.08  | -0.09         | 0.05   | -0.64 |       |
|              | 29-Nov-83 | Tue | 29-Nov-83 | -    | -0.02      | -0.04 | -0.10 | -0.04 | -0.05  | -0.08  | -0.22         | 0.18   | 0.87  |       |
|              | 06-Jun-84 | Wed | 06-Jun-84 | +    | 0.05       | 0.14  | 0.14  | 0.17  | 0.16   | 0.12   | 0.14          | 0.28   | 0.35  |       |
|              |           |     |           | MEAN | +          | 0.10  | 0.11  | 0.08  | 0.09   | 0.11   | 0.08          | 0.01   | 0.16  | -0.28 |
|              |           |     |           | MEAN | -          | -0.07 | -0.04 | -0.06 | -0.06  | -0.06  | -0.08         | -0.08  | -0.08 | 0.31  |
|              |           |     |           |      |            |       |       |       |        |        |               |        |       |       |
|              | DATE      | DAY | END DATE  | -OR+ | 6Monthb    | 3Year | 5Year | 7Year | 20Year | 30Year | F(3,2)        | F(5,2) | DM    |       |
| DISCOUNT     | 19-Nov-82 | Fri | 22-Nov-82 | -    | -0.06      | -0.01 | -0.11 | 0.02  | 0.01   | 0.08   | -0.31         | 0.51   | -0.58 |       |
| RATE         | 13-Dec-82 | Mon | 14-Dec-82 | -    | -0.41      | -0.27 | -0.21 | -0.16 | -0.15  | -0.09  | -0.09         | 0.02   | 1.39  |       |
| ANNOUNCEMENT | 21-Nov-84 | Wed | 23-Nov-84 | -    | -0.12      | -0.13 | -0.15 | -0.14 | -0.13  | -0.14  | -0.19         | -0.10  | -0.51 |       |
|              | 21-Dec-84 | Fri | 24-Dec-84 | -    | -0.03      | -0.04 | -0.04 | -0.03 | -0.03  | -0.02  | -0.04         | 0.01   | -0.22 |       |
|              | 17-May-85 | Fri | 20-May-85 | -    | -0.17      | -0.27 | -0.28 | -0.27 | -0.27  | -0.23  | -0.30         | -0.23  | 1.07  |       |
|              |           |     |           | MEAN |            | -0.16 | -0.11 | -0.13 | -0.08  | -0.07  | -0.04         | -0.16  | 0.11  | 0.02  |
|              |           |     |           |      |            |       |       |       |        |        |               |        |       |       |
| REGULAR      | 16-Feb-83 | Wed | 16-Feb-83 | -    | -0.14      | -0.06 | -0.08 | -0.05 | -0.06  | -0.04  | -0.12         | 0.06   | 0.72  |       |
| RELEASES     | 20-Jul-83 | Wed | 20-Jul-83 | -    | -0.09      | -0.06 | -0.09 | -0.09 | -0.05  | -0.05  | -0.15         | -0.09  | 0.65  |       |
|              | 06-Feb-84 | Mon | 06-Feb-84 | +    | 0.13       | 0.11  | 0.09  | 0.08  | 0.09   | 0.07   | 0.05          | 0.04   | -0.25 |       |
|              | 25-Jul-84 | Wed | 25-Jul-84 | -    | -0.08      | -0.21 | -0.29 | -0.26 | -0.24  | -0.28  | -0.45         | -0.14  | 0.63  |       |
|              | 24-Aug-84 | Fri | 27-Aug-84 | +    | 0.19       | 0.12  | 0.13  | 0.15  | 0.18   | 0.16   | 0.15          | 0.23   | -0.61 |       |
|              | 20-Feb-85 | Wed | 20-Feb-85 | +    | 0.10       | 0.10  | 0.14  | 0.16  | 0.15   | 0.15   | 0.22          | 0.23   | -0.50 |       |
|              |           |     |           | MEAN | +          | 0.14  | 0.11  | 0.12  | 0.13   | 0.14   | 0.13          | 0.14   | 0.17  | -0.45 |
|              |           |     | MEAN      | -    | -0.10      | -0.11 | -0.15 | -0.13 | -0.12  | -0.12  | -0.24         | -0.06  | 0.67  |       |

\*"Date" is the calendar day of the event. "End Date" is the day to which the change in rates (as of 3:30 p.m.) is calculated. "DM" is the percentage change in the dollar per German mark exchange rate.

period 2, bond rates virtually always moved in the same direction as the change in the expected path of the funds rate. However, unlike in period 2, there was a number of cases where the movement in rates was flat across the whole range of maturities, and in some cases long-term rates moved even more than the bill rate.

Discount Rate Announcements Table A7 provides a record of the five policy and hybrid discount rate announcements in period 3 and the change in rates on days of these announcements.<sup>23</sup> Movements in the bill rate following policy and hybrid announcements in this period averaged 16 basis points. In three cases the pattern of the reaction of intermediate- and long-term rates was flat, in one case it was declining and in one case bond rates moved in the opposite direction from the discount rate.<sup>24</sup> The three-year forward rate fell with the discount rate in all five cases. The five-year forward rate experienced mixed changes.<sup>25</sup>

Federal Reserve Policy Announcements All five of the semiannual policy reviews in period 3 were reported by the Journal to have caused a revision in the market's expectations of the near-term course of monetary policy. The

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<sup>23</sup>The money announcement data, open market operation surprises and regressions in this section go through July 1984. We augment the discussion of discount rate announcements and policy announcements with two discount rate announcements and two special policy announcements that occurred between July 1984 and June 1985.

<sup>24</sup>In the one case (November 19, 1982) when the daily change in the spot bond rate moved in the opposite direction from the daily change in the bill rate, the overnight settle-to-open change in the 20-year bond futures rate was in the same direction as the bill rate change. The daily 20-year spot rate rose 1 basis point while the settle-to-open 20-year futures rate fell 1 basis point. (This data is reported in [2]). See footnote 12.

<sup>25</sup>The case of November 19, 1982 is an illustration of the wild swings in forward rates that can occur when combining the Treasury constant-maturity yield series with Shiller's formula. The 3-year, 5-year and 7-year rates fell 1, 11, and 2 basis points, respectively. As a result, the 3-year forward rate fell 31 basis points while the 5-year forward rate rose 51 points.

headlines, relevant quotes, and rate movements are shown in Table A8. The reactions to the policy reviews were caused by a variety of circumstances. In February 1983 the Fed announced increases in the growth rate targets for the monetary aggregates that Chairman Volcker stated were "fully compatible with lower interest rates" as the economy recovers. According to the Journal, this announcement was interpreted as indicating that the Fed would not raise the funds rate in response to the record high growth rate of money in late 1982 and early 1983. In July 1983 the Fed "rebased" the M1 target using the second quarter of 1983 and at the same time raised the target for the second half of the year to 5 to 9%. This eliminated almost all of the large gap between the level of M1 and the upper bound of its target range, thereby reducing expectations that the Fed would raise the funds rate to return money to target. In February 1984 the semiannual report contained strong language warning that deficits would push interest rates up as the expansion progressed, along with large upward revisions in the money supply for the latter half of 1983. The language of the report along with the money supply revisions were viewed as reducing the chance that the Fed would lower the funds rate in reaction to the sharp slowing in the growth of money in the latter months of 1983.

At the July 1984 policy review Chairman Volcker made statements that the market took as indicating the Fed had not tightened at its mid-July FOMC meeting, as had been widely feared in the days prior to the review. When the July 1984 directive was released in August it indicated that the Fed had in fact adopted a "tighter" stance than had been anticipated by market participants based on the Chairman's remarks, and the market reaction to the Chairman's July testimony was reversed. This was the only release of a directive in period 3 that fit the criteria for a policy surprise. At the February 1985 policy review Chairman Volcker indicated that the Fed had stopped easing credit conditions the previous month, which, according to the Journal, weakened

expectations among market participants that the Fed would ease further in order to try to weaken the strong dollar exchange rate.

Table 6 shows that in each of these six cases the rates on all maturities moved in the same direction as the change in the expected funds rate path. With one minor exception the change in the 20-year bond rate was at least one-half that of the bill rate and in two instances it was greater than the change in the bill rate. In 11 out of 12 cases the 3-year and 5-year forward rates moved in the same direction as the policy surprise, and in many cases the movements were substantial.

Comparison of Rate Movements Following Money Surprises and Open Market Operations Regressions results for this period of interest rates on unanticipated changes in the money stock and a policy surprise dummy variable are shown in Table 7. In these regressions we used only one dummy variable for all three categories of policy surprises because of the small number of observations in each category. The coefficients of unanticipated money in all the interest rate and forward rate regressions are significant at the 5% level. The size of the coefficient in the bill rate regression is much lower than in period 2 but still well above that of period 1. The size of the coefficients in the intermediate-term, long-term and forward rate regressions relative to the bill rate coefficient is much larger than in period 2. The coefficients of unanticipated money in the forward rate regressions are roughly equal to the coefficient in the bill rate regression.

The regression results for the policy surprise dummy variable show that both short- and long-term rates reacted to new information influencing the expected path of the funds rate. As with the money announcements, the size of the coefficients of the open market surprise dummy variable is much higher in the long-term rate regressions relative to the bill rate regression than they were in period 2. This is illustrated in Chart 3 which plots both sets of coefficients as ratios of the six-month bill rate coefficient.

TABLE 7

PERIOD 3  
10/15/82 - 7/26/84  
NOB 102

| Rate            | Constant        | Unexpected<br>Money | Policy<br>Surprises | SER   | $\bar{R}^2$ | D.W. |
|-----------------|-----------------|---------------------|---------------------|-------|-------------|------|
| 6 month         | 1.18<br>(1.11)  | 13.94*<br>(4.59)    | 11.80*<br>(4.24)    | 10.69 | 0.26        | 2.20 |
| 3 year          | 0.44<br>(0.39)  | 10.86*<br>(3.35)    | 8.93*<br>(3.01)     | 11.40 | 0.15        | 2.24 |
| 5 year          | -0.06<br>(0.05) | 11.77*<br>(3.75)    | 9.46*<br>(3.29)     | 11.03 | 0.18        | 2.24 |
| 7 year          | 0.32<br>(0.30)  | 12.14*<br>(3.96)    | 9.13*<br>(3.26)     | 10.77 | 0.19        | 2.26 |
| 20 year         | 0.16<br>(0.16)  | 9.16*<br>(3.13)     | 9.11*<br>(3.70)     | 10.30 | 0.15        | 2.31 |
| 30 year         | -0.06<br>(0.06) | 9.42*<br>(3.25)     | 8.11*<br>(3.06)     | 10.18 | 0.14        | 2.28 |
| F(3,2)          | -0.98<br>(0.75) | 13.57*<br>(3.59)    | 10.80*<br>(3.12)    | 13.28 | 0.16        | 2.17 |
| F(5,2)          | 1.96<br>(1.21)  | 13.14*<br>(2.83)    | 5.79<br>(1.36)      | 16.31 | 0.07        | 2.12 |
| DM <sup>a</sup> | -0.13<br>(1.59) | 0.080<br>(0.38)     | -0.500*<br>(2.49)   | 0.678 | 0.06        | 2.25 |

<sup>a</sup>Through 2/23/84.

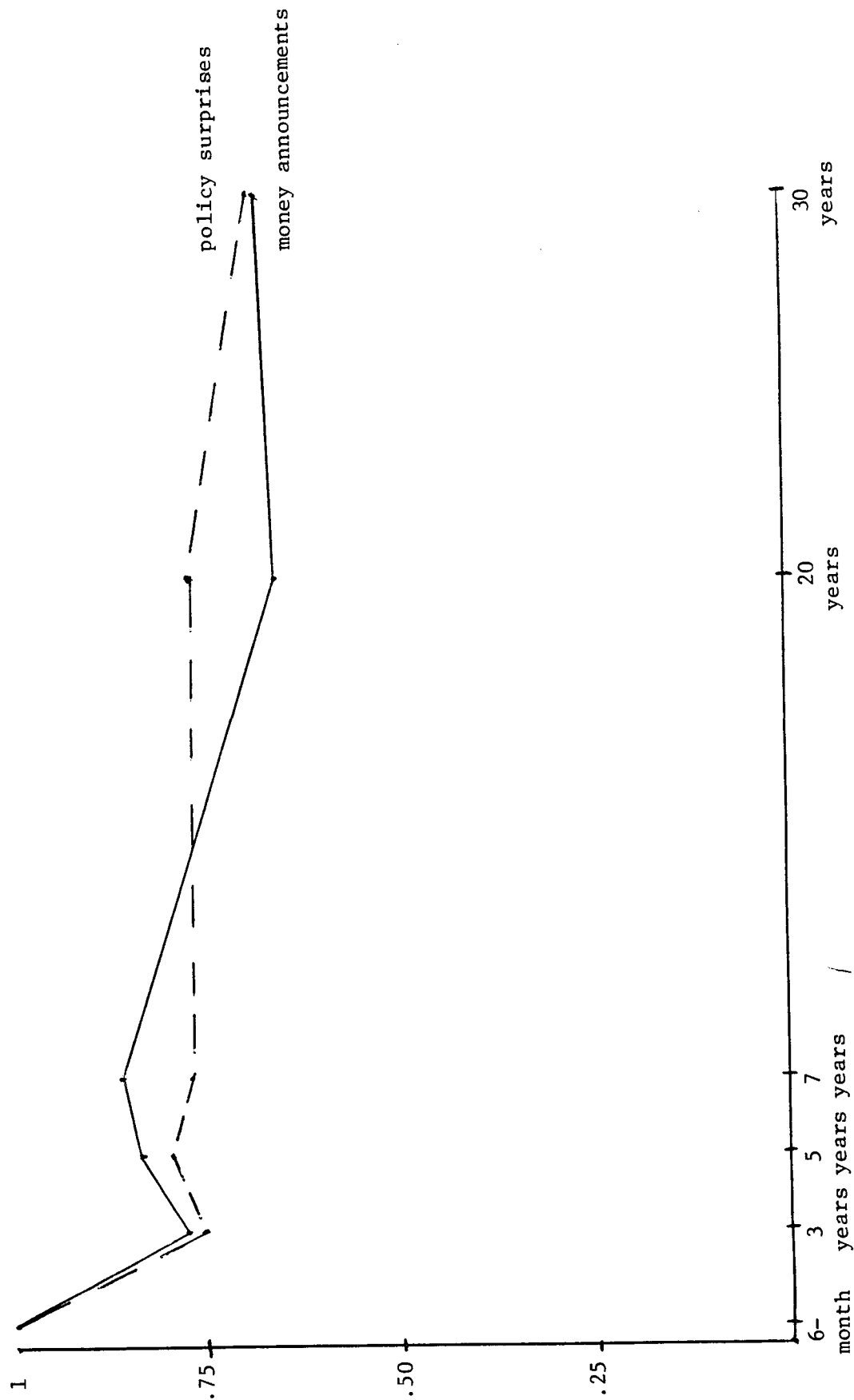
Absolute value of t-statistic in parenthesis.

\*Significant at 5% (2-tailed test)

\*\*Significant at 10% (2-tailed test)

CHART 3

Comparison in Period 3 of the Response of Short-Term and Long-Term  
Rates to Policy Surprises and Money Announcements



## VI. Conclusions

In all three periods covered by this paper, the six-month bill rate reacted strongly to monetary policy surprises that contained new information influencing the expected path of the funds rate. The policy surprise data indicate that the Federal Reserve actions and statements influencing the expected path of the Federal funds rate caused real bill rates to change in all three periods.

In period 1 the policy surprise data show a weak response of long-term rates to new information influencing the expected path of the fund rate. The reaction of long-term rates to policy surprises increased in period 2 not only in absolute magnitude, but also relative to the reaction of short-term rates. In period 3 the reaction of long-term rates to policy surprises relative to the reaction of short-term rates again rose. The policy surprise data indicate that Federal Reserve actions and statements in period 2 and 3 that influenced the expected path of the Federal funds rate caused movements in real long-term interest rates and in real forward rates at least three years into the future. A typical pattern in period 2 was for a one percentage point movement in the 6-month bill rate in reaction to a policy surprise to be accompanied by a one-third of a percentage point movement in the 20-year bond rate and in the three-year forward rate.

The relative reaction of short- and long-term interest rates to policy surprises in the three periods closely paralleled the relative reaction of short- and long-term rates to money surprises. In both cases the relative reaction of long-term rates rose in period 2 and then rose again in period 3. We conclude that the reaction of long-term interest rates to money surprises in the post-October 1979 period was consistent with the reaction of long-term rates to other monetary policy events that contained information influencing the expected Federal funds rate path. The assumption made in some of the money announcement literature that the reaction of long-term interest rates to

money surprises in this period was too large to be a reaction to changes in expectations of the funds rate path is not borne out by the policy surprise data. In our view this data solves the "puzzle" posed by earlier authors who pointed to the reaction of long-term rates as the major, if not the only, evidence inconsistent with the policy anticipations hypothesis.<sup>26</sup>

The real puzzle in the post-October 1979 period is not why long-term interest rates were so sensitive to money announcements, but why long-term interest rates were so sensitive to actual and expected changes in short-term interest rates. Broadly speaking, there are two possible explanations. First, if the simple expectations theory of the term structure is correct, these reactions imply that changes in the expected funds rate path influenced expected real interest rates at least three years into the future in the post-October 1979 period. Alternatively, the simple expectations theory of the term structure may not accurately describe the relationship between long-term and short-term interest rates in this period. Our paper offers no insight into which of these explanations is correct. It only provides evidence that changes in the expected funds rate in this period caused substantial movements in real long-term and forward interest rates.

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<sup>26</sup>See Cornell [6] and Hardouvelis [15]. Hardouvelis also argues that the depreciation of the expected future spot exchange rate after a positive money surprise is a second piece of evidence inconsistent with the policy anticipations hypothesis. His procedure is to use an open interest rate parity arbitrage condition to construct a five-year forward exchange rate, which he then uses as a proxy for the change in the expected spot exchange rate five years in the future following money announcements. His conclusion depends critically on his assumption that movement in the premium component of the forward rate does not vary systematically with the unanticipated component of M1. If this assumption is not valid then his findings are not evidence against the policy anticipations hypothesis. See Fama [10] for a discussion of the differential behavior of expected future spot exchange rates and forward exchange rates.

# **APPENDIX A: CALCULATION OF FORWARD RATES**

This paper employs forward interest rates calculated using the methodology discussed in Shiller, Campbell, and Schoenholtz [24]. The approach accounts for the influence of coupon payments on a bond's effective maturity, or duration, and is therefore suitable for calculating forward rates from yield series on spot coupon bonds, such as the constant maturity series published by the Federal Reserve Board.

The simple linearized approximation to the  $n$  period ahead  $m$  period forward rate is

$$(1) \quad f_t^{(n,m)} = (D_{m+n} R_t^{(m+n)} - D_n R_t^{(n)}) / (D_{m+n} - D_n)$$

$$0 \leq m \leq n$$

where  $D_{m+n}$  and  $D_n$  are the durations of bonds maturing in  $m+n$  and  $n$  periods.

$$D_i = (1 - g^i) / (1 - g) \quad 0 \leq i$$

$$g = 1 / (1 + \bar{R})$$

$(1 + \bar{R})$  is the discount factor.  $\bar{R}$  is assumed to be equal to the average of an interest rate over the relevant period.

$R_t^{(m+n)}$  and  $R_t^{(n)}$  are the quoted rates on the  $m+n$  and  $n$  period securities at time  $t$ .

Durations for a variety of maturities are shown below. The level of linearization ( $\bar{R}$ ) is the average of the 20 year bond rate for the period October 8, 1979 to October 11, 1982 ( $\bar{R} = 12.63$ ,  $g = 1 / (1 + \bar{R}) = 0.887833$ ).

| Maturity (1) | Duration $((1-g^i)/(1-g))$ |
|--------------|----------------------------|
| 3            | 2.68                       |
| 5            | 4.00                       |
| 7            | 5.04                       |
| 20           | 8.10                       |
| 30           | 8.66                       |

For yields on securities longer than one year, many studies use the constant maturity series prepared by the Treasury and published in the Federal Reserve Board's H.15 and G.13 statistical releases. Because bonds with the selective maturities are not continuously available, yields for 1, 2, 3, 5, 7, 10, 20, and 30 years are read from the Treasury's daily yield curve. The yield curve is constructed by plotting actual market yields derived from composite bid prices on actively traded issues. The curve is made continuous by drawing a smooth curve through the available points.

Since the constant maturity yields are constructed and do not necessarily represent actual yields on available securities, it is possible that small errors are introduced by the construction procedure. While any errors may be minor in the spot data, the errors are magnified in the calculation of the forward rates according to equation (1).

Money announcement studies use the one period change in the forward rates as the dependent variable in regressions with the unanticipated component of the M1 announcement as the independent variable. The one period change in the forward rate may be written:

$$(2) \quad f_{t+1}^{(n,m)} - f_t^{(n,m)} = \frac{D_{m+n}(R_{t+1}^{(m+n)} - R_t^{(m+n)}) - D_n(R_{t+1}^{(n)} - R_t^{(n)})}{(D_{m+n} - D_n)}$$

A random error (e) in  $R_{t+1}^{m+n}$  independent of measurement error in  $R_t^{m+n}$ ,  $R_{t+1}^n$ , and  $R_t^n$ , will produce an error in the change in the forward rate of:

$$(D_{m+n} / (D_{m+n} - D_n)) * e$$

For different combinations of m and n, values of  $D_{m+n} / (D_{m+n} - D_n)$  are:

| F(n,m)   | $D_{m+n} / (D_{m+n} - D_n)$ |
|----------|-----------------------------|
| F(3,2)   | 3.03                        |
| F(5,2)   | 4.85                        |
| F(20,10) | 15.46                       |

The value for F(20,10) indicates that a one basis point error in the 30-year constant maturity bonds yield produces an error of over 15 basis points in the change in the 20-year ahead 10 year forward rate. Assuming that the measurement error and the equation's disturbance term are independent, then the estimated coefficients and variances will be unbiased and ordinary least squares is the proper estimation technique. However, the estimated standard error of the coefficient will be higher than in the absence of measurement error. This makes it more difficult to reject the null hypothesis that the coefficient on unanticipated money is zero. We do not have a measure of the extent of the measurement error problem. However, we do know that measurement error will be more severe as the durations of the securities increases. For this reason, we have chosen to display data only for the 2 year rates 3 and 5 years ahead.

**APPENDIX B:**  
**DO POLICY SURPRISES AFFECT THE MARKET'S EXPECTATIONS OF**  
**SUBSEQUENT MONEY ANNOUNCEMENTS?**

In this appendix we discuss the hypothesis that the reaction of interest rates to the policy surprises documented in this paper occurred because these surprises changed market expectations of subsequent money announcements. We describe two possible tests of this hypothesis and carry out one of these tests. As background information for these tests it is useful to review the timing of the expectation surveys and money announcements. From September 1977 through January 31, 1980 the money market expectations surveys were carried out on Tuesday and Thursday and the money announcement was made (late) Thursday. From February 8, 1980 through February 10, 1984 the expectations survey was carried out on Tuesday and the money announcement was on Friday. Since February 16, 1984 the expectations surveys have been on Friday and Tuesday for the money announcement on the subsequent Friday.

One test of whether the policy surprises documented in this paper provided market participants with information that they used to revise their expectations of the subsequent money release would be to look at the expectations surveys before and after a policy surprise and see whether changes in expectations were in the same direction as the change in the funds rate path indicated by the policy surprise. The only policy surprises that could be used for this experiment are those that occurred between two expectations series for the same money release. We were unable to get both expectations series for the period before February 1980, and in any case there were only a small number of policy surprises that occurred on the necessary day (Wednesday). The next four years there was only one expectations survey. Consequently, we were unable to do this exercise.

A second test of whether the policy surprises documented in this paper provided market participants with information that they used to revise their expectations of the subsequent money announcement is to add to the regressions reported in the paper a dummy variable that takes a non-zero value on money announcement days when a policy surprise occurred between the M1 expectations survey day and the money announcement. The dummy variable is +1 when the policy surprise indicates a higher funds rate path and -1 when the policy surprise indicates a lower funds rate path. If M1 estimates are significantly revised following a policy surprise, then the expected sign for the dummy variable coefficient is negative since a policy surprise indicating a higher funds rate would raise the expected M1 figure relative to the available survey number and lower the actual response of interest rates relative to the predicted response.

Table B1 provides a list of the twenty-one policy surprises in period 2 that occurred between the M1 expectations survey day and the money announcement.\* Two policy surprises on consecutive days were in opposite directions, so we set the dummy variable equal to zero for the money announcement day following these events. This left nineteen observations for which the dummy variable takes on a value of +1 or -1. The regression results for the coefficient of the dummy variable are reported in Table B2. (The regression results for the coefficients of all the other variables were virtually unchanged.) In all but one of the regressions the coefficient of the dummy variable is not significantly different from zero. In the five-year

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\*We only did this exercise for period 2. In period 1 the expectations survey and the money announcement were on the same day. In period 3 there were only six policy surprises that occurred between the expectations survey and money announcement days (excluding surprises on two consecutive days in opposite directions).

TABLE B1

PERIOD TWO  
NOB 186

| Policy Surprise             |         | +/- |  | Money Announcement |     |          |
|-----------------------------|---------|-----|--|--------------------|-----|----------|
| Date                        | Day     |     |  | Date               | Day | Surprise |
| Open Market Operations      |         |     |  |                    |     |          |
| 1. May 2, 1980              | Fri     | -   |  | May 2, 1980        | Fri | -.672    |
| 2. May 8, 1980              | Thr     | +   |  | May 9, 1980        | Fri | -1.280   |
| 3. Jun 11, 1980             | Wed     | -   |  | Jun 13, 1980       | Fri | .590     |
| 4. Jul 31, 1980             | Thr     | +   |  | Aug 1, 1980        | Fri | -.076    |
| 5. Sep 3, 1980              | Wed     | -   |  | Sep 5, 1980        | Fri | .249     |
| 6. Oct 15, 1980             | Wed     | -   |  | Oct 17, 1980       | Fri | .903     |
| 7. Jun 7, 1981              | Wed     | +   |  | Jan 9, 1981        | Fri | -.615    |
| 8. Apr 2, 1981              | Thr     | +   |  | Apr 3, 1981        | Fri | .119     |
| 9. Jan 13, 1982             | Wed     | +   |  | Jan 15, 1982       | Fri | 1.399    |
| 10. Jan 21, 1982            | Thr     | +   |  | Jan 22, 1982       | Fri | 1.174    |
| 11. Jul 8, 1982             | Thr     | -   |  | Jul 9, 1982        | Fri | -1.009   |
| 12. Aug 12, 1982            | Thr     | -   |  | Aug 13, 1982       | Fri | 0        |
| 13. Sep 15, 1982            | Wed     | +   |  | Sep 17, 1982       | Fri | -.087    |
| 14. Sep 16, 1982            | Thr     | -   |  | Sep 17, 1982       | Fri | -.087    |
| 15. Sep 29, 1982            | Wed     | +   |  | Oct 1, 1982        | Fri | .434     |
| Discount Rate Announcements |         |     |  |                    |     |          |
| 16. Feb 15, 1980            | Fri-Fri | +   |  | Feb 15, 1980       | Fri | .687     |
| 17. Sep 26, 1980            | Thr-Fri | +   |  | Sep 26, 1980       | Fri | .978     |
| 18. Nov 1, 1980             | Fri-Mon | +   |  | Nov 18, 1980       | Tue | -.194    |
| 19. Dec 5, 1980             | Thr-Fri | +   |  | Dec 5, 1980        | Fri | .289     |
| Regular Release             |         |     |  |                    |     |          |
| 20. Feb 10, 1982            | Wed     | -   |  | Feb 12, 1982       | Fri | .467     |
| Special Event               |         |     |  |                    |     |          |
| 21. Oct 7, 1982             | Thr     | -   |  | Oct 8, 1982        | Fri | -.284    |

TABLE B2

Regression Results for Dummy Variable  
Described in Appendix B

|            |                  |
|------------|------------------|
| 6 month    | 0.61<br>(0.08)   |
| 3 year     | 0.09<br>(0.02)   |
| 5 year     | 0.62<br>(0.13)   |
| 7 year     | 2.48<br>(0.57)   |
| 20 year    | 3.85<br>(0.94)   |
| 30 year    | 4.51<br>(1.18)   |
| $F(3,2)^a$ | 3.03<br>(0.61)   |
| $F(5,2)$   | 9.71**<br>(1.78) |
| DM         | 0.12<br>(0.60)   |

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<sup>a</sup>Cochrane-Orcutt correction.

\*\*Significant at 10% (2-tailed test).

forward rate regression that coefficient is significant at the 10% level but has the wrong sign. Hence, this test provides no support for the view that the reaction of market rates to policy surprises documented in this paper reflected a revision in the market's expectations of the subsequent money announcement.

## **APPENDIX C: DATA DESCRIPTION**

### **Interest Rates:**

All interest rates are from the Federal Reserve Board's Macro Data Library. The interest rate series are also published in the Board's G.13 statistical release. The daily interest rates are derived from 3:30 bid quotes. The six month Treasury bill rate is measured as a bond equivalent yield. The bond rates are from the Treasury's constant maturity series.

For all monetary policy events, including the money announcements, interest changes are measured from the preceding 3:30 observation to the following 3:30 observation. If the bond market was closed on the day following the policy event, the next available observation was used.

### **Exchange Rates:**

The German mark-U.S. dollar exchange rate data for 1977 to 1983 are taken from various issues of the International Monetary Market Yearbook. The daily exchange rate, defined as the price of the German mark in U.S. dollars, is taken at the 3:00 market close. The daily change is measured as the percentage change.

The exchange rate changes for 1984 and 1985 were calculated from data published in the Wall Street Journal.

### **Money Supply Data:**

M1 figures were taken from the Federal Reserve Board's H.6 weekly release. From September 29, 1977 to January 31, 1980, the scheduled release day was Thursday. From February 8, 1980 to February 10, 1984, the scheduled release day was Friday. Since February 16, 1984, the scheduled release day has been Thursday. The actual change in M1 in billions of dollars was

calculated as the difference between the current week's M1 figure minus the past week's unrevised M1 figure. For the 10 weeks in which the previous week's figure was significantly revised due to benchmarking or a change in definition of M1, the revised figure for the previous week was used.

The consensus predicted change in M1 is proxied by the median estimate from the weekly survey conducted by Money Market Services. For the period September 29, 1977 to January 31, 1980, the survey was conducted on Tuesday and Thursday. We have used the median from the Thursday survey. For the period February 8, 1980 to February 10, 1984, the survey was conducted on Tuesday. For the period since February 16, 1984, the survey has been conducted on Friday and Tuesday. We have used the median from the Tuesday survey.

The unexpected component of the M1 release is measured by the difference between the actual change in M1 minus the predicted change in M1 as a percentage of the previous week's M1 figure.

## REFERENCES

1. Axilrod, Stephen H. "U.S. Monetary Policy in Recent Years: An Overview," Federal Reserve Bulletin, 71 (January 1985), pp. 14-24.
2. Cook, Timothy and Thomas Hahn. "The Information Content of Different Types of Discount Rate Announcements and their Effect on Market Interest Rates," Federal Reserve Bank of Richmond, December 16, 1985.
3. \_\_\_\_\_ and \_\_\_\_\_. "The Reaction of Interest Rates to Unanticipated Federal Reserve Actions and Statements: Implications for the Monetary Announcement Controversy," unpublished paper, Federal Reserve Bank of Richmond, February 3, 1986. [This is a shorter version of this working paper dealing only with the period from October 1979 to October 1982.]
4. Cornell, Bradford. "Money Supply Announcements, Interest Rates, and Foreign Exchange," Journal of International Money and Finance, August 1982, pp. 201-208.
5. \_\_\_\_\_. "Money Supply Announcements and Interest Rates: Another View," Journal of Business 56 (January 1983a), pp. 1-23.
6. \_\_\_\_\_. "The Money Supply Announcements Puzzle: Review and Interpretation," American Economic Review, 73 (September 1983b), pp. 644-57.
7. \_\_\_\_\_. "The Money Supply Announcements Puzzle: Reply," American Economic Review, 75 (June 1985), pp. 565-566.
8. Engel, Charles and Jeffrey Frankel. "Why Interest Rates React to Money Announcements: An Explanation from the Foreign Exchange Market," Journal of Monetary Economics, 13 (January 1984), pp. 31-39.
9. Fama, Eugene F. "Inflation, Output, and Money," Journal of Business, 55 (April 1982), pp. 201-32.
10. \_\_\_\_\_. "Forward and Spot Exchange Rates," Journal of Monetary Economics (November 1984), pp. 319-338.
11. "Fed Role in Funds Rate Rise Denied," New York Times, September 7, 1984.
12. Frankel, Jeffrey A. and Gikas A. Hardouvelis, "Commodity Prices, Money Surprises, and Fed Credibility," Journal of Money, Credit and Banking, 17 (November 1985), pp. 425-438.
13. Gavin, William T. and Nicholas V. Karamouzis. "Monetary Policy and Real Interest Rates: New Evidence From the Money Stock Announcements," Working Paper 8406, Federal Reserve Bank of Cleveland, December 1984.
14. Gilbert, R. Anton. "Operating Procedures for Conducting Monetary Policy," Federal Reserve Bank of St. Louis, Review, 67 (February 1985), pp. 13-20.

15. Hardouvelis, Gikas A. "Market Perceptions of Federal Reserve Policy and the Weekly Money Announcements," Journal of Monetary Economics, 14 (September 1984), pp. 225-40.
16. Loeys, Jan. G. "Changing Interest Rate Responses to Money Announcements: 1977-1983," Journal of Monetary Economics, 15 (May 1985), pp. 323-332.
17. "Monetary Policy and Open Market Operations in 1980," Federal Reserve Bank of New York, Quarterly Review 6 (Summer 1981), pp. 56-75.
18. Nichols, Donald A. and Others. "Why Interest Rates Rise When an Unexpectedly Large Money Stock is Announced," American Economic Review, 73 (June 1983), pp. 383-388.
19. Pearce, Douglas P. and Roley, V. V. "The Reaction of Stock Prices to Unanticipated Changes in Money," Research Working Paper 82-5, Federal Reserve Bank of Kansas City, 1982.
20. Poole, William. "Federal Reserve Operating Procedures: A Survey and Evaluation of the Historical Record Since October 1979," Journal of Money, Credit, and Banking, (November 1982), pp. 577-596.
21. Roley, V. V. "The Response of Short-Term Interest Rates to Weekly Money Announcements," Journal of Money, Credit, and Banking, 15 (August 1983), pp. 344-54.
22. \_\_\_\_\_ and Rick Troll. "The Impact of New Economic Information on the Volatility of Short-Term Interest Rates," Economic Review, Federal Reserve Bank of Kansas City, (February 1983), pp. 3-15.
23. \_\_\_\_\_ and Carl Walsh. "Monetary Policy Regimes, Expected Inflation, and the Response of Interest Rates to Money Announcements," The Quarterly Journal of Economics, 100 (Supplement, 1985), pp. 1011-1039.
24. Shiller, Robert J., and John Y. Campbell, and Kermit L. Schoenholtz. "Forward Rates and Future Policy: Interpreting the Term Structure of Interest Rates," Brookings Papers on Economic Activity (1:1983), pp. 173-217.
25. Urich, Thomas J. "The Information Content of Weekly Money Supply Announcements," Journal of Monetary Economics, 10 (July 1982), pp. 73-88.
26. \_\_\_\_\_ and Paul Wachtel. "The Effects of Inflation and Money Supply Announcements on Interest Rates," Journal of Finance, 39 (September 1984), pp. 1177-1188.
27. Wallich, Henry C. "Recent Techniques of Monetary Policy," Remarks to the Midwest Finance Association, Chicago, Illinois, April 5, 1984.

TABLE A1

Period 2  
OPEN MARKET OPERATIONS  
OCTOBER 6, 1979 TO OCTOBER 7, 1982

| Date                      | Headline                                                                               | Quotation                                                                                                                                                                                                                                                                                                                                                                        | Changes in Treasury Yields |        |        |        |         |         |                                 | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |
|---------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|---------------------------------|------------------------------------------------|
|                           |                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                  | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                 |                                                |
| Monday, February 11, 1980 | Fed May Have Tightened Credit a Little. Some Analysts Say, But Others Disagree         | Whatever the case, the possibility of a credit tightening sent short-term interest rate upward....the Fed allowed the interest rate on federal funds to pierce 14% without taking any offsetting action. In the past few weeks, the Fed generally moved to add reserves to the banking system as the funds rate approached 14%.                                                  | 0.30                       | 0.21   | 0.15   | 0.12   | 0.24    | 0.22    | 0.03                            | 0.01                            | 0.03                                           |
| Tuesday, April 29, 1980   | Reserve Lets Federal Funds Rate Topple, Sparking a Slide in Key Short-Term Rates       | Investors in the short-term market were buoyed when the Fed permitted the funds rate to topple to 13%... without taking any counteractive moves. The rate on such funds had averaged more than 14 5/8% Monday.                                                                                                                                                                   | -0.42                      | -0.12  | 0      | 0.02   | 0.04    | 0.03    | 0.24                            | 0.10                            | -0.13                                          |
| Friday, May 2, 1980       | Fed Relaxes Money Market Credit Curbs [Costs] as Pressures Mount for End to Restraints | The Fed's concern was evident Friday, when it sharply eased its grip on credit costs in the money market, sending short-term interest rates plunging...The Fed's signal of credit easing came Friday when it injected reserves into the banking network as federal funds were trading at 14 5/8%. Previously, it would have taken much higher rates to spur the Fed into action. | -0.82                      | -0.59  | -0.55  | -0.48  | -0.29   | -0.25   | -0.47                           | -0.21                           | -1.10                                          |
| Tuesday, May 6, 1980      | Interest Rates Seen Ready to Fall Again As the Fed Acts to Bolster Money Supply        | ...the Fed gave a clear signal that it had eased sharply its credit reins in the open market....sparking yesterday's downward slide was the fact the Federal Reserve allowed the rate on so-called federal funds to tumble to 11% before taking any action to counteract the drop.                                                                                               | -0.50                      | -0.49  | -0.37  | -0.24  | -0.23   | -0.12   | -0.12                           | 0.26                            | 0.07                                           |
| Thursday, May 8, 1980     | Fed Drains Reserves to Stem Plunge in Interest Rates, Mauling Bond Quotes              | Key to the upward rate drive was the Fed's decision to drain reserves from the banking network when the rate on federal funds fell to less than 10 1/2%                                                                                                                                                                                                                          | -0.11                      | 0.15   | 0.12   | 0.01   | 0.18    | 0.15    | 0.06                            | -0.41                           | -0.64                                          |

TABLE A1

Period 2  
OPEN MARKET OPERATIONS  
OCTOBER 6, 1979 TO OCTOBER 7, 1982

- 2 -

| Date                           | Headline                                                                                                | Quotation                                                                                                                                                                                                                                                                              | Changes in Treasury Yields |        |        |        |         |         |                                    | Percentage Change in<br>Dollar/Mark Exchange Rate |       |
|--------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------|---------------------------------------------------|-------|
|                                |                                                                                                         |                                                                                                                                                                                                                                                                                        | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward<br>rate 3 years out | 2-year forward<br>rate 5 years out                |       |
| Tuesday,<br>June 10,<br>1980   | Prices of Debt Issues<br>Plunge as Fed Shows It<br>Isn't Ready to Lower<br>Interest Rate Floor          | Market participants generally<br>had been expecting the Federal<br>Reserve to lower its interest<br>rate floor...                                                                                                                                                                      | 0.11                       | 0.11   | 0.10   | 0.11   | 0.14    | 0.13    | 0.08                               | 0.15                                              | -0.09 |
|                                |                                                                                                         | But the hopes were dashed when the<br>Fed twice moved to drain reserves<br>from the banking system as funds<br>were trading at about 8 1/4%.                                                                                                                                           |                            |        |        |        |         |         |                                    |                                                   |       |
| Wednesday,<br>June 11,<br>1980 | Interest Rates Fall<br>as Fed Eases Refns<br>on Money                                                   | Specifically, the Fed indicated it<br>lowered to at least 8 1/2% from a<br>presumed 9% level its interest<br>rate floor on so-called federal<br>funds reserves banks lend each<br>other.                                                                                               | -0.30                      | -0.08  | -0.10  | -0.11  | -0.09   | -0.09   | -0.14                              | -0.15                                             | -0.11 |
|                                |                                                                                                         | The hint of yesterday's Fed easing,<br>however, came when the nation's money<br>manager allowed federal funds to<br>hover in the 8 1/2% area without<br>taking any action to boost the rate.<br>Previously, the Fed drained reserves<br>whenever the funds fell below the<br>9% level. |                            |        |        |        |         |         |                                    |                                                   |       |
| Thursday,<br>July 31,<br>1980  | Interest Rates Soar,<br>Reflecting the Fears<br>and Uncertainties<br>About the Fed's Policy<br>network. | Those worried were reinforced yester-<br>day when the Fed waited until the<br>funds rate hit 10 1/4% before moving<br>to inject reserves into the banking<br>network.                                                                                                                  | 0.31                       | 0.39   | 0.28   | 0.25   | 0.21    | 0.29    | 0.05                               | 0.13                                              | -0.34 |

Previously, the Fed generally had  
tried to keep the funds rate from  
going above 9 1/2%.

|                                         |                                                                                           |                                                                                                                                                                                                                                                                |       |       |       |       |       |       |       |       |      |
|-----------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Tuesday,<br>Septem-<br>ber 2,<br>1980   | Interest Rates Fall<br>on Growing Sentiment<br>That Fed Has Ended<br>Its Tightening Moves | Interest rates fell in the money<br>and capital markets yesterday amid<br>growing conviction that the recent<br>tightening of credit conditions by<br>the Federal Reserve System had<br>reached its limit.                                                     | -0.27 | -0.35 | -0.21 | -0.22 | -0.19 | -0.19 | 0.08  | -0.25 | 0.39 |
| Wednesday,<br>Septem-<br>ber 3,<br>1980 | The Fed Drains<br>Reserves, Aiding<br>Interest Rates' Slide<br>and Buoying Prices         | Interest rates continued to press<br>downward yesterday as the Federal<br>Reserve System gave implicit con-<br>firmation that its preferred<br>trading range for federal funds is<br>about 9 1/2% to 10 1/8% lower than<br>originally feared....The indication | -0.22 | -0.36 | -0.32 | -0.29 | -0.18 | -0.14 | -0.24 | -0.18 | 0.32 |

TABLE A1

Period 2  
OPEN MARKET OPERATIONS  
OCTOBER 6, 1979 TO OCTOBER 7, 1982

- 3 -

| Date                        | Headline                                                                          | Quotation                                                                                                                                                                                                                                                                                                                      | Changes in Treasury Yields |        |        |        |         |         |                                 | Percentage Change in Dollar/Mark Exchange Rate |                                 |
|-----------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|------------------------------------------------|---------------------------------|
|                             |                                                                                   |                                                                                                                                                                                                                                                                                                                                | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                                | 2-year forward rate 5 years out |
| Monday, September 8, 1980   | Interest Rates Rise on Fears That the Fed Might Be Tightening Credit Conditions   | of a 9 1/2% to 10 1/2% "preferred" trading range for funds came yesterday morning when the Fed drained reserves from the banking network with funds trading at 9 1/2%.                                                                                                                                                         | 0.31                       | 0.16   | 0.11   | 0.09   | 0.11    | 0.09    | 0.01                            | 0.01                                           | 0.37                            |
|                             |                                                                                   | Worries about a possible tightening of credit conditions were fueled when the Fed drained reserves from the banking network yesterday as federal funds were trading at 10 1/4%....Just last week, most analysts concluded that the Fed's reserve policy was such that funds would trade mainly in the 9 1/2% to 10 1/2% range. |                            |        |        |        |         |         |                                 |                                                |                                 |
| Wednesday, October 15, 1980 | Interest Rates Fall and Debt Prices Rise on Fed's Surprise Treasury Bill Purchase | A surprise purchase of U.S. Treasury bills by the Federal Reserve System sent interest rates falling in the money and credit markets, pushing up prices on debt securities.                                                                                                                                                    | -0.21                      | -0.09  | -0.06  | -0.05  | -0.05   | -0.05   | 0                               | -0.01                                          | -0.05                           |
| Tuesday, November 25, 1980  | Bond Prices Plunge Amid Signs the Fed Is Willing to Tolerate High Interest Rates  | The downward drive began when the Fed failed to inject reserves into the banking network despite the fact that federal funds had traded at rates of 16 1/2% to 16 3/4% for much of the day....The Fed in recent days actively supplied reserves at progressively lower funds rates.                                            | -0.13                      | 0.06   | 0.07   | 0.03   | -0.02   | -0.01   | 0.09                            | -0.12                                          | 0.02                            |
| Wednesday, January 7, 1981  | Fed Move Dashes Hope for Easier Credit, and Short-term Interest Rates Skyrocket   | Bond prices plunged and interest rates soared yesterday as the Federal Reserve System dashed investor hopes that it would soon relax its grip on the nation's credit....It drained reserves from the banking network at a time when the key interest rate on federal funds was hovering at 13 3/4%.                            | 0.87                       | 0.47   | 0.40   | 0.33   | 0.20    | 0.22    | 0.26                            | 0.06                                           | -0.72                           |
| Thursday, April 2, 1981     | Bond Prices Tumble as Hopes Dwindle That Fed Will Relax Its Policy Further        | Bond prices tumbled yesterday as hopes waned that the Federal Reserve System would soon ease credit conditions further.<br><br>Especially disappointing to traders was the fact that the closely                                                                                                                               | 0.25                       | 0.15   | 0.10   | 0.10   | 0.12    | 0.15    | 0                               | 0.10                                           | -1.28                           |

TABLE A1

Period 2  
OPEN MARKET OPERATIONS  
OCTOBER 6, 1979 TO OCTOBER 7, 1982

- 4 -

| Date                        | Headline                                                                          | Quotation                                                                                                                                                                                                                                                                                                                                                                                                     | Changes in Treasury Yields |        |        |        |         |         |       | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |
|-----------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|-------|---------------------------------|------------------------------------------------|
|                             |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                               | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year |       |                                 |                                                |
| Tuesday, June 23, 1981      | Bond Prices Fall Sharply as Fed Drains Banking Reserves in an Unexpected Move     | watched interest rate on federal funds continued under strong upward pressure yesterday. The rate, which serves as a kind of anchor for most other interest rates, hovered between 14 3/4% and 15 1/2% for much of the day.                                                                                                                                                                                   | 0.13                       | 0.04   | 0.04   | -0.01  | 0.09    | 0.13    | 0.04  | -0.20                           | -0.80                                          |
| Wednesday, January 13, 1982 | Bond Prices Slide Amid Renewal that Fed Has Tightened Credit Conditions           | Triggering the fears over credit policy yesterday was a move by the Fed to drain funds from the banking network through the temporary sales of Treasury bills.... The action came at a time when banks appeared to be a bit strained for reserves. For instance, the interest rate on federal funds hovered between 12 1/8% and 12 3/4% for much of the day, above the 12 3/8% average the previous six days. | 0.31                       | 0.18   | 0.16   | 0.15   | 0.21    | 0.20    | 0.12  | 0.11                            | -1.07                                          |
| Tuesday, January 19, 1982   | Bond Prices Fall; Worry Over Fed Policy and Uncertainty About Economy Cited       | The downward drive in bond prices was sparked when the Federal Reserve moved to drain funds from the banking network through the sale of Treasury bills from its portfolio.                                                                                                                                                                                                                                   | 0.14                       | -0.07  | 0.02   | 0.01   | 0.14    | 0.09    | 0.20  | -0.03                           | -0.41                                          |
| Thursday, January 21, 1982  | Draining of Reserves Bolsters Wide Belief that Fed is Hitting Credit Brakes Again | The Federal Reserve System may be in the process of tightening credit conditions for the second time in as many months.... That view was bolstered yesterday when the Fed moved to drain reserves from the banking system through the temporary sale of securities.                                                                                                                                           | 0.13                       | -0.15  | -0.15  | -0.13  | -0.14   | -0.11   | -0.15 | -0.06                           | 0                                              |

TABLE A1

Period 2  
OPEN MARKET OPERATIONS  
OCTOBER 6, 1979 TO OCTOBER 7, 1982

- 5 -

| Date                       | Headline                                                                                   | Quotation                                                                                                                                                                                                                                                                                            | Changes in Treasury Yields |        |        |        |         |         |                                 | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |
|----------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|---------------------------------|------------------------------------------------|
|                            |                                                                                            |                                                                                                                                                                                                                                                                                                      | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                 |                                                |
| Monday, March 22, 1982     | Bond Prices Rise, Aided by Sharp Decline in the Interest Rate on Federal funds             | Bond traders were especially cheered by a sharp decline in the interest rate on federal funds, or reserves that banks lend one another overnight. The funds rate, which strongly influences other interest rates, fell to as low as 14% yesterday after averaging almost 15% Friday.                 | -0.37                      | -0.16  | -0.15  | -0.14  | -0.20   | -0.19   | -0.13                           | -0.11                           | -0.86                                          |
| Thursday, July 8, 1982     | Short-Term Rates Fall; Bond Prices Soar Amid Signs Fed Is Easing Its Credit Reins          | Signs that the Federal Reserve System may be easing credit conditions sent short-term interest rates tumbling and bond prices soaring....This view was underscored yesterday when the Fed injected reserves into the banking system through the temporary purchase of Treasury securities.           | -0.64                      | -0.44  | -0.36  | -0.34  | -0.36   | -0.20   | -0.20                           | -0.26                           | 0.13                                           |
| Monday, August 9, 1982     | Interest Rates Fall After Surprise Move by Fed of Injecting Reserves into Banks            | Interest rates tumbled yesterday after the Federal Reserve System, in an unexpected move, injected reserves into banks by temporary purchases of U.S. government securities                                                                                                                          | -0.27                      | -0.16  | -0.14  | -0.15  | -0.10   | -0.10   | -0.10                           | -0.19                           | 0.35                                           |
| Thursday, August 12, 1982  | Interest Rates Tumble Amid Speculation Fed May Be Easing Credit Reins Further              | Interest rates tumbled yesterday amid speculation that the Federal Reserve System may be loosening its credit grip further. Even before the Lombard-Wall actions, interest rates were falling as traders were encouraged by an injection of reserves into the banking system by the Federal Reserve. | -0.52                      | -0.24  | -0.24  | -0.14  | -0.11   | -0.11   | -0.24                           | 0.24                            | 0.96                                           |
| Monday, September 13, 1982 | Short-term Interest Rates Fall, Bond Prices Surge As Fed Injects Cash into Banking Network | Short-term interest rates fell and bond prices spurted amid signs the Federal Reserve System apparently isn't ready to hit its credit brakes just yet. In recent weeks the nation's money supply has grown rapidly, sparking fears that the central bank soon                                        | -0.19                      | -0.11  | -0.04  | -0.08  | -0.13   | -0.15   | 0.10                            | -0.24                           | 0.03                                           |

Period 2  
OPEN MARKET OPERATIONS  
OCTOBER 6, 1979 TO OCTOBER 7, 1982

Percentage Change in Dollar/Mark Exchange Rate

| Date                          | Headline                                                                          | Quotation                                                                                                                                                                                                                                                                                                              | Changes in Treasury Yields |        |        |        |         |         |                                 |                                 |
|-------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|---------------------------------|
|                               |                                                                                   |                                                                                                                                                                                                                                                                                                                        | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 4-year forward rate 3 years out | 2-year forward rate 5 years out |
| Wednesday, September 15, 1982 | Interest Rates are Pushed Higher by Fear That Fed May Tighten Conditions          | might be forced to tighten credit conditions. Those fears were alleviated, at least temporarily yesterday, when the Fed injected funds into the banking network. Fears that the Federal Reserve System may be tightening credit conditions pushed interest rates higher yesterday.                                     | 0.24                       | 0.23   | 0.18   | 0.01   | 0.04    | 0.01    | 0.08                            | -0.64                           |
| Thursday, September 16, 1982  | Bond Prices Rise After Fed Injects Funds into Banking Network; Stable Policy Seen | The worries were triggered when the Fed in an unexpected move drained funds from the nation's banking network through the "temporary" sale of securities from its portfolio. Bond prices rose yesterday after the Federal Reserve System injected funds into the banking network.                                      | -0.15                      | -0.07  | -0.04  | -0.01  | 0       | -0.07   | 0.02                            | 0.11                            |
| Wednesday, September 29, 1982 | Bond Prices Slip Amid Renewed Concern Over Course of Short-Term Interest Rates    | The Fed action alleviated fears that the central bank might be in the process of tightening credit conditions. Those fears were sparked Wednesday when the Fed unexpectedly drained funds from the banking system. Renewed concern about the outlook for short-term interest rates pushed bond prices lower yesterday. | -0.16                      | -0.07  | -0.02  | -0.04  | 0       | 0.03    | 0.08                            | -0.11                           |

TABLE A2

## FEDERAL RESERVE POLICY ANNOUNCEMENTS: PERIOD 2

| Date                      | Headline                                                                                                   | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Changes in Treasury Yields |        |        |        |         |         |                                 | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |
|---------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|---------------------------------|------------------------------------------------|
|                           |                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                 |                                                |
| Saturday, October 6, 1979 | Prices erode further in early reaction to Fed's tough new credit in operating restrictions.                | Bond prices, already at record lows, plunged further yesterday in a preliminary reaction to the tough new credit restraints announced over the past weekend by Federal Reserve Board Chairman Paul A. Volcker.                                                                                                                                                                                                                                                                                                    | 1.07                       | 0.55   | 0.55   | 0.46   | 0.29    | 0.25    | 0.55                            | 0.12                            | -1.46                                          |
| Thursday, October 7, 1982 | Prices on stocks, bonds soar in massive buying binge; short-term rates fall, most big banks cut prime fees | Investor euphoria was sparked by reports that the Federal Reserve System decided Tuesday to concentrate its efforts on healing the economy's deep wounds and to pay less attention to meeting its own money supply targets in the weeks ahead. The Fed's willingness to allow the money supply to expand faster than originally planned relieved investor fear that the central bank would tighten credit conditions and push up interest rates.                                                                  | -0.59                      | -0.71  | -0.71  | -0.63  | -0.46   | -0.40   | -0.71                           | -0.32                           | 1.92                                           |
| MI                        | 1982 Fed decision to deemphasize                                                                           | Yesterday's optimism was sparked by an article in The Wall Street Journal that the Federal Reserve's policymaking arm decided at a meeting Tuesday to allow faster money supply growth temporarily than previously targeted. Money growth has been running above the Fed's goals for several weeks, and many economists are predicting potentially large increases this month. Analysts had been worried that the Fed would hit its credit brakes in an attempt to bring money growth back into its target range. |                            |        |        |        |         |         |                                 |                                 |                                                |
| Saturday, October 9, 1982 | Fed's public stance underestimates importance of policy moves, traders and bankers say, (Tuesday paper)    | The Federal Reserve System's latest policy moves are far more significant than Fed officials are willing to say publicly. And they augur well for continued declines in interest rates.                                                                                                                                                                                                                                                                                                                           | -0.57                      | -0.43  | -0.31  | -0.27  | -0.37   | -0.34   | -0.06                           | -0.12                           | 0.53                                           |
| MI                        | Announcing deemphasiz                                                                                      | The market for Treasury securities was closed yesterday because of Columbus Day. But prices of corporate                                                                                                                                                                                                                                                                                                                                                                                                          |                            |        |        |        |         |         |                                 |                                 |                                                |

\*The Treasury market was closed Monday, which was a holiday. The reaction was Tuesday morning. We include quotes from both Tuesday and Wednesday's paper.

TABLE A2

## FEDERAL RESERVE POLICY ANNOUNCEMENTS: PERIOD 2

- 2 -

| Date                             | Headline                                                                         | Quotation                                                                                                                                                                                                                                                                                                                                      | Changes in Treasury Yields |        |        |        |         |         | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |
|----------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|------------------------------------------------|
|                                  |                                                                                  |                                                                                                                                                                                                                                                                                                                                                | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year |                                 |                                                |
|                                  |                                                                                  | bonds soared in light semi-holiday trading that was dominated by dealers. Some high-quality corporate issues surged more than 2 1/2 points, or \$25, for each \$1,000 face amount of securities.                                                                                                                                               |                            |        |        |        |         |         |                                 |                                                |
|                                  |                                                                                  | Other short-term interest rates continued to fall yesterday, and bond prices surged. But there were signs that the bond rally was beginning to lose steam. Bond prices, which early in the day had been up more than four points, or \$40 for each \$1,000 face amount of securities, wound up the session with gains of less than two points. |                            |        |        |        |         |         |                                 |                                                |
|                                  |                                                                                  | Interest rates soared and bond prices took one of their biggest one-day plunges this year as traders were shaken by word that the Federal Reserve System had taken a tougher credit stance than originally thought...                                                                                                                          | 1.22                       | 0.48   | 0.39   | 0.43   | 0.31    | 0.34    | 0.21                            | 0.58                                           |
| Late Friday, April 3, 1981       | Bond prices plunge as traders are shaken on word of tough Federal Reserve policy |                                                                                                                                                                                                                                                                                                                                                |                            |        |        |        |         |         |                                 |                                                |
| Release of two February meetings |                                                                                  |                                                                                                                                                                                                                                                                                                                                                |                            |        |        |        |         |         |                                 | -1.43                                          |

Bond analysts attributed much of yesterday's sharp declines to concern about Fed policies. Their concern stemmed from the Fed's release late last Friday of summaries of two February meetings of its policy-making committee. The minutes of those meetings indicated that the Fed didn't want interest rates to fall as sharply as they did early last month, contrary to the assumptions of most traders and economists.

The minutes showed that the committee voted to maintain a target range of 15% to 20% on the rate on federal funds, which are reserves that banks lend one another for short periods, usually overnight. Most analysts had thought that the lower end of the range had been reduced to as low as 10%.

"It was probably the biggest surprise I've seen" from the Fed, said Donald E. Maude, chief financial economist of Merrill Lynch & Co. "It really did fool the entire financial community."

-1.43

FEDERAL RESERVE POLICY ANNOUNCEMENTS: PERIOD 2

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[illegible]

TABLE A3  
POLICY AND HYBRID DISCOUNT RATE ANNOUNCEMENTS: PERIOD 2

| Date of<br>Announcement            | Change in<br>Rate and<br>Type of<br>Announcement | Quotation                                                                                                                                                                                                                                                                                                                                                                                                 | Changes in Treasury Yields |        |        |        |         |         |                                    | Percentage Change in<br>Dollar/Mark Exchange Rate |                                    |
|------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------|---------------------------------------------------|------------------------------------|
|                                    |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                           | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward<br>rate 3 years out |                                                   | 2-year forward<br>rate 5 years out |
| Saturday,<br>October 6,<br>1979    | 11 to 12<br>Policy                               | The Federal Reserve today announced a series of complementary actions that should assure better control over the expansion of money and bank credit, help curb speculative excesses in financial, foreign exchange and commodity markets and thereby serve to dampen inflationary forces.                                                                                                                 | 1.07                       | 0.55   | 0.55   | 0.46   | 0.29    | 0.25    | 0.55                               | 0.12                                              | -1.46                              |
| Friday,<br>February 15,<br>1980    | 12 to 13<br>Policy                               | The Board has been particularly concerned that recent economic developments, including the large increase in the price of imported oil, are adding to inflationary pressures and may lead to further destabilizing pricing decisions. These developments underscore the need to take such measures as may be required to maintain firm control over growth of money and credit.                           | 0.67                       | 0.37   | 0.33   | 0.27   | 0.27    | 0.21    | 0.25                               | 0.04                                              | -0.07                              |
| Thursday,<br>September 25,<br>1980 | 10 to 11<br>Hybrid                               | This action is part of the continuing policy of the Federal Reserve to discourage excessive growth in the monetary aggregates. In taking the action, the Board also took note of recent appreciable increases in borrowings at the Federal Reserve discount window as short-term market interest rates have risen significantly above the 10 percent discount rate that has been in effect since July 28. | 0.51                       | 0.17   | 0.13   | 0.10   | 0.15    | 0.15    | 0.05                               | -0.01                                             | -0.34                              |
| Friday,<br>November 14,<br>1980    | 11 to 12<br>Hybrid                               | These actions, which are effective on Monday, November 17, were taken in view of the current level of short-term market interest rates and the recent rapid growth in the monetary aggregates and bank credit.                                                                                                                                                                                            | 0.88                       | 0.37   | 0.25   | 0.29   | 0.16    | 0.15    | 0.01                               | 0.44                                              | -0.96                              |

TABLE A3 -2 -

| Date of<br>Announcement          | Change in<br>Rate and<br>Type of<br>Announcement | Quotation                                                                                                                                                                                                                             | Changes in Treasury Yields |        |        |        |         |         |                                    | Percentage Change in<br>Dollar/Mark Exchange Rate |       |
|----------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------|---------------------------------------------------|-------|
|                                  |                                                  |                                                                                                                                                                                                                                       | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward<br>rate 3 years out | 2-year forward<br>rate 5 years out                |       |
| Thursday,<br>December 4,<br>1980 | 12 to 13<br>Hybrid                               | In light of the current level<br>of market rates and consistent<br>existing policy to restrain<br>excessive growth in money and<br>credit, the Federal Reserve<br>Board today announced an<br>increase in the basic<br>discount rate. | 0.46                       | 0.16   | 0.02   | 0      | -0.08   | -0.10   | -0.26                              | -0.07                                             | -0.53 |
| Monday,<br>May 4,<br>1981        | 13 to 14<br>Hybrid                               | These actions, which are<br>effective Tuesday, May 5,<br>were taken in light of the<br>current levels in short-term<br>market interest rates and the<br>need to maintain restraint<br>in the monetary and credit<br>aggregates.       | 0.64                       | 0.55   | 0.51   | 0.40   | 0.19    | 0.13    | 0.46                               | -0.06                                             | -0.90 |
| Monday,<br>July 19,<br>1982      | 12 to<br>11 1/2<br>Hybrid                        | The action was taken in the<br>context of recent declines<br>short-term market rates and<br>the relatively restrained<br>growth of money and credit<br>in recent months.                                                              | -0.28                      | -0.23  | -0.15  | -0.16  | -0.10   | -0.10   | 0.01                               | -0.20                                             | 1.01  |
| Friday,<br>July 30,<br>1982      | 11 1/2 to<br>11<br>Hybrid                        | In light of market interest<br>rates and relatively<br>restrained money and credit<br>growth, the Federal Reserve<br>Board today approved a<br>reduction in the basic<br>discount rate.                                               | -0.70                      | -0.31  | -0.27  | -0.25  | -0.26   | -0.25   | -0.19                              | -0.18                                             | 1.45  |
| Friday,<br>August 13,<br>1982    | 11 to<br>10 1/2<br>Hybrid                        | As in other recent changes,<br>the action was taken against<br>the background of moderate<br>growth in money, some indication<br>of reduced credit demands at<br>banks, and declines in market<br>interest rates.                     | -0.47                      | -0.34  | -0.24  | -0.17  | -0.17   | -0.18   | -0.04                              | 0.10                                              | -0.35 |

Period 1  
OPEN MARKET OPERATIONS  
September 1977 to October 6, 1979

| Date                       | Headline                                                                                            | Quotation                                                                                                                                                                                                                                                                                                                                                                           | Changes in Treasury Yields |        |        |        |         |         |                                 | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |
|----------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|---------------------------------|------------------------------------------------|
|                            |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                     | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                 |                                                |
|                            |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                     |                            |        |        |        |         |         |                                 |                                 |                                                |
| Friday, September 30, 1977 | Even Tighter Credit Seen as Fed Appears to Boost Federal Funds Rate Target to 6 3/8% 6 1/4 to 6 3/8 | The concern over possible tighter credit reins was heightened Friday when the Federal Reserve indicated it had raised to at least 6 3/8% from 6 1/4% its target interest rate on federal funds....<br><br>The Fed's determination was evident Friday when it let federal funds trade at an interest rate of 6 3/8%, 6 7/16% and finally 6 1/2% before taking any offsetting action. | 0.04                       | 0      | 0.01   | 0.01   | 0       | 0       | 0.02                            | 0.01                            | 0.35                                           |
| Friday, October 7, 1977    | Money Supply May Post Another Spurt; Fed Expected to Tighten Credit Further 6 3/8 to 6 1/2          | Just last Friday the Fed gave an implicit signal that it had boosted to 6 1/2% from 6 3/8% its target interest rate for federal funds....<br><br>The Fed gave tacit confirmation of the boost to 6 1/2% from 6 3/8% in its funds target by moving to drain reserves from the banking system Friday on two occasions when funds were trading at the 6 3/8% level.                    | 0                          | 0.05   | 0.02   | 0.04   | 0.03    | 0.01    | -0.03                           | 0.11                            | 0.16                                           |
| Monday, October 31, 1977   | The Fed clamps a Tight Vise on Credit and New Treasury Note Prices Plunge 6 1/2 to 6 5/8            | The Fed raised to at least 6 5/8% from 6 1/2% its target interest rate on federal funds....<br><br>It did so by draining large amounts of reserves from the banking network.... Both of yesterday's maneuvers came when funds were already trading at 6 1/2%.                                                                                                                       | 0.21                       | 0.10   | 0.06   | 0.06   | 0.02    | 0.02    | -0.02                           | 0.06                            | 0.79                                           |
| Monday, January 9, 1978    | Federal Reserve Moves to Tighten Credit in Escalating Effort to Bolster U.S. Dollar 6 1/2 to 6 3/4  | In its action yesterday, the Fed indicated it had boosted to at least 6 3/4% from 6 1/2% its target interest rate on federal funds, a key money measure.<br><br>Yesterday's move became evident when the Fed moved to drain reserves from the banking network at a time when federal funds were trading at 6 9/16%.                                                                 | 0.38                       | 0.31   | 0.26   | 0.19   | 0.15    | 0.11    | 0.17                            | -0.04                           | -0.34                                          |

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- 2 -

[illegible]

Period 1  
OPEN MARKET OPERATIONS  
September 1977 to October 6, 1979

September 1977 to October 6, 1979

[illegible]

Period 1  
OPEN MARKET OPERATIONS  
September 1977 to OCTOBER 6, 1979

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| Date                          | Headline                                                                        | Quotation                                                                                                                                                                             | Changes in Treasury Yields |        |        |        |         |         | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |       |
|-------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|------------------------------------------------|-------|
|                               |                                                                                 |                                                                                                                                                                                       | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year |                                 |                                                |       |
| Friday, August 18, 1978       | Fed Raises Discount Rate to 7 3/4%, Signals 8 1/8% on Fed Funds                 | Separately, the Federal Reserve signaled that it has settled at least temporarily on an 8 1/8% target interest rate on federal funds, reserves that banks lend each other....         | 0.07                       | 0.02   | 0      | -0.01  | 0       | -0.02   | -0.03                           | -0.05                                          | -0.89 |
|                               | 8 to 8 1/8                                                                      | In its open market operations, the Fed indicated where it wants the rate on federal funds by draining reserves from the banking network when the rate on funds dipped below 8%.       |                            |        |        |        |         |         |                                 |                                                |       |
| Monday, August 28, 1978       | Fed Apparently Tightens Credit Spigot, This Time to Dampen Domestic Growth      | According to specialists who watch Fed operations closely, the nation's money manager appeared to boost to at least 8 1/4% from 8 1/8% its target interest rate for federal funds.... | 0.09                       | 0.01   | -0.02  | 0      | 0.01    | 0       | -0.07                           | 0.07                                           | -0.54 |
|                               | 8 1/8 to 8 1/4                                                                  | The indication of a tighter credit policy came when the Federal Reserve allowed federal funds to trade above 8 1/4% before intervening to counteract the trend.                       |                            |        |        |        |         |         |                                 |                                                |       |
| Friday, September 8, 1978     | Fed Appears to Tighten Its Credit Reins Despite Indicators Inflation Is Abating | But that belief was shattered when the Federal Reserve gave what many considered to be a clear signal that it had boosted to 8 3/8% from 8 1/4% its target rate on federal funds....  | 0.07                       | 0.01   | 0.01   | 0.01   | 0       | -0.01   | 0.01                            | 0.01                                           | -0.84 |
|                               | 8 1/4 to 8 3/8                                                                  | The Fed's indication of tighter credit came when it drained reserves from the banking network when federal funds were trading at 8 1/4%.                                              |                            |        |        |        |         |         |                                 |                                                |       |
| Wednesday, September 20, 1978 | The Fed Acts to Tighten Credit Further By Raising Federal Funds Target Rate     | Specifically, the Fed yesterday indicated it has raised to at least 8 1/2% from 8 3/8% its target rate on so-called federal funds....                                                 | 0.08                       | 0.03   | 0.02   | 0.06   | 0.07    | 0.06    | 0                               | 0.19                                           | 0.61  |
|                               | 8 3/8 to 8 1/2                                                                  | The Fed itself left little doubt that it was tightening. With federal                                                                                                                 |                            |        |        |        |         |         |                                 |                                                |       |

TABLE A4

Period 1  
OPEN MARKET OPERATIONS  
September 1977 to OCTOBER 6, 1979 - 5 -

| Date                         | Headline                                                                                      | Quotation                                                                                                                                                                                                                                                                                                                           | Changes in Treasury Yields |        |        |        |         |         |                                 | Percentage Change in Dollar/Mark Exchange Rate |                                 |
|------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|------------------------------------------------|---------------------------------|
|                              |                                                                                               |                                                                                                                                                                                                                                                                                                                                     | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                                | 2-year forward rate 5 years out |
|                              |                                                                                               | funds trading at the former 8 3/8% target, the Fed drained reserves from the banking system.                                                                                                                                                                                                                                        |                            |        |        |        |         |         |                                 |                                                |                                 |
| Monday, September 25, 1978   | Fed Signals Raise in Federal Funds Target to 8 5/8%<br>8 1/2 to 8 5/8                         | In operations yesterday, the Fed gave an implicit signal it had raised to 8 5/8% from 8 1/2% its target rate on federal funds....<br><br>The hint of yesterday's tightening came when the Federal Reserve allowed funds to trade at 8 5/8% for a significant period before injecting reserves into the banking network.             | 0.02                       | 0.01   | 0.04   | 0.04   | 0.01    | -0.01   | 0.09                            | 0.04                                           | 0.23                            |
| Thursday, September 28, 1978 | Fed Target on Funds Seems Lifted to 8 3/4%<br>8 5/8 to 8 3/4                                  | The Federal Reserve System, stepping up its inflation battle, appears to have boosted to 8 3/4% its interest rate target on federal funds....<br><br>The indication of an 8 3/4% target rate on federal funds came as the Fed allowed funds to hover at that level and slightly above.                                              | -0.04                      | 0      | -0.01  | -0.01  | 0       | 0.01    | -0.03                           | -0.01                                          | 0.15                            |
| Wednesday, October 18, 1978  | Rate on Federal Funds Appears Raised to At Least 8 7/8% in Fed Credit Move<br>8 3/4 to 8 7/8  | Analysts said yesterday's action indicated the Fed boosted to at least 8 7/8% from 8 3/4% its target interest rate on federal funds....<br><br>The credit tightening move by the Fed was signaled when the nation's money manager moved to drain reserves from the banking system while federal funds were trading at about 8 7/8%. | -0.06                      | 0.04   | 0.01   | 0.03   | 0.01    | 0       | -0.05                           | 0.10                                           | 0.22                            |
| Friday, October 20, 1978     | Increase in Banks' Prime Interest Rate to 10 1/4% is Seen as Early as This Week<br>8 7/8 to 9 | On Friday, for example, the Fed raised to at least 9% from 8 7/8% its target interest rate on federal funds, uncommitted reserves banks lend one another.<br><br>On Friday, the Fed allowed the rate on Federal funds to rise above 9% without directly intervening to stem the upward movement immediately.                        | 0.07                       | 0.03   | 0.02   | 0.03   | 0.02    | 0.02    | 0                               | 0.07                                           | 1.39                            |

TABLE A4

Period 1  
OPEN MARKET OPERATIONS  
September 1977 to OCTOBER 6, 1979 - 6 -

| Date                        | Headline                                                                                             | Quotation                                                                                                                                                                                                                                                                                                                                              | Changes in Treasury Yields |        |        |        |         |         |                                 | Percentage Change in Dollar/Mark Exchange Rate |                                 |
|-----------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|------------------------------------------------|---------------------------------|
|                             |                                                                                                      |                                                                                                                                                                                                                                                                                                                                                        | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                                | 2-year forward rate 5 years out |
| Thursday, October 26, 1978  | Interest Rates on Big Bank CDs Climb Sharply<br>9 to 9 1/8                                           | In its operations yesterday, the Federal Reserve indicated it was seeking a target interest rate of at least 9 1/8% on federal funds in carrying out monetary policy....<br><br>Yesterday the Fed allowed funds to trade at 9 1/8% or so, without taking any overt steps to drive the rate down.                                                       | 0.12                       | 0.03   | 0.07   | 0.04   | 0.03    | 0.03    | 0.14                            | -0.06                                          | -0.51                           |
| Tuesday, October 31, 1978   | Chase Manhattan Boosts to 10% its Prime Rate<br>9 1/8 to 9 1/2                                       | Yesterday's move indicated the Fed had raised to 9 3/8% or 9 1/2% from 9 1/8% its target interest rate on federal funds, uncommitted reserves banks lend each other.<br><br>In yesterday's maneuvering, the Fed allowed federal funds to trade at 9 1/2% during the lunch-hour period here without taking any overt action to temper the upward drive. | 0.33                       | 0.27   | 0.23   | 0.09   | 0.02    | 0.03    | 0.15                            | -0.38                                          | -1.79                           |
| Wednesday, November 1, 1978 | Prime Rate Seen at 11% or More Before Year-End<br>9 1/2 to 9 3/4                                     | Yesterday, funds traded at 10% for most of the day, and the Fed at one point injected reserves into the system indicating it didn't want the rate to go higher. Thus, it appeared the current target is somewhere between 9 1/2% and 10%.<br><br>[This action was part of the Treasury/Federal Reserve program to strengthen the dollar.]              | 0.09                       | -0.28  | -0.39  | -0.32  | -0.18   | -0.21   | -0.59                           | -0.08                                          | -6.85                           |
| Tuesday, November 28, 1978  | Fed Moves to Indicate It Lifted Target Rate on Federal Funds to 9 7/8% from 9 3/4%<br>9 3/4 to 9 7/8 | The Federal Reserve System gave implicit confirmation that it has boosted to 9 7/8% from 9 3/4% its target interest rate on federal funds, reserves banks lend each other....<br><br>The signal came yesterday when the Fed allowed funds to trade at about 10% before acting to temper the rise by injecting reserves into the banking network.       | 0.04                       | 0.01   | 0      | 0      | 0       | 0.01    | -0.01                           | 0                                              | -0.15                           |

Period 1  
OPEN MARKET OPERATIONS  
September 1977 to OCTOBER 6, 1979

September 1977 to OCTOBER 6, 1979

| Date                       | Headline                                                                       | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Changes in Treasury Yields |        |        |        |         |         |                                 | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |
|----------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|---------------------------------|------------------------------------------------|
|                            |                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                 |                                                |
| Tuesday, December 19, 1978 | Fed Move to Drain Bank System Reserves Seen a Signal of More Credit Tightening | the money markets reacted quickly when the Fed moved yesterday when federal funds were trading at 9 7/8% to drain reserves from the banking system.                                                                                                                                                                                                                                                                                                                        | 0.07                       | 0.03   | 0      | 0.01   | 0.01    | -0.02   | -0.05                           | 0.04                            | 1.04                                           |
| Monday, January 15, 1979   | Fed Apparently Tightens Credit Reins, Boosting to 10 1/8% Target Rate on Funds | The Federal Reserve System apparently tightened its credit reins another notch, boosting to 10 1/8% from 10% its target interest rate on federal funds.... Yesterday the Fed gave additional evidence of a new tightening move. That evidence came when the Fed allowed the rate on federal funds to rise to 10 1/8% without taking an overt action to stem the increase.                                                                                                  | 0                          | 0      | -0.01  | 0.01   | 0       | 0       | -0.03                           | 0.08                            | -0.13                                          |
| Friday, April 27, 1979     | Big Upward Push on Interest Rates Is Expected as Fed Tightens Credit           | Analysts surveying the situation said the Fed probably boosted to a range of 10 1/8% to 10 3/8% its target interest rate on federal funds. Previously it maintained a 10% to 10 1/8% range.... The signal of a tighter credit policy came when the Federal Reserve moved to drain reserves from the banking system when federal funds were trading at 10 1/16% [sic]. Previously, the Fed had acted to drain reserves only when the funds rate declined to about 9 15/16%. | 0.29                       | 0.12   | 0.05   | 0.05   | 0.03    | 0.01    | -0.07                           | 0.05                            | -1.02                                          |
| Friday, July 20, 1979      | Tighter Credit Policy of Fed Facing Test on Foreign Exchange Markets           | Although the Fed didn't give any clear indication of the new funds rate goal, money specialists guessed it could be as high as 10 3/4%, up from the old target of 10 1/4%.... The Fed waited until early afternoon Friday, when the federal funds rate hit almost 10 3/4%, to inject reserves into the banking network. That could leave the new target at anywhere from 10 1/2% to 10 3/4%.                                                                               | 0.14                       | 0.04   | 0      | -0.03  | -0.01   | -0.04   | -0.07                           | 0.13                            | -0.34                                          |



TABLE A4

Period 1  
OPEN MARKET OPERATIONS  
September 1977 to OCTOBER 6, 1979 - 9 -

| Date                                | Headline                                                                   | Quotation                                                                                                                                                                                                                                                                                                                   | Changes in Treasury Yields |        |        |        |         |         |                                    | Percentage Change in<br>Dollar/Mark Exchange Rate |                                    |
|-------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------|---------------------------------------------------|------------------------------------|
|                                     |                                                                            |                                                                                                                                                                                                                                                                                                                             | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward<br>rate 3 years out |                                                   | 2-year forward<br>rate 5 years out |
| Wednesday,<br>September 19,<br>1979 | Fed Indicates It Wants<br>Credit to Get<br>Tighter<br><br>11 3/8 to 11 1/2 | Yesterday's action indicated a Fed<br>increase to 11 1/2% from 11 3/8%<br>in the target interest rate on<br>federal funds, reserves that banks<br>lend each other. To accomplish<br>this, the Fed drained reserves<br>from the banking network while<br>funds were trading at 11 3/8%.                                      | -0.25                      | -0.05  | -0.07  | -0.04  | -0.02   | -0.03   | -0.11                              | 0.06                                              | 0.56                               |
|                                     |                                                                            | Many market specialists had<br>expected the Fed to boost the<br>target rate to as high as 11 3/4%<br>in its efforts to quell the nation's<br>inflationary pressures. That outlook<br>gained support following the increase<br>in the discount rate, the fee that<br>the Fed charges on loans to member<br>commercial banks. |                            |        |        |        |         |         |                                    |                                                   |                                    |

Many market specialists had expected the Fed to boost the target rate to as high as 11 3/4% in its efforts to quell the nation's inflationary pressures. That outlook gained support following the increase in the discount rate, the fee that the Fed charges on loans to member commercial banks.

TABLE AS  
POLICY AND HYBRID DISCOUNT RATE ANNOUNCEMENTS: PERIOD 1

| Date of<br>Announcement          | Change in<br>Rate and<br>Type of<br>Announcement | Quotation                                                                                                                                                                                                                                                                                     | Changes in Treasury Yields |        |        |        |         |         | 2-year forward<br>rate 3 years out | 2-year forward<br>rate 5 years out | Percentage Change in<br>Dollar/Mark Exchange Rate |
|----------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------|------------------------------------|---------------------------------------------------|
|                                  |                                                  |                                                                                                                                                                                                                                                                                               | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year |                                    |                                    |                                                   |
| Friday,<br>January 6,<br>1978    | 6 to<br>6 1/2<br>Policy                          | The recent disorder in foreign exchange markets constitutes a threat to orderly expansion of the domestic and international economy. In view of this, the Board of Governors of the Federal Reserve System today approved an increase in the discount rate from 6 per cent to 6 1/2 per cent. | 0.38                       | 0.31   | 0.26   | 0.19   | 0.15    | 0.11    | 0.17                               | -0.04                              | -0.34                                             |
| Friday,<br>August 18,<br>1978    | 7 1/4 to<br>7 3/4<br>Policy                      | The Board expressed the hope that the need for the increase will prove temporary. The Board further indicated that the condition of the domestic economy is sound and that credit supplies to sustain economic expansion will remain ample.                                                   | 0.07                       | 0.02   | 0      | -0.01  | 0       | -0.02   | -0.03                              | -0.05                              | -0.89                                             |
| Friday,<br>September 22,<br>1978 | 7 3/4 to<br>8<br>Hybrid                          | Action was taken in view of recent disorderly conditions in foreign exchange markets as well as the continuing serious domestic inflationary problem.                                                                                                                                         | 0.17                       | -0.03  | 0.02   | 0      | 0.07    | 0.06    | 0.11                               | -0.06                              | 0.18                                              |
| Friday,<br>October 13,<br>1978   | 8 to<br>8 1/2<br>Hybrid                          | Action was taken in recognition of recent increases in other short-term interest rates, to bring the discount rate into closer alignment with short-term rates generally, and as a further step to strengthen the dollar.                                                                     | 0.21                       | 0.04   | 0.10   | 0.11   | 0.05    | 0.06    | 0.21                               | 0.14                               | 1.04                                              |

TABLE A5

-2 -

| Date of<br>Announcement           | Change in<br>Rate and<br>Type of<br>Announcement | Quotation                                                                                                                                                                                                                                                                                         | Changes in Treasury Yields |        |        |        |         |         |                                    | Percentage Change in<br>Dollar/Mark Exchange Rate |       |
|-----------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------|---------------------------------------------------|-------|
|                                   |                                                  |                                                                                                                                                                                                                                                                                                   | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward<br>rate 3 years out | 2-year forward<br>rate 5 years out                |       |
| Wednesday,<br>November 1,<br>1978 | 8 1/2 to<br>9 1/2<br>Policy                      | The Treasury Department and the<br>Federal Reserve today announced<br>measures to strengthen the<br>dollar and thereby counter<br>continuing domestic<br>inflationary pressures.                                                                                                                  | 0.09                       | -0.28  | -0.39  | -0.32  | -0.18   | -0.21   | -0.59                              | -0.08                                             | -6.85 |
| Friday,<br>July 20,<br>1979       | 9 1/2 to<br>10<br>Hybrid                         | Action was taken as a<br>further step to strengthen<br>the dollar on the foreign<br>exchange markets, and in<br>view of the recent rapid<br>rate of expansion in the<br>monetary aggregates, and<br>to bring the discount rate<br>into alignment with short-<br>term interest rates<br>generally. | 0.14                       | 0.04   | 0      | -0.03  | -0.01   | -0.04   | -0.07                              | -0.14                                             | -0.34 |
| Thursday,<br>August 16,<br>1979   | 10 to<br>10 1/2<br>Policy                        | Action was taken against the<br>background of the continuing<br>strong inflationary forces<br>that are evident in the economy<br>and in recognition of the<br>relatively rapid rate of<br>expansion in the monetary<br>aggregates.                                                                | 0.05                       | 0.03   | 0.01   | 0.01   | 0       | 0       | -0.03                              | 0.01                                              | -0.06 |

TABLE A6

Period 3  
OPEN MARKET OPERATIONS  
OCTOBER 7, 1982 TO JULY 26, 1984

| Date                        | Headline                                                                           | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                                       | Changes in Treasury Yields |        |        |        |         |         |                                 | Percentage Change in Dollar/Mark Exchange Rate |       |
|-----------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|------------------------------------------------|-------|
|                             |                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 4-year forward rate 3 years out | 2-year forward rate 5 years out                |       |
| Thursday, November 18, 1982 | Bond Prices Leap on Revived Speculation That Fed Will Soon Cut Discount Rate to 9% | The climb was sparked by a decline in the federal funds rate, the closely watched interest rate on overnight loans between banks....the bond market came to life after the Federal Reserve arranged four-day repurchase agreements, a maneuver that pumped reserves temporarily into the banking system. As a result, the funds rate fell to 9 1/4% at one point yesterday afternoon from an average of about 9.6% in the week ended Wednesday. | -0.11                      | -0.06  | -0.13  | -0.14  | -0.14   | -0.21   | -0.27                           | -0.18                                          | 0.57  |
| Wednesday, December 8, 1982 | Bond Prices Fall Again on Investor Fears Fed Won't Lower Discount Rate Until '83   | Sparking that worry was a rise in the closely watched interest rate on federal funds, which are reserves banks lend each other. Moreover, some analysts were upset that the Fed failed to inject reserves into the banking network yesterday to offset technical factors that normally drain reserves at this time of year.                                                                                                                     | 0.09                       | 0.13   | 0.04   | 0.08   | 0.14    | 0.09    | -0.13                           | 0.23                                           | -0.73 |
| Thursday, December 9, 1982  | Bonds Rebound as Fed Injection of Funds Revives Hopes for Discount Rate Cut Soon   | Bond prices rebounded yesterday after the Federal Reserve System injected funds into the banking network. In its action yesterday, the Fed bought Treasury bills for delivery today....Most traders had expected the Fed to place the buy order Wednesday. When the Fed didn't bond prices slid.                                                                                                                                                | -0.04                      | 0.01   | 0.05   | 0.01   | -0.03   | -0.02   | 0.13                            | -0.14                                          | 0.07  |
| Tuesday, June 7, 1983       | Bond Prices Fall, Short-Term Rates Jump Amid Signs Fed May be Tightening Credit    | Signs that the Federal Reserve System may be tightening credit conditions sent tremors through the nation's financial markets.... Technical factors have been draining reserves from the banking system and most analysts had been expecting the Fed to offset those forces by adding reserves.                                                                                                                                                 | 0.14                       | 0.10   | 0.07   | 0.07   | 0.08    | 0.07    | 0.02                            | 0.07                                           | -0.33 |

TABLE A6

Period 3  
OPEN MARKET OPERATIONS  
OCTOBER 7, 1982 TO JULY 26, 1984

- 2 -

| Date                             | Headline                                                                               | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Changes in Treasury Yields |        |        |        |         |         |                                    | Percentage Change in<br>Dollar/Mark Exchange Rate |       |
|----------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------|---------------------------------------------------|-------|
|                                  |                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward<br>rate 3 years out | 2-year forward<br>rate 5 years out                |       |
| Thursday,<br>August 25,<br>1983  | Bond Prices Slump as<br>Fed Credit Stance<br>Keeps Dealers and<br>Economists Baffled   | Several analysts earlier this week<br>said they detected signs that the<br>Fed was easing its credit clamp,<br>paving the way for lower short-<br>term interest rates. But the Fed<br>yesterday acted to drain reserves<br>from the banking system in a move<br>that economists said could mean<br>that the Fed hasn't loosened its<br>grip after all.                                                                                                                                                                                                                                                                                               | 0.11                       | 0.08   | 0.05   | 0.05   | 0.05    | 0.05    | 0                                  | 0.05                                              | -0.42 |
| Monday,<br>September 19,<br>1983 | Bond Prices Advance<br>as the Fed is said to<br>Take Measures to Ease<br>Credit Policy | In the credit markets yesterday,<br>bond prices rose in the morning<br>but tumbled after the Fed's<br>reserve-draining operation.<br><br>The optimism was sparked by a<br>combination of factors, including<br>an injection of funds into the<br>banking network by the Fed<br>yesterday. The maneuver was<br>undertaken despite indications<br>that banks have been relatively<br>flush with funds recently....The<br>Fed's injection of reserves came<br>at a time when the interest rate<br>on federal funds was at 9 3/8%.<br>After the action the funds rate<br>fell to 9 1/4%. That compared<br>with an average funds rate of<br>9.59% Friday. | -0.09                      | -0.04  | -0.01  | -0.07  | -0.01   | 0       | 0.05                               | -0.29                                             | 0.67  |

Tuesday,  
Septem-  
ber 20,  
1983

Bond Prices Surge  
Second Day in a Row  
on Signs Fed Might  
Relax Its Policy

Bond prices surged for the  
second consecutive day amid  
increasing signs that the  
Federal Reserve System may  
be relaxing its credit hold,  
setting the stage for lower  
interest rates.

The Federal Reserve in recent  
days has injected a massive  
amount of reserves into the  
banking network through purchases  
of government securities. The  
central bank normally adds  
reserves at this time of year  
to offset technical pressures  
that tend to drain reserves from  
banks. Many economists say the

-0.64

0.05

-0.09

-0.08

-0.07

-0.06

-0.09

-0.09

-0.08

TABLE A6

Period 3  
OPEN MARKET OPERATIONS  
OCTOBER 7, 1982 TO JULY 26, 1984

- 3 -

| Date                       | Headline                                                              | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Changes in Treasury Yields |        |        |        |         |         |                                 | Percentage Change in Dollar/Mark Exchange Rate |                                 |
|----------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|------------------------------------------------|---------------------------------|
|                            |                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                                | 2-year forward rate 5 years out |
| Tuesday, November 29, 1983 | Bond Prices Climb on Move by Fed as Economist Debate Credit Policy    | Fed's actions appear to be more aggressive than the technical factors would require, and cite this as evidence that the central bank has eased<br><br>Bond prices spurted yesterday, fueled in part by an injection of funds into the banking network by the Federal Reserve System.... The funds rate, which strongly influences other interest rates, fell to as low as 9 1/8% at one point yesterday afternoon, down from Monday's average rate of 9.23%. | -0.02                      | -0.04  | -0.10  | -0.04  | -0.05   | -0.08   | -0.22                           | 0.18                                           | 0.87                            |
| Wednesday, June 6, 1984    | Bond Prices Fall as Rise in Funds Rate Causes Concern Over Fed Policy | The funds rate jumped to 11 1/4% at one point yesterday afternoon from Tuesday's average of 10.65% and Monday's average of 10.53%.... Many analysts had been expecting the Fed to inject reserves into the banking system yesterday in order to offset technical factors draining funds from banks. The absence of any Fed action prompted speculation among some dealers that the Fed may be tightening its credit hold further.                            | 0.05                       | 0.14   | 0.14   | 0.17   | 0.16    | 0.12    | 0.14                            | 0.28                                           | 0.35                            |

TABLE A7  
POLICY AND HYBRID DISCOUNT RATE ANNOUNCEMENTS: PERIOD 3

| Date of<br>Announcement            | Change in<br>Rate and<br>Type of<br>Announcement | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Changes in Treasury Yields |        |        |        |         |         |                                    | Percentage Change in<br>Dollar/Mark Exchange Rate |       |
|------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------|---------------------------------------------------|-------|
|                                    |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward<br>rate 3 years out | 2-year forward<br>rate 5 years out                |       |
| Friday,<br>November 19,<br>1982    | 9 1/2 to<br>9<br>Hybrid                          | The further half-point reduction in the discount rate, which is broadly consistent with the prevailing pattern of market rates, was taken against the background of continued progress toward greater price stability, and indications of continued sluggishness in business activity and relatively strong demands for liquidity.                                                                                                                                                     | -0.06                      | -0.01  | -0.11  | 0.02   | 0.01    | 0.08    | -0.31                              | 0.51                                              | -0.58 |
| Monday,<br>December 13,<br>1982    | 9 to<br>8 1/2<br>Policy                          | The further half-point reduction in the discount rate was taken in the light of current business conditions, strong competitive pressures on prices and further moderation of cost increases, a slowing of private credit demands, and present indications of some tapering off in growth of the broader monetary aggregates.                                                                                                                                                          | -0.41                      | -0.27  | -0.21  | -0.16  | -0.15   | -0.09   | -0.09                              | 0.02                                              | 1.39  |
| Wednesday,<br>November 21,<br>1984 | 9 to<br>8 1/2<br>Policy                          | The reduction was taken against the background of growth in M1 and M2 in the lower part of the desired ranges and in the context of distinct moderation in the pace of business expansion, of relative stability in producer and commodity prices in recent months, of the restrained trend of wages and costs, and of the continued strength of the dollar internationally.                                                                                                           | -0.12                      | -0.13  | -0.15  | -0.14  | -0.13   | -0.14   | -0.19                              | -0.10                                             | -0.51 |
| Friday,<br>December 21,<br>1984    | 8 1/2 to<br>8<br>Hybrid                          | The action is designed to bring the discount rate into more appropriate alignment with short-term market interest rates. It was taken in the general context of the moderation of growth in economic activity since mid-year, continued relative stability or declines in sensitive commodity prices, and strength of the dollar internationally. M1 and M2 have remained within desired longer run ranges, but growth in M1 has on average been relatively sluggish in recent months. | -0.03                      | -0.04  | -0.04  | -0.03  | -0.03   | -0.02   | -0.04                              | 0.01                                              | -0.22 |

Percentage Change in Dollar/Mark Exchange Rate

### Changes in Treasury Yields

**2-year forward rate 5 years out**

The action was taken against the background of relatively unchanged output for some time in the industrial sector and the possibility of a sharp rise in the price of the economy stemming heavily from rising imports and a strong dollar. Price pressures, while clearly a continuing concern in some areas, appear to remain relatively well contained in goods producing sectors of the economy, and sensitive commodity prices are generally at the lowest levels in about two years. Growth of the monetary aggregates has slowed appreciably, although M1 has remained somewhat above the path implied by the annual target.

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In this setting, a reduction in the discount rate consistent with the declining trend in market interest rates over recent weeks appears appropriate.

## 1.07

TABLE A8

## FEDERAL RESERVE POLICY ANNOUNCEMENTS: PERIOD 3

| Date                                                                    | Headline                                                                        | Quotation                                                                                                                                                                                                                                                            | Changes in Treasury Yields |        |        |        |         |         | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |      |
|-------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|------------------------------------------------|------|
|                                                                         |                                                                                 |                                                                                                                                                                                                                                                                      | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year |                                 |                                                |      |
| Wednesday, February 16, 1983, statement before Senate Banking Committee | Bonds Rally As Fed's New Money Targets are Expected to Pave Way for Lower Rates | The Federal Reserve System's new, more lenient money-supply targets will pave the way for lower interest rates and help strengthen the economy's recovery, bankers and economists say.                                                                               | -0.14                      | -0.06  | -0.08  | -0.05  | -0.06   | -0.04   | -0.12                           | 0.06                                           | 0.72 |
|                                                                         |                                                                                 | The targets are structured to give the central bank broad flexibility in setting credit policy. They eliminate any pressure on the Fed to tighten its grip on credit, analysts say, and could lead to further easing moves.                                          |                            |        |        |        |         |         |                                 |                                                |      |
|                                                                         |                                                                                 | Bond prices rallied and most short-term interest rates declined yesterday after Paul Volcker, Reserve Board chairman, disclosed the new targets at a Senate Banking Committee hearing yesterday.                                                                     |                            |        |        |        |         |         |                                 |                                                |      |
| Wednesday, July 20, 1983, statement before House Banking Committee      | Fed's New Approach Buys Bonds Early But Later Uncertainty Erases Most Gains     | The Federal Reserve System's new, more tolerant approach to targeting the growth of the basic money supply buoyed bond prices early in the day. But most of the gains were erased later amid continued uncertainty over the long-term outlook for interest rates.... | -0.09                      | -0.06  | -0.09  | -0.09  | -0.05   | -0.05   | -0.15                           | -0.09                                          | 0.65 |
|                                                                         |                                                                                 | The change will make it easier for the Fed to meet its money objective. Under the old guidelines, M1 was \$16 billion above target in June. The new framework leaves it less than \$3 billion above.                                                                 |                            |        |        |        |         |         |                                 |                                                |      |
|                                                                         |                                                                                 | Most analysts said the action will ease pressure on the Fed to take additional credit-tightening measures.                                                                                                                                                           |                            |        |        |        |         |         |                                 |                                                |      |

TABLE A8

## FEDERAL RESERVE POLICY ANNOUNCEMENTS: PERIOD 3

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| Date                                                                 | Headline                                                                       | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                      | Changes in Treasury Yields |        |        |        |         |         | Percentage Change in Dollar/Mark Exchange Rate |                                 |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|------------------------------------------------|---------------------------------|
|                                                                      |                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out                | 2-year forward rate 5 years out |
| Monday, February 6, 1984 state-ment before House Banking Committee   | Interest Rates Rise as Analysts Worry That Fed Won't Be Loosening Reins Soon   | Most interest rates rose yesterday, jarring the stock market and helping to push the dollar higher in foreign exchange trading.                                                                                                                                                                                                                                                                                                | 0.13                       | 0.11   | 0.09   | 0.08   | 0.09    | 0.07    | 0.05                                           | 0.04                            |
|                                                                      |                                                                                | With the U.S. economy showing renewed signs of strength recently, many analysts say the Federal Reserve System can't afford to ease credit conditions. Some argue that the Fed even may decide to tighten its clamp in coming months, leading to slightly higher interest rates--a view they say was bolstered by a lengthy Fed report released yesterday to Congress.                                                         |                            |        |        |        |         |         |                                                |                                 |
| Wednesday, July 25, 1984 state-ment before Senate Banking Committee  | Bond Prices Surge, Interest Rates Slide as Volcker's Remarks Kindie Confidence | Bond prices surged after Federal Reserve Board Chairman Paul Volcker outlined what many investors interpreted as a reassuring outlook for both the economy and inflation.                                                                                                                                                                                                                                                      | -0.08                      | -0.21  | -0.29  | -0.26  | -0.24   | -0.28   | -0.45                                          | -0.14                           |
|                                                                      |                                                                                | Mr. Volcker's remarks helped calm fears that the economy is in danger of overheating and that the Fed would have to hit its credit brakes hard to keep inflation under control. Although parts of Mr. Volcker's remarks were ambiguous, many analysts also concluded that the Fed's policy-making committee last week didn't make any major credit-tightening moves, as some had feared.                                       |                            |        |        |        |         |         |                                                |                                 |
| Late Friday August 24, 1984 release by Fed of July 16 and 17 minutes | Waning hopes of easier credit stance by the Fed spark climb in interest rates  | But that view was shaken Friday when the Fed released minutes of the July 16 and 17 meeting of its policy-making arm, showing that Fed officials remained deeply concerned that the economy's strong growth eventually will reignite inflation. The group, the Federal Open Market Committee, voted to maintain a tight hold on credit and to authorize an even tougher policy if needed to keep the economy from overheating. | 0.19                       | 0.12   | 0.13   | 0.15   | 0.18    | 0.16    | 0.15                                           | 0.23                            |
|                                                                      |                                                                                | The report indicated "the Fed is willing to tighten but is reluctant to ease," said Robert A. Brusca, vice president and money-market economist at Irving Trust Co.                                                                                                                                                                                                                                                            |                            |        |        |        |         |         |                                                |                                 |

TABLE A8

FEDERAL RESERVE POLICY ANNOUNCEMENTS: PERIOD 3

- 3 -

| Date                                                                      | Headline                                                                   | Quotation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Changes in Treasury Yields |        |        |        |         |         |                                 | 2-year forward rate 5 years out | Percentage Change in Dollar/Mark Exchange Rate |
|---------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------|--------|--------|---------|---------|---------------------------------|---------------------------------|------------------------------------------------|
|                                                                           |                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6-month                    | 3-year | 5-year | 7-year | 20-year | 30-year | 2-year forward rate 3 years out |                                 |                                                |
| Wednesday, February 20, 1985<br>Statement before Senate Banking Committee | Bond Prices Slump as Volcker Confirms Fed Stopped Easing Credit Conditions | <p>This view differs sharply from the impression many bond traders and analysts had after listening to Fed Chairman Paul Volcker at a Senate Banking Committee hearing July 25. Many experts said then that Mr. Volcker's remarks indicated the Fed wasn't likely to tighten credit conditions any further this year.</p> <p>Bond prices tumbled yesterday amid growing concern among dealers and investors that the Federal Reserve System will tighten its credit hold in coming months.</p> <p>Those fears intensified yesterday after Paul Volcker, chairman of the Reserve Board, outlined the Fed's money supply targets and economic projections for the year. In testimony before the Senate Banking Committee, Mr. Volcker confirmed that the Fed stopped easing credit conditions last month and said he is still concerned about the longer-term battle against inflation.</p> <p>Many analysts had hoped that the Fed might ease credit conditions in an effort to keep the dollar from rising further in foreign-exchange trading. But economists said Mr. Volcker's testimony indicated that the dollar isn't playing a primary role in monetary policy.</p> | 0.10                       | 0.10   | 0.14   | 0.16   | 0.15    | 0.15    | 0.22                            | 0.23                            | -0.50                                          |