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Working Paper 86-5

THE INFORMATION CONTENT OF DISCOUNT RATE ANNOUNCEMENTS AND THEIR EFFECT ON MARKET INTEREST RATES

Timothy Cook
and
Thomas Hahn

Federal Reserve Bank of Richmond

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Abstract

This paper presents evidence that throughout the 1973-85 period the Federal Reserve systematically used certain types of discount rate announcements to signal changes in its policy instrument, the Federal funds rate. Market participants understood the signals contained in discount rate announcements and used them to revise their expectations of the future path of the funds rate. These revisions in funds rate expectations caused movements in Treasury bill rates. The paper also presents evidence that discount rate announcements signaling changes in the funds rate had a strong effect on bond rates in the period since October 1979.

THE INFORMATION CONTENT OF DISCOUNT RATE ANNOUNCEMENTS AND THEIR EFFECT ON MARKET INTEREST RATES

I. INTRODUCTION

A number of papers in recent years have examined the announcement effect of discount rate changes on market interest rates. Baker and Meyer [1980] find that discount rate changes over the 1953-78 period influenced Treasury bill rates. Roley and Troll [1984] find that before October 1979 market yields did not change significantly in response to discount rate changes while after October 1979 interest rates across the maturity spectrum responded. Smirlock and Yawitz [1985] also find virtually no evidence of an effect of discount rate changes on market interest rates in the pre-October 1979 period. For the post-October 1979 period they conclude that interest rates responded only to unexpected discount rate changes. Both Roley and Troll and Smirlock and Yawitz attribute the difference in their results before and after October 1979 to the difference in Federal Reserve operating procedures in those periods.

Smirlock and Yawitz use two methods to classify discount rate changes into "'technical' discount rate changes that are endogenous and 'nontechnical' changes which contain some informative policy implications [p.1142]" They first make this classification using a statistical model relating changes in the discount rate to past levels of discount window borrowing and the spread between the funds rate and the discount rate. Technical changes (or the amounts of the changes that are technical) are those predicted by this model. They also classify discount rate changes on the basis of the language in the announcement accompanying the changes. Neither of these methods distinguishes between discount rate changes according to the signals announcements carry for future monetary policy actions.

In this paper we evaluate whether different types of discount rate announcements carry different signals about subsequent Federal Reserve policy actions and, if so, whether market participants understand these signals and use them to revise their interest rate expectations. We find that some types of discount rate announcements signal persistent changes in the Federal Reserve's policy instrument, the Federal funds rate, and we link movements in Treasury bill rates in reaction to discount rate announcements to changes in market expectations of the future funds rate caused by these announcements. In this framework announcement effects are possible under any of the operating procedures that have been used by the Federal Reserve and, in contrast to Roley and Troll and Smirlock and Yawitz, we find strong evidence of such effects both before and after October 1979.

We begin by classifying discount rate announcements into three types according to the language contained in the announcement. This classification is shown in the Appendix A. "Type 1" announcements indicate that the discount rate is being changed to realign it with market rates. "Type 3" announcements indicate the discount rate is being changed because of the Fed's concern over the growth rate of money and credit, or its concern over the pace of economic activity, the inflation rate, or some other macroeconomic variable. "Type 2" announcements contain the language of both type 1 and type 3 announcements. Over the 1973 through 1985 period covered by this paper there were 21 type 1 announcements, 18 type 2 announcements and 10 type 3 announcements.

We look at each type of announcement to see whether it has been used by the Federal Reserve to signal persistent movements in the Federal funds rate. The distinction we make is between those types of announcements that systematically signal a movement in the funds rate versus those that do

not. If the Fed uses certain types of discount rate announcements to signal persistent funds rate movements and if people use the information that is available in these signals, then expectations of the future funds rate path should change following these announcements, assuming the subsequent funds rate movements were not fully anticipated.

We assume that the relationship between the Treasury bill rate and the funds rate is determined in accordance with the expectations theory of the term structure, i.e., that the Treasury bill rate is determined by expectations of the funds rate over the life of the bill. Consequently, if funds rate expectations change following a certain type of discount rate announcement, then Treasury bill rates should experience an announcement effect in response to these revised expectations. Conversely, Treasury bill rates should not react to announcements that do not signal a change in the funds rate.

We find that throughout the 1973-1985 period the Federal Reserve systematically used type 2 and type 3 discount rate announcements to signal movements in the funds rate. From 1973 through 1975 the Fed also used type 1 announcements this way. These announcements virtually always had an effect on Treasury bill rates. Conversely, type 1 announcements in the 1976-85 period carried no reliable signal about the subsequent movement in the funds rate and had no effect on bill rates. Our interpretation of these results is that market participants understood the signals contained in discount rate announcements and used them to revise their expectations of the future path of the funds rate, which in turn caused bill rate movements.

II. FEDERAL RESERVE BEHAVIOR FOLLOWING DIFFERENT TYPES OF DISCOUNT RATE ANNOUNCEMENTS

There are three aspects of Federal Reserve behavior in the period covered by this paper that are relevant for our discussion of the information content of discount rate announcements. First, the Federal Reserve pursued its monetary policy objectives by targeting the Federal funds rate.[1] Second, the Fed changed its Federal funds rate target discontinuously in reaction to new information. Third, changes in the funds rate target were highly persistent and seldom, if ever, quickly reversed. (We provide evidence on the time frame of this statement below.) We present no explanation of why the Fed behaved in this fashion. We simply present these as three aspects of Fed behavior that were well recognized by market participants.[2]

In this section we determine whether certain types of discount announcements were systematically used by the Fed to signal changes in the Federal funds rate over the 1973-85 period covered by this paper. We also want to confirm that funds rate movements signaled by discount rate announcements persisted, as implied by our discussion above. We measure the change in the funds rate following discount rate announcements in two ways. First, we compare weekly averages of daily rates in the two weeks immediately

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[1]There is some controversy over how closely the Fed controlled the funds rate in the period from October 1979 through October 1982. We discuss this period later in the paper.

[2]For the first half of the period covered by this paper--until October 1979--the Fed's target ranges for the Federal funds rate were so narrow and well-defined that market participants and the financial press could virtually always identify the day on which a target change occurred and the magnitude of the target change. In this period it is possible to carefully document the description of Fed behavior in this paragraph. See Cook and Hahn [1986b].

following the announcement to the average of rates in the week preceding the announcement. The weekly average following the announcement starts on the market day after the announcement if the announcement is late in the day or on the weekend and starts on the day of the announcement if the announcement occurred early in the day.[3] (Forty-two of the forty-nine announcements occurred between 3:30 p.m. and 6 p.m. and one was on Saturday. The other six announcements occurred between 9:30 a.m. and 12:15 p.m.). Although a change in the discount rate can occur at any time, the Reserve Banks make discount rate recommendations every two weeks. In six instances in our sample, the discount rate was changed two to three weeks following the previous change. Hence, two weeks is the longest period for which movements in the funds rate follow only one announcement.

Table 1 shows the average Federal funds rate in the week before and the two weeks after the 49 discount rate announcements in the 1973-85 period.[4] The behavior of the funds rate following type 2 and type 3 announcements was very similar so we group these together in the table and in the regressions below.[5] The last two columns in Table 2 show the funds rate in the first and second weeks after each announcement minus the funds rate in

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[3]In calculating the weekly averages for the years prior to 1976 we dropped Wednesdays (reserve settlement days) because the funds rate was extremely volatile on these days, frequently differing by two or three percentage points from the prevailing level. These movements were viewed by market participants as having no policy significance and including them would in some instances have a considerable distorting effect on the weekly averages.

[4]The daily funds rate data surrounding each announcement are reported in Appendix B.

[5]The change in the funds rate divided by the change in the discount rate--shown in Table 2--averaged 1.225 for the 18 type 2 announcements and 1.228 for the 10 type 3 announcements.

TABLE I

FUNDS RATE MOVEMENTS FOLLOWING DISCOUNT RATE ANNOUNCEMENTS

Discount Rate Announcements							Funds Rate							Funds Rate Divided by Discount Rate (changes)	
Date	Day	Following Market close	Day	Discount Rate Announced	Change	Type	One Week Before	Week After	Two Weeks After	Avg. 91 Days After	Avg. 182 Days After	Change First Week After	Change Second Week After	First Week After	Second Week After
12-Jan-73	Fri	15-Jan-73	Mon	5.00	0.50	1	5.69	6.02	6.28	6.73	7.55	0.33	0.59	0.67	1.19
20-Apr-73	Fri	23-Apr-73	Mon	5.75	0.25	1	7.21	7.28	7.64	8.60	9.35	0.07	0.43	0.26	1.72
10-May-73	Thu	11-May-73	Fri	6.00	0.25	1	7.70	7.86	8.03	9.19	9.78	0.16	0.33	0.63	1.33
13-Aug-73	Mon	14-Aug-73	Tue	7.50	0.50	1	10.46	10.46	10.80	10.35	10.06	0.01	0.35	0.02	0.70
04-Feb-75	Tue	05-Feb-75	Wed	6.75	-0.50	1	6.73	6.26	6.29	5.68	5.67	-0.47	-0.45	0.94	0.90
15-May-75	Thu	16-May-75	Fri	6.00	-0.25	1	5.20	5.09	5.09	5.75	5.83	-0.11	-0.11	0.45	0.42
16-Jan-76	Fri	19-Jan-76	Mon	5.50	-0.50	1	4.80	4.76	4.86	4.80	5.05	-0.04	0.06	0.07	-0.13
19-Nov-76	Fri	22-Nov-76	Mon	5.25	-0.25	1	4.94	4.86	4.66	4.66	4.76	-0.08	-0.28	0.33	1.12
29-Aug-77	Mon	30-Aug-77	Tue	5.75	0.50	1	6.01	6.03	5.98	6.36	6.52	0.02	-0.02	0.05	-0.05
25-Oct-77	Tue	26-Oct-77	Wed	6.00	0.25	1	6.48	6.56	6.54	6.58	6.69	0.07	0.06	0.29	0.22
11-May-78	Thu	11-May-78	Thu	7.00	0.50	1	7.32	7.34	7.43	7.64	8.15	0.02	0.11	0.04	0.21
30-Jun-78	Fri	03-Jul-78	Mon	7.25	0.25	1	7.96	7.54	7.76	8.11	8.85	-0.41	-0.20	-1.65	-0.80
18-Sep-79	Tue	19-Sep-79	Wed	11.00	0.50	1	11.41	11.54	11.97	13.34	13.86	0.13	0.56	0.27	1.12
28-May-80	Wed	29-May-80	Thu	12.00	-1.00	1	9.46	10.74	9.68	9.36	11.09	1.28	0.22	-1.28	-0.22
12-Jun-80	Thu	13-Jun-80	Fri	11.00	-1.00	1	9.48	9.11	9.02	9.40	11.77	-0.37	-0.45	0.37	0.45
25-Jul-80	Fri	28-Jul-80	Mon	10.00	-1.00	1	8.68	9.91	8.84	10.90	14.34	1.23	0.16	-1.23	-0.16
30-Oct-81	Fri	02-Nov-81	Mon	13.00	-1.00	1	14.49	14.53	13.56	12.95	13.88	0.04	-0.93	-0.04	0.93
03-Dec-81	Thu	04-Dec-81	Fri	12.00	-1.00	1	12.47	11.99	12.27	13.49	14.07	-0.49	-0.20	0.49	0.20
26-Aug-82	Thu	27-Aug-82	Fri	10.00	-0.50	1	9.08	10.32	10.06	9.82	9.28	1.24	0.98	-2.48	-1.96
08-Oct-82	Fri	12-Oct-82	Tue	9.50	-0.50	1	9.72	9.48	9.50	9.16	8.90	-0.25	-0.22	0.49	0.44
06-Apr-84	Fri	09-Apr-84	Mon	9.00	0.50	1	10.56	10.02	10.23	10.60	10.98	-0.54	-0.33	-1.09	-0.66
23-Feb-73	Fri	26-Feb-73	Mon	5.50	0.50	2	6.50	7.23	7.02	7.32	8.49	0.73	0.52	1.46	1.04
08-Jun-73	Fri	11-Jun-73	Mon	6.50	0.50	2	8.43	8.43	8.63	10.05	10.14	0.00	0.20	0.00	0.39
29-Jun-73	Fri	02-Jul-73	Mon	7.00	0.50	3	8.80	9.73	9.68	10.57	10.29	0.93	0.88	1.87	1.77
24-Apr-74	Wed	25-Apr-74	Thu	8.00	0.50	2	10.87	11.27	11.44	11.99	11.67	0.40	0.57	0.81	1.14
06-Dec-74	Fri	09-Dec-74	Mon	7.75	-0.25	2	8.97	8.80	8.63	7.06	6.21	-0.16	-0.33	0.65	1.34
03-Jan-75	Fri	06-Jan-75	Mon	7.25	-0.50	3	8.45	7.36	7.03	6.35	5.88	-1.09	-1.42	2.18	2.83
07-Mar-75	Fri	10-Mar-75	Mon	6.25	-0.50	2	5.84	5.48	5.49	5.36	5.66	-0.35	-0.34	0.70	0.69
06-Jan-78	Fri	09-Jan-78	Mon	6.50	0.50	3	6.62	6.73	6.72	6.77	7.07	0.11	0.11	0.23	0.21
18-Aug-78	Fri	18-Aug-78	Fri	7.75	0.50	3	7.89	8.17	8.30	8.81	9.42	0.27	0.41	0.55	0.82
22-Sep-78	Fri	22-Sep-78	Fri	8.00	0.25	2	8.38	8.66	8.85	9.40	9.76	0.28	0.47	1.14	1.87
13-Oct-78	Fri	16-Oct-78	Mon	8.50	0.50	2	8.72	8.95	9.30	9.80	9.92	0.22	0.58	0.44	1.15
01-Nov-78	Wed	01-Nov-78	Wed	9.50	1.00	3	9.25	9.83	9.68	9.96	10.02	0.58	0.43	0.58	0.43
20-Jul-79	Fri	20-Jul-79	Fri	10.00	0.50	2	10.36	10.66	10.76	11.38	12.62	0.30	0.40	0.59	0.79
16-Aug-79	Thu	17-Aug-79	Fri	10.50	0.50	3	10.86	11.03	11.21	12.52	13.04	0.17	0.35	0.34	0.70
06-Oct-79	Sat	09-Oct-79	Tue	12.00	1.00	3	11.59	13.09	14.74	13.79	14.64	1.50	3.15	1.50	3.15
15-Feb-80	Fri	15-Feb-80	Fri	13.00	1.00	3	13.84	14.97	14.64	16.07	12.73	1.14	0.81	1.14	0.81
25-Sep-80	Thu	26-Sep-80	Fri	11.00	1.00	2	10.91	12.70	12.45	15.48	16.15	1.79	1.53	1.79	1.53
14-Nov-80	Fri	17-Nov-80	Mon	12.00	1.00	2	14.12	17.10	18.02	18.37	17.10	2.98	3.90	2.98	3.90
04-Dec-80	Thu	05-Dec-80	Fri	13.00	1.00	2	17.69	19.11	19.91	17.97	17.23	1.42	2.22	1.42	2.22
04-May-81	Mon	05-May-81	Tue	14.00	1.00	2	19.01	18.07	18.45	18.82	17.50	-0.94	-0.56	-0.94	-0.56
19-Jul-82	Mon	20-Jul-82	Tue	11.50	-0.50	2	12.74	10.82	11.44	10.27	9.68	-1.92	-1.31	3.84	2.61
30-Jul-82	Fri	02-Aug-82	Mon	11.00	-0.50	2	11.44	10.76	10.73	10.03	9.49	-0.68	-0.71	1.35	1.43
13-Aug-82	Fri	16-Aug-82	Mon	10.50	-0.50	2	10.73	9.16	9.58	9.83	9.32	-1.56	-1.15	3.13	2.30
19-Nov-82	Fri	22-Nov-82	Mon	9.00	-0.50	2	9.35	8.52	8.96	8.74	8.72	-0.83	-0.39	1.66	0.78
13-Dec-82	Mon	14-Dec-82	Tue	8.50	-0.50	3	8.79	8.81	8.56	8.67	8.72	0.02	-0.23	-0.03	0.45
21-Nov-84	Wed	23-Nov-84	Fri	8.50	-0.50	3	9.43	8.90	8.87	8.45	8.40	-0.53	-0.55	1.05	1.11
21-Dec-84	Fri	24-Dec-84	Mon	8.00	-0.50	2	7.89	8.22	8.59	8.46	8.22	0.33	0.71	-0.67	-1.41
17-May-85	Fri	20-May-85	Mon	7.50	-0.50	2	8.08	7.62	7.67	7.75	7.87	-0.46	-0.42	0.93	0.83

the week before the announcement divided by the change in the discount rate. A ratio of 1 indicates that the funds rate moved in the same direction as the discount rate and by an equal amount.

In 26 out of 28 cases the funds rate moved in the same direction as the discount rate in the two weeks following type 2 and type 3 discount rate announcements.[6] On average, following type 2 and 3 announcements the funds rate moved 1.23 times the change in the discount rate. The behavior of the funds rate following type 1 announcements changes within the 1973-85 period. In the 1973-1975 period the funds rate moved in the same direction as the discount rate following all six announcements. On average, the funds rate moved 1.04 times the change in the discount rate. In the 1976-1985 period, however, the funds rate moved in the same direction as the discount rate only 8 out of 15 times and the average movement was only .05 times the change in the discount rate.

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[6]Furthermore, there were special circumstances surrounding the other two cases. In the case of the May 4, 1981 announcement, there was a huge increase of over three percentage points in the funds rate in the days immediately preceding the discount rate increase. Hence, the announcement may still have provided information as to whether the higher funds rate was going to be maintained. The higher funds rate was largely maintained, so the average funds rate rose from 15.70 percent two weeks before the announcement to 18.07 percent the week following the announcement. In the case of the December 21, 1984 announcement, new information about the growth of the money supply became available shortly after the discount rate announcement, and this information may have caused a revision in the funds rate desired by the Federal Reserve. In the five months preceding December, M1 had grown at an annual rate of only 1.4 percent and was below its target range. According to the Policy Directive of the December 18 FOMC meeting, which was only three days before the discount rate change, "several [members] were of the view that some additional easing of reserve conditions was probably needed to help assure adequate growth in M1. It was noted that there was at yet no clear evidence that the recent easing of reserve conditions and accompanying decline in short-term interest rates would foster a sustained rebound in M1 growth." M1, however, grew sharply in the latter part of December resulting in a M1 growth rate for that month of 10.7 percent.

We check for whether a given type of announcement over a specified period of time was followed by changes in the funds rate in the same direction as the discount rate by estimating the equation:

1. $\Delta RFF_t = b1 + b2*\Delta RDIS_t + u_t$,

where ΔRDIS is the change in the discount rate accompanying a discount rate announcement and ΔRFF is the average funds rate in the second week after the announcement minus the average funds rate in the week before the announcement. The estimates of equation 1 are reported in Table 2. The coefficient of ΔRDIS for type 2 and 3 announcements is 1.38 and is significant at the 1% level. We conclude that throughout the 1973-85 period type 2 and type 3 announcements were used to signal subsequent changes in the Federal funds rate.

The coefficient of ΔRDIS for type 1 announcements in the 1973-1975 period is .90 and is significant at the 1% level. This result indicates that in the 1973-1975 period type 1 announcements--their language notwithstanding--were followed by changes in the funds rate roughly equal, on average, to changes in the discount rate. The coefficient of ΔRDIS for type 1 announcements over the 1976-85 period is not significantly different from zero, indicating that type 1 announcements in this period were not used to signal changes in the funds rate.

To check that funds rate movements following type 2 and type 3 announcements persisted, we also measured the change in the funds rate using daily averages of rates over the 91 days (three months) and 182 days (six months) following each announcement. (We use these lengths of time because we are going to look at the behavior of Treasury bill yields in the next section of the paper.) The averages, shown in Table 1, begin the day after the late afternoon announcements and the day of the morning announcements.

TABLE 2

$$\Delta RFF_t = b1 + b2\Delta RDIS_t + u_t$$

Sample	Constant	Change in Discount Rate	SER	$\bar{R}^2$
type 2 and 3 announcements (number of observations)				
1. 1973-85 (28)	.03 (0.17)	1.38 (5.11)	.87	.48
type 1 announcements (number of observations)				
2. 1973-75 (6)	.08 (1.44)	.90 (6.64)	.12	.90
3. 1976-85 (15)	.01 (0.07)	.15 (0.79)	.45	-.03

Note: 1. ΔRFF is calculated as the difference between the average funds rate in the second week following a discount rate announcement and the average funds rate in the week preceding the announcement.

2. t-statistics in parentheses.

Following type 2 and 3 announcements, the 91-day average funds rate moved in the same direction as the discount rate in all but two out of twenty-eight cases and the 182-day average funds rate moved in the same direction as the discount rate in all but four cases.

We reestimated equation (1) with the dependent variable calculated as the difference between the 91-day or 182-day average funds rate following a discount rate announcement and the weekly average funds rate over the seven days prior to the announcement. The regression results, shown in Table 3, conform closely to those in Table 2 and confirm that funds rate movements signaled by type 2 and 3 announcements generally persisted for a number of months. The coefficient of the change in the discount rate in both regressions for type 2 and 3 announcements is significant at the 1% level. The magnitude of the coefficients is actually higher than for the same regression in Table 2. The coefficients of the change in the discount rate in the regressions for the six 1973-75 type 1 announcements also are higher than in Table 2, although the t-statistics of the coefficients drop sharply. Lastly, the regression results for the post-1975 type 1 announcements again show no relationship between the change in the discount rate and the subsequent change in the funds rate.

III. ANNOUNCEMENT EFFECTS: TREASURY BILL RATES

If a certain type of announcement has been systematically used by the Fed over some period of time to signal persistent changes in the funds rate, we would expect investors to learn this signal and use the information provided by it to revise their expectations of the future behavior of the funds rate. Further, if we assume that the Treasury bill rate is linked to the funds rate in accordance with the expectations theory of the term

TABLE 3

$$\Delta RFF_t = b1 + b2\Delta RDIS_t + u_t$$

Sample	Constant	Change in Discount Rate	SER	$\bar{R}^2$
type 2 and 3 announcements (number of observations)				
1. 1973-85 (28)				
a. 91-day average	.05 (.22)	2.02 (5.74)	1.13	.54
b. 182-day average	-.07 (.22)	1.91 (3.89)	1.58	.34
type 1 announcements (number of observations)				
2. 1973-75 (6)				
a. 91-day average	0.38 (.98)	1.37 (1.40)	.90	.16
b. 182-day average	0.68 (1.18)	1.81 (1.24)	1.34	.10
3. 1976-85 (15)				
a. 91-day average	.34 (1.25)	.19 (.40)	.95	-.06
b. 182-day average	.84 (1.84)	-.63 (.94)	1.61	-.01

Note:

1. ΔRFF is calculated as the difference between the 91-day or 182-day average funds rate following a discount rate announcement and the weekly average funds rate over the seven days prior to the announcement.

2. t-statistics in parentheses.

structure, then we would expect the bill rate to adjust to new information about the funds rate signaled by this type of announcement. Conversely, if announcements of a certain type provide no systematic information about the future path of the funds rate, we would not expect investors to revise their funds rate expectations following these announcements, and we not would expect a movement in the bill rate. In light of the results in the previous section we would therefore expect type 2 and type 3 announcements throughout the 1973-85 period and type 1 announcements in the 1973-75 period to have had announcement effects if the funds rate movements signaled by these announcements were not fully anticipated.[7] Conversely, we would not expect type 1 announcements in the 1976-85 period to have had announcement effects.

We check to see if there is this correspondence between the funds rate signal provided by announcements and announcement effects on the bill rate by estimating the following regression for the same sets of announcements used in the first equation:

2. $\Delta RTB_t = c1 + c2*\Delta RDIS_t + u_t$

where ΔRTB_t is the change in the bill rate immediately following the discount rate announcement. If market participants use the information on funds rate movements signaled by discount rate announcements and if these movements are not fully anticipated, then we would expect a positive value of b2 in equation 1 to imply a positive value of c2 in equation 2. Conversely, if b2

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[7] By "fully anticipated" we mean that the magnitude and the timing of the change in the funds rate signaled by the discount rate announcement was known with certainty. Even if a funds rate change is widely anticipated, a discount rate announcement may still provide new information about the path of the funds rate by indicating the funds rate change is going to occur quickly. We return to this point later in the paper.

is not significantly different from zero in equation 1 for a type of announcement, then we would expect c2 in equation 2 to be zero for that type.

Most of the discount rate announcements in our sample occurred late in the afternoon after 3:30 p.m.. To our knowledge all existing papers on discount rate announcement effects have used daily interest rate data from 3:30 p.m. the day of the announcement to 3:30 p.m. the following day. Instead, we measure the response of interest rates to discount rate announcements using International Monetary Market (IMM) Treasury bill futures rate data. This data has the advantage that it is available from the "settle" at the end of one market day to the "open" early the following morning. These two times bracket the late afternoon discount rate announcements but unlike the daily spot rate data do not also encompass the following day when the market may be getting new information about policy directly through Federal Reserve open market operations. For those six cases in our sample when the announcement occurred in the morning, we use the change in the futures rate from the open prior to the announcement to the settle the same day. In each case the contract used is the first due after the month of the announcement. The movement of the rate on the Treasury bill futures contract following discount rate announcements is shown in Table 4. (The corresponding futures price data are reported in Appendix C.) The IMM futures rate data is available only since the beginning of 1976. For the earlier years we supplement this data with the 3:30 to 3:30 p.m. spot rate data for six-month Treasury bills. (All bill rates are calculated on a bond equivalent basis.)

In estimating equation 2 and in the discussion in the remainder of this section, we delete three discount rate announcements that occurred over the same IMM settle-to-open (or open-to-settle) interval as three major policy announcements that may also have influenced rates. These were (1) the

TABLE 4

BILL AND BOND RATE MOVEMENTS FOLLOWING DISCOUNT RATE ANNOUNCEMENTS

Discount Rate Announcements							Bill Rates							Bond Rates	
								Futures							
Date	Day	Following Market Close	Day	Discount Rate Announced	Change	Type	Spot	Contract	Settle to Open	Open to Settle	Settle to Settle	Rate Used	Divided by Discount Rate Changes	Change	Divided by Discount Rate Change
12-Jan-73	Fri	15-Jan-73	Mon	5.00	0.50	1	0.01					0.01	0.02	-0.01	-0.02
20-Apr-73	Fri	23-Apr-73	Mon	5.75	0.25	1	0.14					0.14	0.56	0.02	0.08
10-May-73	Thu	11-May-73	Fri	6.00	0.25	1	0.17					0.17	0.68	0.01	0.04
13-Aug-73	Mon	14-Aug-73	Tue	7.50	0.50	1	0.14					0.14	0.28	0.01	0.02
04-Feb-75	Tue	5-Feb-75	Wed	6.75	-0.50	1	-0.14					-0.14	0.28	-0.05	0.10
15-May-75	Thu	16-May-75	Fri	6.00	-0.25	1	-0.08					-0.08	0.32	0.00	0.00
16-Jan-76	Fri	19-Jan-76	Mon	5.50	-0.50	1	-0.08	Mar-76	-0.06	-0.03	-0.09	-0.06	0.12	-0.02	0.04
19-Nov-76	Fri	22-Nov-76	Mon	5.25	-0.25	1	-0.07	Dec-76	-0.09	0.08	-0.01	-0.09	0.36	-0.06	0.24
29-Aug-77	Mon	30-Aug-77	Tue	5.75	0.50	1	0.01	Sep-77	0.04	0.00	0.04	0.04	0.08	0.02	0.04
25-Oct-77	Tue	26-Oct-77	Wed	6.00	0.25	1	-0.04	Dec-77	-0.03	0.02	-0.01	-0.03	-0.12	-0.01	-0.02
11-May-78	Thu	11-May-78	Thu	7.00	0.50	1	0.02	Jun-78	0.02	-0.06	-0.04	-0.06	-0.12	-0.01	-0.01
30-Jun-78	Fri	3-Jul-78	Mon	7.25	0.25	1	-0.06	Sep-78	-0.04	-0.02	-0.06	-0.04	-0.16	-0.02	-0.08
18-Sep-79	Tue	19-Sep-79	Wed	11.00	0.50	1	-0.25	Dec-79	0.03	-0.42	-0.38	0.03	0.06	0.04	0.08
28-May-80	Wed	29-May-80	Thu	12.00	-1.00	1	0.27	Jun-80	0.06	0.16	0.22	0.06	-0.06	-0.02	0.02
12-Jun-80	Thu	13-Jun-80	Fri	11.00	-1.00	1	-0.21	Sep-80	-0.17	-0.02	-0.19	-0.17	0.17	-0.13	-0.13
25-Jul-80	Fri	28-Jul-80	Mon	10.00	-1.00	1	0.25	Sep-80	-0.05	0.27	0.22	-0.05	0.05	0.01	-0.01
30-Oct-81	Fri	2-Nov-81	Mon	13.00	-1.00	1	-0.03	Dec-81	-0.01	0.10	0.09	-0.01	0.01	0.00	0.00
03-Dec-81	Thu	4-Dec-81	Fri	12.00	-1.00	1	-0.75	Mar-82	-0.64	0.00	-0.64	-0.64	0.64	-0.28	0.28
26-Aug-82	Thu	27-Aug-82	Fri	10.00	-0.50	1	0.63	Sep-82	0.17	0.40	0.57	0.17	-0.34	0.02	-0.05
08-Oct-82	Fri	11-Oct-82	Mon	9.50	-0.50	1	-0.57	Dec-82	-0.60	-0.03	-0.63	-0.60	1.20	-0.20	0.41
06-Apr-84	Fri	9-Apr-84	Mon	9.00	0.50	1	-0.04	Jun-84	0.02	-0.12	-0.10	0.02	0.04	0.00	0.00
23-Feb-73	Fri	26-Feb-73	Mon	5.50	0.50	2	0.21					0.21	0.42	0.03	0.06
08-Jun-73	Fri	11-Jun-73	Mon	6.50	0.50	2	0.10					0.10	0.20	0.02	0.04
29-Jun-73	Fri	2-Jul-73	Mon	7.00	0.50	3	0.38					0.38	0.76	0.04	0.08
24-Apr-74	Wed	25-Apr-74	Thu	8.00	0.50	2	0.22					0.22	0.44	0.05	0.10
06-Dec-74	Fri	9-Dec-74	Mon	7.75	-0.25	2	-0.24					-0.24	0.96	-0.11	0.44
03-Jan-75	Fri	6-Jan-75	Mon	7.25	-0.50	3	-0.12					-0.12	0.24	-0.03	0.06
07-Mar-75	Fri	10-Mar-75	Mon	6.25	-0.50	2	0.00					0.00	0.00	0.02	-0.04
06-Jan-78	Fri	9-Jan-78	Mon	6.50	0.50	3	0.38	Mar-78	0.27	0.03	0.30	0.27	0.54	0.07	0.14
18-Aug-78	Fri	18-Aug-78	Fri	7.75	0.50	3	0.07	Sep-78	0.03	0.04	0.07	0.04	0.08	-0.07	-0.13
22-Sep-78	Fri	22-Sep-78	Fri	8.00	0.25	2	0.17	Dec-78	0.01	0.17	0.18	0.17	0.68	0.05	0.18
13-Oct-78	Fri	16-Oct-78	Mon	8.50	0.50	2	0.21	Dec-78	0.22	-0.07	0.15	0.22	0.44	0.05	0.10
01-Nov-78	Wed	1-Nov-78	Wed	9.50	1.00	3	0.09	Dec-78	0.21	0.11	0.32	0.11	0.11	-0.03	-0.03
20-Jul-79	Fri	20-Jul-79	Fri	10.00	0.50	2	0.14	Sep-79	0.10	0.12	0.21	0.12	0.24	-0.07	-0.13
16-Aug-79	Thu	17-Aug-79	Fri	10.50	0.50	3	0.05	Sep-79	0.09	-0.02	0.06	0.09	0.18	-0.03	-0.06
06-Oct-79	Sat	8-Oct-79	Mon	12.00	1.00	3	1.07	Dec-79	0.54	0.00	0.54	0.54	0.54	-0.06	-0.06
15-Feb-80	Fri	15-Feb-80	Fri	13.00	1.00	3	0.67	Mar-80	0.41	0.13	0.54	0.13	0.13	0.13	0.13
25-Sep-80	Thu	26-Sep-80	Fri	11.00	1.00	2	0.51	Dec-80	0.56	-0.15	0.41	0.56	0.56	0.18	0.18
14-Nov-80	Fri	17-Nov-80	Mon	12.00	1.00	2	0.88	Dec-80	0.51	0.11	0.62	0.51	0.51	0.07	0.07
04-Dec-80	Thu	5-Dec-80	Fri	13.00	1.00	2	0.46	Mar-81	0.40	-0.10	0.30	0.40	0.40	0.07	0.07
04-May-81	Mon	5-May-81	Tue	14.00	1.00	2	0.64	Jun-81	0.66	0.00	0.66	0.66	0.66	0.11	0.11
19-Jul-82	Mon	20-Jul-82	Tue	11.50	-0.50	2	-0.28	Sep-82	-0.29	0.06	-0.23	-0.29	0.58	-0.10	0.20
30-Jul-82	Fri	2-Aug-82	Mon	11.00	-0.50	2	-0.70	Sep-82	-0.64	0.00	-0.64	-0.64	1.28	-0.17	0.34
13-Aug-82	Fri	16-Aug-82	Mon	10.50	-0.50	2	-0.47	Sep-82	-0.29	-0.14	-0.43	-0.29	0.58	-0.12	0.24
19-Nov-82	Fri	22-Nov-82	Mon	9.00	-0.50	2	-0.06	Dec-82	-0.08	0.09	0.01	-0.08	0.16	-0.01	0.02
13-Dec-82	Mon	14-Dec-82	Tue	8.50	-0.50	3	-0.41	Mar-83	-0.37	-0.06	-0.43	-0.37	0.74	-0.27	0.54
21-Nov-84	Wed	23-Nov-84	Fri	8.50	-0.50	3	-0.12	Dec-84	-0.06	-0.01	-0.07	-0.06	0.12	-0.07	0.14
21-Dec-84	Fri	24-Dec-84	Mon	8.00	-0.50	2	-0.03	Mar-85	-0.04	-0.03	-0.07	-0.04	0.08	-0.02	0.03
17-May-85	Fri	20-May-85	Mon	7.50	-0.50	2	-0.17	Jun-85	-0.21	-0.01	-0.22	-0.21	0.42	-0.21	0.42

November 1, 1978 announcement of a package of Fed-Treasury actions to support the dollar, (2) the October 6, 1979 announcement of the change to a "reserve-oriented" operating procedure, and (3) the October 9, 1982 announcement of the deemphasis of M1.

As shown in Table 4, following all nineteen type 2 and type 3 discount rate announcements over the 1976-85 period for which the IMM data are available, the futures bill rate moved in the same direction as the discount rate. Also, following six of the seven type 2 and 3 announcements over the 1973-75 period the six-month spot bill rate moved in the same direction as the discount rate; the spot bill rate was unchanged following the other announcement.

The spot bill rate moved in the same direction as the discount rate following all six type 1 announcements in the 1973-75 period and the magnitude of the movement in this period was similar to that following type 2 and 3 announcements. (On average, in this period the bill rate moved .36 times the change in the discount rate accompanied by type 1 announcements and .43 times the change in the discount rate accompanied by type 2 and 3 announcements.) In the 1976-85 period the bill futures rate often moved in the opposite direction from the discount rate following type 1 announcements and in most cases the movement in the rate was small compared to the typical movement following type 2 and 3 announcements and the earlier type 1 announcements.

Estimates for equation 2 are shown in Table 5. The first four regressions are for type 2 and 3 announcements over different time periods. The first period--1976 through 1985--includes only those observations for which we have futures rate data. The second covers the whole 1973-85 period. The third and fourth regressions are for pre- and post-October 1979. The

TABLE 5

$$\Delta RTB_t = c1 + c2*\Delta RDIS_t + u_t$$

Sample	Constant	Change in Discount Rate	SER	$\bar{R}^2$
type 2 and 3 announcements (number of observations)				
1. 1976-85 (19)	-.03 (0.64)	.45 (7.23)	.17	.74
2. 1973-85 (26)	-.01 (0.24)	.43 (8.06)	.16	.72
3. pre-October 1979 (13)	.03 (0.76)	.31 (3.71)	.12	.51
4. post-October 1979 (13)	-.01 (0.26)	.47 (6.10)	.20	.75
type 1 announcements (number of observations)				
5. 1973-75 (6)	.01 (0.22)	.25 (2.62)	.09	.54
6. 1976-85 (14)	-.03 (0.63)	0.10 (1.28)	.18	.05

Note: t-statistics in parentheses.

coefficient of the discount rate change is positive and significant at the 1% level in all these regressions. We conclude that there was a strong announcement effect on bill rates following type 2 and type 3 discount rate announcements throughout the 1973-1985 period. This conclusion differs from that of Roley and Troll [1984] and Smirlock and Yawitz [1985] who found virtually no evidence of announcement effects prior to October 1979.[8] (These papers are discussed below.)

The coefficient of the discount rate change for the 1973-1975 type 1 observations is .25 and significant at the 5% level. The coefficient for the 1976-85 observations is not significant. We conclude that there was an announcement effect following type 1 announcements in the 1973-1975 period but no announcement effect following type 1 announcements in the 1976-85 period. Of course, we can not rule out the possibility that there may have been some individual type 1 announcements that affected bill rates in this period.

Our interpretation of the behavior of the funds rate and the bill rate following discount rate announcements is straightforward. Throughout the period covered by this paper the Federal Reserve systematically used type 2 and type 3 discount rate announcements to signal persistent movements in the funds rate. In the earlier years, 1973-75, the Fed also used type 1 announcements in a similar way. Market participants understood these signals and used them to revise their expectations of the future path of the Federal funds rate. Consequently, these announcements had an effect on bill rates.

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[8] Baker and Meyer [1980], however, did find evidence of an impact of discount rate changes on Treasury bill rates in the period before October 1979.

Conversely, in the 1976-85 period type 1 announcements carried no reliable signal about the subsequent movement in the funds rate and, for this reason, had no announcement effect.[9]

That the bill rate moved in the same direction as the discount rate following all but one of the discount rate announcements signaling changes in the funds rate indicates that these funds rate changes were virtually never fully anticipated over the 1973-85 period. It seems likely to us that this reflects uncertainty about the timing of interest rate movements in a regime in which the monetary authority is using the funds rate as its policy instrument and is changing its funds rate target discontinuously in reaction to new information. For example, market participants may believe that the Fed is going to put upward pressure on the funds rate in coming weeks. However, they do not know when this will occur and attach only a small probability to it occurring in the next few days. In these circumstances, a discount rate announcement that signals a change in the funds rate provides new information by indicating that the change in the funds rate will occur quickly, which causes a movement in the bill rate.

IV. ANNOUNCEMENT EFFECTS: TREASURY BOND RATES

We measure the response of Treasury bond rates to discount rate announcements using Chicago Board of Trade data for 20-year Treasury bond futures contracts. The dates of the contracts and the intervals over which

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[9]This interpretation raises the question of how market participants learned the change in Fed behavior following type 1 announcements. As shown in Table 4, the bill rate did move with the discount rate following the first three post-1975 type 1 announcements, even though in two of these cases the funds rate in the subsequent two weeks did not move in the same direction as the discount rate. It seems plausible that market perceptions of the information content of type 1 announcements were altered by the failure of the funds rate to follow the discount rate in these cases.

we measure rate changes are the same as those for the bill futures rates.[10] The movement of the bond futures rate following discount rate announcements is shown in Table 4. The Treasury bond futures data is available only since the beginning of 1977. For the earlier years we use 3:30 to 3:30 p.m. spot rate data for 20-year Treasury bonds. As with the bill rate, we exclude the discount rate announcements of November 1, 1978, October 6, 1979, and October 8, 1982.

As shown in Table 4, following type 2 and 3 announcements prior to October 1979 the bond rate moved in the opposite direction from the discount rate 4 out of 13 times. After October 1979, however, the bond rate always moved with the discount rate and in a number of cases the movements were quite large. Movements in the bond rate following discount rate changes accompanied by type 1 announcements were generally small throughout the 1973-85 period and were frequently in the opposite direction from the discount rate change.

Table 6 reports announcement effect regression results with the change in the Treasury bond rate (R20) as the dependent variable:

3. $\Delta R20_t = d1 + d2*\Delta RDIS_t + u_t$

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[10] The bond futures data was collected from the Wall Street Journal. The Journal prints open and settle prices but only settle yields. We calculated the settle-to-open (or open-to-settle) change in yields by assuming that the proportion of the daily change in yields occurring in the settle-to-open interval was the same as the proportion of the daily change in prices occurring in the settle-to-open interval. Specifically, for a late afternoon discount rate change the settle-to-open yield was calculated by $(R_{s,t}-R_{s,t-1}) * [(P_{o,t}-P_{s,t-1})/(P_{s,t}-P_{s,t-1})]$ where R, P, o, and s refer to yield, price, open and settle, t-1 is the day of the discount rate announcement and t is the following day. These data are reported in Appendix D.

TABLE 6

$$\Delta R20_t = d1 + d2\Delta RDIS_t + u_t$$

Sample	Constant	Change in Discount Rate	SER	$\bar{R}^2$
type 2 and 3 announcements number of observations)				
1. 1977-85 (19)	-.05 (2.81)	.15 (5.41)	.07	.61
2. 1973-85 (26)	-.04 (2.61)	.13 (5.60)	.07	.55
3. pre-October 1979 (13)	-.01 (0.53)	.04 (1.07)	.06	.01
4. post-October 1979 (13)	-.04 (2.01)	.16 (5.26)	.08	.69
type 1 announcements (number of observations)				
5. 1973-75 (6)	-.01 (0.97)	.04 (1.86)	.02	.33
6. 1976-85 (14)	-.02 (0.79)	.06 (1.83)	.08	.15

Note: t-statistics in parenthesis.

The first set of regressions are for type 2 and 3 announcements. The first regression covers the period for which we have futures rate data from 1977 through 1985. The second covers the whole 1973-85 period. Both regressions show a strong announcement effect. The third and fourth regressions split the data into pre- and post-October 1979. In the early period the coefficient of the change in the discount rate is small and not significant. In the latter period the coefficient is .16 and significant at the 1% level. The last two regressions in Table 6 are for discount rate changes accompanied by type 1 announcements over 1973-1975 and 1976-85. In both periods the coefficient is positive but small. The coefficient is just significant at the 10 percent level in the latter period and not significant at the 10 percent level in the earlier period.

Our interpretation of these results is that after October 1979 the reaction of the 20-year rate to new information about the Federal funds rate jumped sharply. While we have no explanation for why this occurred, this interpretation is consistent with two other sets of empirical results. After October 1979 long-term rates reacted more substantially to Federal Reserve open market operations providing new information about the funds rate, both absolutely and relative to the reaction of short-term rates. Similarly, after October 1979 long-term rates reacted more substantially to money announcements, both absolutely and relative to the reaction of short-term rates.[11]

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[11] The increased reaction after October 1979 of long-term rates to money announcements and to open market operations providing new information about the funds rate is shown in Cook and Hahn [1986a, 1986b]. In the post-October 1979 period the ratio of the coefficients of the discount rate change in the bond and bill rate regressions for type 2 and 3 announcements is .34. This is similar to the ratio of the coefficients of unanticipated money in bond and bill rate regressions reported in the money announcement literature for the post-October 1979 period.

V. ANNOUNCEMENT EFFECTS AND FEDERAL RESERVE OPERATING PROCEDURES

Two recent papers by Roley and Troll [1984] and Smirlock and Yawitz [1985] have argued that the presence of discount rate announcement effects should depend on the operating procedures in use by the Federal Reserve. Roley and Troll estimated announcement effect regressions over the periods from September 27, 1977 to October 5, 1979 and from October 8, 1979 to October 15, 1982. They found that before October 1979 market yields did not change significantly in response to discount rate announcements while after October 1979 interest rates across the maturity spectrum responded to such announcements. Smirlock and Yawitz estimated announcement effect regressions from the beginning of 1975 to October 1979 and from October 1979 to the end of 1982. They classified discount rate changes according to whether they were "technical" or "nontechnical" (1) by using a statistical model relating changes in the discount rate to past levels of borrowing and the spread between the funds rate and the discount rate and (2) on the basis of the language contained in the announcements. Both methods led to a similar classification. They concluded that prior to October 1979 neither category had an effect on interest rates or stock prices, while after October 1979 only nontechnical announcements had an effect.[12]

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[12] Smirlock and Yawitz's classification by language is very similar to the one used in this paper, which raises the question of why they found no announcement effect prior to October 1979 while we found a strong one. Our speculation is that the difference in results may reflect a difference in data measurement affecting a number of their observations in the pre-October 1979 period. Smirlock and Yawitz measure the announcement effect as the change in market rates on the "announcement day" which is defined as "the day the discount rate change is reported in the Wall Street Journal." [1985, p. 1144] For those announcements that occurred in the morning--five of which were in 1978 and 1979--the appropriate day to measure the announcement effect would be the day before the discount rate change was reported in the Journal.

Roley and Troll argue that under the "Federal funds rate" operating procedure used prior to October 1979, discount rate changes would not be expected to affect market interest rates because "they are not needed to change the level of the federal funds rate" [1984, p.33]. Along the same lines Smirlock and Yawitz argue that in the pre-October 1979 regime announcement effects would not be expected because "regardless of classification, a discount rate change is not required, and will not by itself change the level of market interest rates." [1985,p.1152] In our opinion these statements are misleading. The relevant point is not whether a discount rate change is "needed" or "required", but whether market participants are able to get any new information from the announcement about the subsequent actions of the Federal Reserve. There is no reason to rule out a priori the possibility of announcement effects in the pre-October 1979 period.

A related question is the interpretation of announcement effects in the October 1979 to October 1982 period. Roley and Troll, among others, have described the operating procedure in this period as "nonborrowed reserves targeting." According to these descriptions the Federal Reserve set a target for nonborrowed reserves that would remain fixed for a period of time, such as the interval between FOMC meetings. Under the prevailing system of lagged reserve requirements, the selection of a target for nonborrowed reserves for a given reserve maintenance week would imply a particular level of borrowed reserves in that week. Because the demand for borrowed reserves depends on the spread between the funds rate and the discount rate, the choice of the nonborrowed reserves target would also determine the spread between the funds rate and the discount rate in the current week. Therefore, with a fixed nonborrowed reserves target a change in the discount rate would

cause a roughly equal change in the funds rate. Hence, as Roley and Troll [1984, p. 33-34] point out, "Under a nonborrowed reserves operating procedure, a discount rate change would be expected to affect interest rates without any further overt policy actions."

Under such a nonborrowed reserves procedure the reaction of market rates to a discount rate announcement might reflect the market's belief in the Fed's commitment to pursue a nonborrowed reserves policy. The movement in rates would still be an announcement effect, but the interpretation of this effect would be narrower than for the rest of the period. Under a nonborrowed reserves procedure, however, type 1 announcements would be ruled out since the funds rate necessarily has to change with the discount rate. Yet, as shown in Table 2, six out of the fifteen announcements in this period were type 1 announcements and the funds rate did not as a rule move with the discount rate following these announcements. The use of type 1 announcements is evidence against the view that the Fed was using a nonborrowed reserves operating procedure throughout the 1979-82 period.

An alternative view is that the Fed was following a nonborrowed reserves procedure in this period only when the funds rate was above the discount rate. This generally encompassed only those announcements indicating a higher discount rate. As indicated in Table 2, all six increases in the discount rate in this period were accompanied by type 2 and 3 announcements. In these six cases the reaction of the bill rate may have reflected a belief among market participants that the Fed was committed to keeping the level of nonborrowed reserves fixed for some period of time, or it may have simply reflected the more general view that the announcement signaled the Fed's intention to move the funds rate. It is impossible to say.

VII. CONCLUSIONS

Over the 1973-1985 period covered by this paper the Federal Reserve used three types of discount rate announcements. Types 2 and 3, and type 1 in the 1973-75 period, systematically signaled subsequent changes in the Federal funds rate. With one exception, treasury bill rates always moved in the same direction as the discount rate change accompanying these announcements. In contrast, type 1 announcements after 1975 contained no signal for the funds rate and had no announcement effect. Our interpretation of these results is that market participants understood the signals contained in discount rate announcements and used them to revise their expectations of the future path of the funds rate. These revisions in funds rate expectations caused movements in the bill rate.

Prior to October 1979, the reaction of Treasury bond rates to discount rate announcements signaling changes in the funds rate was weak. After October 1979 bond rates reacted strongly to these announcements. We have no explanation for this phenomenon. However, the increased reaction after October 1979 of long-term interest rates to new information affecting the expected path of the funds rate also shows up in the reaction of long-term rates to open market operations and to money announcements.

The framework in this paper of how policy is carried out and what causes announcement effects conforms to the popular view among money market participants and Fed-watchers on these subjects. According to this view, the Fed reacts discontinuously to new information affecting its funds rate target. Once changes in the target are made, they are likely to persist for months. Further, the Fed periodically makes announcements (or takes actions in the money market) that signal changes in the funds rate target. Some of

these announcements accompany discount rate changes; others are made at regularly scheduled public hearings or on an ad hoc basis. Changes in expectations of the future behavior of the funds rate caused by Fed announcments and actions influence the yields of longer term money market instruments. A complete understanding of Federal Reserve policy and its effect on economic activity would take into account each of these aspects of policy.

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APPENDIX A
CLASSIFICATION OF DISCOUNT RATE ANNOUNCEMENTS

Date of Announcement	Change in Rate	Type 1	Type 2	Type 3
Friday, January 12, 1973	4 1/2 to 5	This move is designed to bring the discount rate into better alignment with short-term market interest rates, which have risen substantially over recent months. The widened gap between the discount rate and other sources of bank funds has contributed to a sharply increased level of borrowing by banks from the Federal Reserve in recent weeks. The present increase of the discount rate is merely a passive adjustment to what has already happened to market interest rates and it, therefore, should not be the occasion for a further increase in interest rates.		
Friday, February 23, 1973	5 to 5 1/2		This action was taken in recognition of the recent rise in short-term open market interest rates which is an out-growth of strong credit demands generated by continued rapid economic expansion. In this situation and in view of recent developments in the foreign exchange markets, the Board concluded that an increase in the discount rate--to bring it into closer alignment with short-term rates generally--was called for in furtherance of the objectives of economic stabilization.	
Friday, April 20, 1973	5 1/2 to 5 3/4	In announcing the action, the Board took note of developments in the money markets that have occurred since the discount rate was raised to 5 1/2 per cent, effective on February 26.		
Thursday, May 11, 1973	5 3/4 to 6	The action was in recognition of increases that have already taken place in other short-term interest rates and is intended to bring the discount rate into better alignment with short-term rates generally.		
Friday, June 8, 1973	6 to 6 1/2		The action was taken in recognition of increases that have already occured in other short-term interest rates, the recent growth in money and bank credit, and the continuing rise in the general price level.	
Friday, June 29, 1973	6 1/2 to 7			The Board of Governors of the Federal Reserve System today took two actions designed to restrain continuing excessive expansion in money and credit.

Date of Announcement	Change in Rate	Type 1	Type 2	Type 3
Monday, August 13, 1973	7 to 7 1/2	The action was taken in recognition of increases that have already occurred in other short-term interest rates and is intended to bring the discount rate--which is the rate charged member banks for borrowings from their district Federal Reserve Banks--into better alignment with short-term rates generally.		
Wednesday, April 24, 1974	7 1/2 to 8		The action was taken in the light of a recent rapid rise in money and bank credit and in recognition of increases that have already occurred in other short-term interest rates. The problem of inflation continues to be a serious concern to the Board.	
Friday, December 6, 1974	8 to 7 3/4		The action was taken in view of the recent slackening in the demand for credit and in recognition of the lower leve of market interest rates that has developed since last summer.	
Friday, January 3, 1975	7 3/4 to 7 1/4			The action was taken in view of the weakening in economic activity.
Tuesday, February 4, 1975	7 1/4 to 6 3/4	The action was taken in recognition of the reductions that have occurred over recent weeks in other short-term rates.		
Friday, March 7, 1975	6 3/4 to 6 1/4		The action was taken in view of the weakness in economic activity, the recent evidence of moderation in the rate of inflation, and also to bring the discount rate into better alignment with other short-term interest rates.	
Thursday, May 15, 1975	6 1/4 to 6	The action was taken in recognition of declines that have occurred recently in other short-term interest rates and is intended to bring the discount rate into better alignment with short-term rates generally.		
Friday, January 16, 1976	6 to 5 1/2	The action is intended to bring the discount rate into better alignment with other short term interest rates which have recently declined.		
Friday, November 19, 1976	5 1/2 to 5 1/4	This action will bring the discount rate into better with short-term market interest rates generally.		
Monday, August 29, 1977	5 1/2 to 5 3/4	Action was taken to reduce the incentive for member banks to borrow from the Federal Reserve. Such borrowing has increased rapidly in recent weeks.		

Date of Announcement	Change in Rate	Type 1	Type 2	Type 3
		The Board stated that this action is intended as a technical move for the purpose of bringing the discount rate into better alignment with other short-term interest rates, and it has no monetary policy implications.		
Tuesday, October 25, 1977	5 3/4 to 6	Today's action was taken in recognition of increases that occurred recently in other short-term interest rates and will bring the discount rate into closer alignment with short-term rates generally. The increase will also reduce the incentive for member banks to borrow from the Federal Reserve.		
Friday, January 6, 1978	6 to 6 1/2			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. 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.
Thursday, May 11, 1978	6 1/2 to 7	Action was taken in recognition of increases that have already occurred in other short-term interest rates and will bring the discount rate into closer alignment with short-term rates generally.		
Friday, June 30, 1978	7 to 7 1/4	Action was taken in recognition of increases that have occurred recently in other short-term interest rates and to bring the discount rate into closer alignment with short-term rates generally.		
Friday, August 18, 1978	7 1/4 to 7 3/4			Action was taken in view of recent disorderly conditions in foreign exchange markets as well as the continuing serious domestic inflationary problem.
Friday, September 22, 1978	7 3/4 to 8		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.	

Date of Announcement	Change in Rate	Type 1	Type 2	Type 3
Friday, October 13, 1978	8 to 8 1/2		The action was taken to bring the discount rate into closer alignment with increased short-term market interest rates, and in recognition of continued high inflation, the recent rapid rate of monetary expansion and current international financial conditions.	
Wednesday, November 1, 1978	8 1/2 to 9 1/2			The Treasury Department and the Federal Reserve today announced measures to strengthen the dollar and thereby counter continuing domestic inflationary pressures.
Friday, July 20, 1979	9 1/2 to 10		Action was taken as a further step to strengthen the dollar on the foreign exchange markets, and in view of the recent rapid rate of expansion in the monetary aggregates, and to bring the discount rate into alignment with short-term interest rates generally.	
Thursday, August 16, 1979	10 to 10 1/2			Action was taken against the background of the continuing strong inflationary forces that are evident in the economy and in recognition of the relatively rapid rate of expansion in the monetary aggregates.
Tuesday, September 18, 1979	10 1/2 to 11	Action was taken against the background of recent increases in other short-term interest rates, to bring the discount rate into closer alignment with short-term rates generally, and to discourage excessive borrowing by member banks at the discount window.		
Saturday, October 6, 1979	11 to 12			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.

Date of Announcement	Change in Rate	Type 1	Type 2	Type 3
Friday, February 15, 1980	12 to 13			The Board has been particularly concerned that recent economic developments, including the large increase in theprice 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.
Wednesday, May 28, 1980	13 to 12	The action was taken entirely in reflection of recent substantial declines in short-term market interest rates to levels well below the existing discount rate.		
Thursday, June 12, 1980	12 to 11	The action was taken entirely in reflection of recent further declines in short-term market interest rates to levels well below the existing discount rate.		
Friday, July 25, 1980	11 to 10	The action is a purely technical adjustment to bring the discount rate into alignment with the level of short-term market interest rates and bank lending rates.		
Thursday, September 25, 1980	10 to 11		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.	
Friday, November 14, 1980	11 to 12		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.	
Thursday, December 4, 1980	12 to 13		In light of the current level of market rates and consistent existing policy to restrain excessive growth in money and credit, the Federal Reserve Board today announced an increase in the basic discount rate.	

Date of Announcement	Change in Rate	Type 1	Type 2	Type 3
Monday, May 4, 1981	13 to 14		These actions, which are effective Tuesday, May 5, were taken in light of the current levels in short-term market interest rates and the need to maintain restraint in the monetary and credit aggregates.	
Friday, October 30, 1981	14 to 13	This action was taken against the background of recent declines in short-term interest rtes and the reduced level of adjustment borrowing at the discount window. It is consistent with a pattern of continued restraint on growth of money and credit.*		
Thursday, December 3, 1981	13 to 12	The action was taken to bring the discount rate into better alignment with short-term rates that have been prevailing recently in the market.		
Monday, July 19, 1982	12 to 11 1/2		The action was taken in the context of recent declines short-term market rates and the relatively restrained growth of money and credit in recent months.	
Friday, July 30, 1982	11 1/2 to 11		In light of market interest rates and relatively restrained money and credit growth, the Federal Reserve Board today approved a reduction in the basic discount rate.	
Friday, August 13, 1982	11 to 10 1/2		As in other recent changes, the action was taken against the background of moderate growth in money, some indication of reduced credit demands at banks, and declines in market interest rates.	
Thursday, August 26, 1982	10 1/2 to 10	The action was taken to bring the discount rate into better alignment with short-term market interest rates.		
Friday, October 8, 1982	10 to 9 1/2	The change is designed to maintain an appropriate alignment with short-term market rates.		

*This is classified as a type 1 announcement because the last sentence, if anything, is as an assurance that the funds rate will not be lowered.

Date of Announcement	Change in Rate	Type 1	Type 2	Type 3
Friday, November 19, 1982	9 1/2 to 9		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.	
Monday, December 13, 1982	9 to 8 1/2			The further half-point reduction in the discount rate was taken in the light of curr business conditions, strong competitive pressures on price and further moderation of cost increases, a slowing of privat credit demands, and present indications of some tapering off in growth of the broader monetary aggregates.
Friday, April 6, 1984	8 1/2 to 9	The change--the first since late 1982--was undertaken in the light of the relatively wide spread that has developed in recent weeks between short-term market rates and the discount rate.		
Wednesday, November 21, 1984	9 to 8 1/2			The reduction was taken agains the background of growth in M1 and M2 in the lower part of th 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.
Friday, December 21, 1984	8 1/2 to 8		The action is designed to 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.	
Friday, May 17, 1985	8 to 7 1/2		The action was taken against the background of relatively unchanged output for some time in the industrial sector of the economy, stemming heavily from rising imports and a strong dollar. Price pressures, while clearly a con-	

Date of Announcement	Change in Rate	Type 1	Type 2	Type 3
			tinuing 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. In this setting, a reduction in the discount rate consistent with the declining trend in market interest rates over recent weeks appears appropriate.	

APPENDIX B

FUNDS RATE MOVEMENTS SURROUNDING DISCOUNT RATE ANNOUNCEMENTS

Discount Rate Announcements						Daily Rates																					wkly. averages*		
Date	Day	Following Market close	Day	Discount Rate Announced	Type	r-7	r-6	r-5	r-4	r-3	r-2	RFF-1	RFF1	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13	r14	Week Before	Week After	Two Weeks After
12-Jan-73	Fri	15-Jan-73	Mon	5.00	1	5.63	5.50	5.50	5.75	5.75	5.75	5.75	5.88	6.50	5.63	5.75	6.00	6.00	6.00	6.00	6.25	6.19	6.31	6.38	6.38	6.38	5.69	6.02	6.28
23-Feb-73	Fri	26-Feb-73	Mon	5.50	2	7.25	6.25	5.25	6.38	6.38	6.38	6.38	6.75	7.50	7.50	7.00	7.38	7.38	7.38	7.00	6.75	6.25	7.00	7.13	7.13	7.13	6.50	7.23	7.02
20-Apr-73	Fri	23-Apr-73	Mon	5.75	1	7.13	7.75	8.25	7.38	7.00	7.00	7.00	6.88	7.25	7.50	7.38	7.38	7.38	7.38	7.63	7.88	7.00	7.44	7.63	7.63	7.63	7.21	7.28	7.64
10-May-73	Thu	11-May-73	Fri	6.00	1	7.63	7.63	7.63	7.88	7.75	7.25	7.69	7.88	7.88	7.88	7.75	7.63	8.00	8.13	8.00	8.00	8.00	7.88	8.19	8.25	8.13	7.70	7.86	8.03
08-Jun-73	Fri	11-Jun-73	Mon	6.50	2	8.63	8.69	8.25	8.50	8.25	8.25	8.25	8.44	8.25	7.25	8.38	8.50	8.50	8.50	8.69	8.69	8.63	8.69	8.56	8.56	8.56	8.43	8.43	8.63
29-Jun-73	Fri	02-Jul-73	Mon	7.00	3	8.50	8.75	8.50	8.88	8.88	8.88	8.88	10.00	13.00	13.00	9.75	9.63	9.63	9.63	9.75	9.50	8.75	9.75	9.69	9.69	9.69	8.80	9.73	9.68
13-Aug-73	Mon	14-Aug-73	Tue	7.50	1	10.13	9.05	10.50	10.52	10.52	10.52	10.54	10.39	9.73	10.49	10.44	10.44	10.44	10.58	10.74	10.48	10.79	10.84	10.84	10.84	10.77	10.46	10.46	10.80
24-Apr-74	Wed	25-Apr-74	Thu	8.00	2	10.68	10.81	10.81	10.81	11.00	11.08	10.30	11.25	11.36	11.36	11.36	11.29	11.00	10.57	11.28	11.53	11.53	11.53	11.47	11.28	10.41	10.87	11.27	11.44
06-Dec-74	Fri	09-Dec-74	Mon	7.75	2	9.41	8.89	6.88	8.89	8.87	8.87	8.87	8.90	8.95	8.70	8.72	8.75	8.75	8.75	8.77	8.53	8.78	8.57	8.64	8.64	8.64	8.97	8.80	8.63
03-Jan-75	Fri	06-Jan-75	Mon	7.25	3	8.57	3.87	3.87	8.55	8.37	8.37	8.37	7.85	7.30	5.12	7.27	7.24	7.24	7.24	7.28	7.09	7.19	6.96	6.95	6.95	6.95	8.45	7.36	7.03
04-Feb-75	Tue	05-Feb-75	Wed	6.75	1	6.60	6.81	6.76	6.76	6.76	6.73	6.58	4.84	6.21	6.17	6.17	6.17	6.38	6.48	6.36	6.33	6.29	6.29	6.29	6.29	6.22	6.73	6.26	6.29
07-Mar-75	Fri	10-Mar-75	Mon	6.25	2	6.06	5.91	5.00	5.70	5.78	5.78	5.78	5.68	5.41	3.96	5.49	5.44	5.44	5.44	5.50	5.43	4.95	5.46	5.52	5.52	5.52	5.84	5.48	5.49
15-May-75	Thu	16-May-75	Fri	6.00	1	5.24	5.24	5.24	5.25	5.12	4.95	5.09	5.10	5.10	5.10	5.13	5.03	5.36	5.05	5.07	5.07	5.07	5.07	5.11	5.54	5.16	5.20	5.09	5.09
16-Jan-76	Fri	19-Jan-76	Mon	5.50	1	4.74	4.78	4.78	4.81	4.82	4.82	4.82	4.79	4.76	4.83	4.77	4.72	4.72	4.72	4.77	4.79	5.12	4.82	4.84	4.84	4.84	4.80	4.76	4.86
19-Nov-76	Fri	22-Nov-76	Mon	5.25	1	5.09	4.99	4.87	4.95	4.90	4.90	4.90	4.84	4.85	4.97	4.97	4.80	4.80	4.80	4.71	4.69	4.67	4.68	4.63	4.63	4.63	4.94	4.86	4.66
29-Aug-77	Mon	30-Aug-77	Tue	5.75	1	5.99	5.99	6.01	6.00	6.00	6.00	6.05	6.04	6.03	6.06	6.02	6.02	6.02	6.02	6.00	5.62	6.01	6.02	6.02	6.02	6.18	6.01	6.03	5.98
25-Oct-77	Tue	26-Oct-77	Wed	6.00	1	6.59	6.51	6.44	6.44	6.44	6.47	6.50	6.61	6.57	6.49	6.49	6.49	6.60	6.65	6.22	6.62	6.58	6.58	6.58	6.62	6.58	6.48	6.56	6.54
06-Jan-78	Fri	09-Jan-78	Mon	6.50	3	6.53	7.05	6.68	6.56	6.50	6.50	6.50	6.67	6.65	6.69	6.76	6.78	6.78	6.78	6.93	6.77	6.68	6.76	6.64	6.64	6.64	6.62	6.73	6.72
11-May-78	Thu	11-May-78	Thu	7.00	1	7.27	7.29	7.29	7.29	7.38	7.41	7.33	7.37	7.37	7.37	7.37	7.41	7.25	7.27	7.32	7.44	7.44	7.44	7.51	7.49	7.36	7.32	7.34	7.43
30-Jun-78	Fri	03-Jul-78	Mon	7.25	1	7.78	7.78	8.07	8.03	8.01	8.01	8.01	7.64	7.64	6.70	7.72	7.70	7.70	7.70	7.78	7.74	7.71	7.75	7.77	7.77	7.77	7.96	7.54	7.76
18-Aug-78	Fri	18-Aug-78	Fri	7.75	3	7.84	7.84	7.84	7.92	7.90	7.93	7.99	8.04	8.04	8.04	8.24	8.24	8.38	8.20	8.20	8.20	8.20	8.31	8.37	8.45	8.40	7.89	8.17	8.30
22-Sep-78	Fri	22-Sep-78	Fri	8.00	2	8.35	8.35	8.35	8.39	8.34	8.38	8.49	8.50	8.50	8.50	8.73	8.92	8.68	8.81	8.90	8.90	8.90	8.96	8.83	8.68	8.75	8.38	8.66	8.85
13-Oct-78	Fri	16-Oct-78	Mon	8.50	2	8.71	9.06	8.30	8.81	8.73	8.73	8.73	8.84	8.76	8.86	8.95	9.07	9.07	9.07	9.30	9.65	9.55	9.15	9.15	9.15	9.15	8.72	8.95	9.30
01-Nov-78	Wed	01-Nov-78	Wed	9.50	3	9.55	9.15	9.15	9.15	9.15	9.23	9.35	9.87	9.89	9.94	9.94	9.94	9.88	9.34	9.43	9.75	9.67	9.67	9.67	9.80	9.76	9.25	9.83	9.68
20-Jul-79	Fri	20-Jul-79	Fri	10.00	2	10.32	10.32	10.32	10.44	10.36	10.37	10.41	10.61	10.61	10.61	10.97	10.76	10.45	10.60	10.70	10.70	10.70	10.96	10.81	10.75	10.70	10.36	10.66	10.76
16-Aug-79	Thu	17-Aug-79	Fri	10.50	3	10.74	10.74	10.74	10.93	10.80	10.97	11.08	11.05	11.05	11.05	11.12	10.99	10.91	11.01	11.19	11.19	11.19	11.47	11.43	10.66	11.32	10.86	11.03	11.21
18-Sep-79	Tue	19-Sep-79	Wed	11.00	1	11.35	11.37	11.36	11.36	11.36	11.51	11.53	11.11	11.54	11.60	11.60	11.60	11.74	11.59	11.63	11.80	12.16	12.16	12.16	12.06	11.80	11.41	11.54	11.97
06-Oct-79	Sat	09-Oct-79	Tue	12.00	3	11.80	11.22	11.67	11.61	11.61	11.61	11.61	13.86	12.04	13.20	12.97	12.97	12.97	13.65	13.31	13.44	13.64	15.07	15.07	15.07	17.60	11.59	13.09	14.74
15-Feb-80	Fri	15-Feb-80	Fri	13.00	3	13.33	13.33	13.33	13.97	14.02	14.58	14.30	14.67	14.67	14.67	14.67	16.69	14.44	15.01	14.46	14.46	14.46	14.03	14.16	15.76	15.18	13.84	14.97	14.64
28-May-80	Wed	29-May-80	Thu	12.00	1	9.51	8.73	8.73	8.73	8.73	9.55	12.23	10.49	11.06	11.06	11.06	11.26	11.05	9.22	10.07	10.39	10.39	10.39	9.60	8.44	8.48	9.46	10.74	9.68
12-Jun-80	Thu	13-Jun-80	Fri	11.00	1	10.39	10.39	10.39	9.60	8.44	8.48	8.64	8.60	8.60	8.60	9.68	9.53	9.28	9.48	9.43	9.43	9.43	9.29	8.62	7.90	9.05	9.48	9.11	9.02
25-Jul-80	Fri	28-Jul-80	Mon	10.00	1	8.63	8.39	8.86	8.57	8.76	8.76	8.76	9.10	9.31	9.57	9.93	10.48	10.48	10.48	10.04	8.16	7.65	8.86	9.05	9.05	9.05	8.68	9.91	8.84
25-Sep-80	Thu	26-Sep-80	Fri	11.00	2	10.75	10.75	10.75	10.94	11.01	10.92	11.26	11.95	11.95	11.95	13.34	13.19	13.05	13.45	13.31	13.31	13.31	11.90	11.70	11.14	12.45	10.91	12.70	12.45
14-Nov-80	Fri	17-Nov-80	Mon	12.00	2	14.57	14.57	13.01	14.00	14.23	14.23	14.23	16.22	17.19	16.41	17.01	17.63	17.63	17.63	17.11	16.69	18.33	18.33	18.56	18.56	18.56	14.12	17.10	18.02
04-Dec-80	Thu	05-Dec-80	Fri	13.00	2	18.56	18.56	18.56	17.71	16.75	15.58	18.11	19.32	19.32	19.32	18.80	18.37	18.52	20.14	19.44	19.44	19.44	19.62	20.45	20.27	20.74	17.69	19.11	19.91
04-May-81	Mon	05-May-81	Tue	14.00	2	17.12	19.02	18.92	19.79	19.79	19.79	18.67	18.39	17.02	18.41	18.14	18.14	18.14	18.28	18.08	18.26	18.83	18.49	18.49	18.49	18.52	19.01	18.07	18.45
30-Oct-81	Fri	02-Nov-81	Mon	13.00	1	14.69	14.60	14.31	14.48	14.44	14.44	14.44	15.06	15.15	15.50	14.60	13.79	13.79	13.79	13.51	14.29	14.29	13.56	13.08	13.08	13.08	14.49	14.53	13.56
03-Dec-81	Thu	04-Dec-81	Fri	12.00	1	12.25	12.25	12.25	12.44	13.03	12.43	12.65	11.83	11.83	11.83	11.89	11.95	12.27	12.30	12.22	12.22	12.22	12.28	12.25	12.35	12.38	12.47	11.99	12.27
19-Jul-82	Mon	20-Jul-82	Tue	11.50	2	13.25	12.89	13.07	12.64	12.64	12.64	12.09	11.22	10.71	11.04	10.65	10.65	10.65	10.84	11.28	12.01	11.71	11.41	11.41	11.41	10.83	12.74	10.82	11.44
30-Jul-82	Fri	02-Aug-82	Mon	11.00	2	10.84	11.28	12.01	11.71	11.41	11.41	11.41	10.83	10.61	10.68	10.76	10.82	10.82	10.82	11.07	10.99	11.00	10.88	10.38	10.38	10.38	11.44	10.76	10.73
13-Aug-82	Fri	16-Aug-82	Mon	10.50	2	11.07	10.99	11.00	10.88	10.38	10.38	10.38	9.91	9.74	9.13	9.10	8.75	8.75	8.75	9.01	9.03	9.91	9.36	9.91	9.91	9.91	10.73	9.16	9.58
26-Aug-82	Thu	27-Aug-82	Fri	10.00	1	8.75	8.75	8.75	9.01	9.03	9.91	9.36	9.91	9.91	9.91	10.06	10.63	11.28	10.55	10.25	10.25	10.25	10.25	9.74	9.68	9.99	9.08	10.32	10.06
09-Oct-82	Fri	12-Oct-82	Tue	9.50	1	10.27	9.45	9.82	9.63	9.63	9.63	9.63	9.20	9.69	9.57	9.43	9.43	9.43	9.59	9.42	9.81	9.49	9.42	9.42	9.42	9.55	9.72	9.48	9.50
19-Nov-82	Fri	22-Nov-82	Mon	9.00	2	9.82	9.56	9.42	9.50	9.06	9.06	9.06	8.79	8.54	8.36	8.36	8.54	8.54	8.54	8.83	8.93	9.10	9.09	8.93	8.93	8.93	9.35	8.52	8.96
13-Dec-82	Mon	14-Dec-82	Tue	8.50	3	8.51	8.70	8.84	8.83	8.83	8.83	8.99	8.55	9.13	8.99	8.79	8.79	8.79	8.60	8.39	8.50	8.62	8.58	8.58	8.58	8.70	8.79	8.81	8.56
06-Apr-84	Fri	09-Apr-84	Mon	9.00	1	10.42	10.75	10.90	10.74	10.37	10.37	10.37	10.32	9.49	9.25	10.34	10.24	10.24	10.24	10.50	10.45	10.61	10.73	9.77	9.77	9.77	10.56	10.02	10.23
21-Nov-84	Wed	23-Nov-84	Fri	8.50	3	9.54	9.54	9.54	9.45	9.28	9.32	9.32	8.97	8.97	8.97	9.03	8.96	8.78	8.63	8.92	8.92	8.92	9.27	8.80	8.35	8.93	9.43	8.90	8.87
21-Dec-84	Fri	24-Dec-84	Mon	8.00	2	7.83	6.93	7.98	8.29	8.06	8.06	8.06	7.53	7.53	8.12	8.51	8.62	8.62	8.62	8.74	8.74	9.37	8.77	8.18	8.18	8.18	7.89	8.22	8.59
17-May-85	Fri	20-May-85	Mon	7.50	2	8.16	8.02	8.17	8.24	8.00	8.00	8.00	7.75	7.65	7.76	7.80	7.46	7.46	7.46	7.46	7.71	7.87	7.71	7.64	7.64	7.64	8.08	7.62	7.67

*Weekly averages prior to 1976 exclude Wednesdays. In the cases when Wednesday was a holiday (July 4, 1973 and January 1, 1975) the weekly averages also exclude Tuesday, which in those cases was the reserve settlement day.

APPENDIX C

TREASURY BILL FUTURES PRICES AND YIELDS

Discount Rate Announcements							Futures Prices			Yields*			Change in Yields		
Date	Day	Following Market Close	Day	Discount Rate Announced	Type	Contract	Settle (-1)	Open	Settle	Settle (-1)	Open	Settle	Settle to Open	Open to Settle	Settle to Settle
16-Jan-76	Fri	19-Jan-76	Mon	5.50	1	Mar-76	94.87	94.93	94.96	5.27	5.21	5.18	-0.06	-0.03	-0.09
19-Nov-76	Fri	22-Nov-76	Mon	5.25	1	Dec-76	95.34	95.43	95.35	4.78	4.69	4.77	-0.09	0.08	-0.01
29-Aug-77	Mon	30-Aug-77	Tue	5.75	1	Sep-77	94.48	94.44	94.44	5.67	5.72	5.72	0.04	0.00	0.04
25-Oct-77	Tue	26-Oct-77	Wed	6.00	1	Dec-77	93.64	93.67	93.65	6.55	6.52	6.54	-0.03	0.02	-0.01
06-Jan-78	Fri	9-Jan-78	Mon	6.50	3	Mar-78	93.41	93.15	93.12	6.79	7.07	7.10	0.27	0.03	0.30
11-May-78	Thu	11-May-78	Thu	7.00	1	Jun-78	93.16	93.14	93.20	7.06	7.08	7.01	0.02	-0.06	-0.04
30-Jun-78	Fri	3-Jul-78	Mon	7.25	1	Sep-78	92.54	92.58	92.60	7.71	7.67	7.64	-0.04	-0.02	-0.06
18-Aug-78	Fri	18-Aug-78	Fri	7.75	3	Sep-78	92.84	92.81	92.77	7.39	7.42	7.47	0.03	0.04	0.07
22-Sep-78	Fri	22-Sep-78	Fri	8.00	2	Dec-78	91.84	91.83	91.67	8.45	8.46	8.63	0.01	0.17	0.18
13-Oct-78	Fri	16-Oct-78	Mon	8.50	2	Dec-78	91.80	91.59	91.66	8.49	8.71	8.64	0.22	-0.07	0.15
01-Nov-78	Wed	1-Nov-78	Wed	9.50	3	Dec-78	91.03	90.83	90.73	9.30	9.52	9.62	0.21	0.11	0.32
20-Jul-79	Fri	20-Jul-79	Fri	10.00	2	Sep-79	90.92	90.83	90.72	9.42	9.52	9.63	0.10	0.12	0.21
16-Aug-79	Thu	17-Aug-79	Fri	10.50	3	Sep-79	90.48	90.40	90.42	9.89	9.97	9.95	0.09	-0.02	0.06
18-Sep-79	Tue	19-Sep-79	Wed	11.00	1	Dec-79	89.98	89.95	90.34	10.42	10.45	10.04	0.03	-0.42	-0.38
06-Oct-79	Sat	8-Oct-79	Mon	12.00	3	Dec-79	89.30	88.80	88.80	11.15	11.68	11.68	0.54	0.00	0.54
15-Feb-80	Fri	15-Feb-80	Fri	13.00	3	Mar-80	87.56	87.18	87.06	13.02	13.43	13.56	0.41	0.13	0.54
28-May-80	Wed	29-May-80	Thu	12.00	1	Jun-80	92.46	92.40	92.25	7.79	7.85	8.01	0.06	0.16	0.22
12-Jun-80	Thu	13-Jun-80	Fri	11.00	1	Sep-80	93.39	93.55	93.57	6.81	6.65	6.63	-0.17	-0.02	-0.19
25-Jul-80	Fri	28-Jul-80	Mon	10.00	1	Sep-80	91.88	91.93	91.67	8.40	8.35	8.63	-0.05	0.27	0.22
25-Sep-80	Thu	26-Sep-80	Fri	11.00	2	Dec-80	88.53	88.01	88.15	11.97	12.53	12.38	0.56	-0.15	0.41
14-Nov-80	Fri	17-Nov-80	Mon	12.00	2	Dec-80	86.77	86.30	86.20	13.87	14.38	14.49	0.51	0.11	0.62
04-Dec-80	Thu	5-Dec-80	Fri	13.00	2	Mar-81	86.77	86.40	86.49	13.87	14.27	14.18	0.40	-0.10	0.30
04-May-81	Mon	5-May-81	Tue	14.00	2	Jun-81	85.28	84.68	84.68	15.49	16.15	16.15	0.66	0.00	0.66
30-Oct-81	Fri	2-Nov-81	Mon	13.00	1	Dec-81	87.51	87.52	87.43	13.07	13.06	13.16	-0.01	0.10	0.09
03-Dec-81	Thu	4-Dec-81	Fri	12.00	1	Mar-82	89.05	89.65	89.65	11.41	10.77	10.77	-0.64	0.00	-0.64
19-Jul-82	Mon	20-Jul-82	Tue	11.50	2	Sep-82	88.43	88.70	88.64	12.08	11.79	11.85	-0.29	0.06	-0.23
30-Jul-82	Fri	2-Aug-82	Mon	11.00	2	Sep-82	88.67	89.27	89.27	11.82	11.18	11.18	-0.64	0.00	-0.64
13-Aug-82	Fri	16-Aug-82	Mon	10.50	2	Sep-82	89.78	90.05	90.18	10.63	10.35	10.21	-0.29	-0.14	-0.43
26-Aug-82	Thu	27-Aug-82	Fri	10.00	1	Sep-82	91.56	91.40	91.02	8.74	8.91	9.31	0.17	0.40	0.57
08-Oct-82	Fri	11-Oct-82	Mon	9.50	1	Dec-82	91.89	92.46	92.49	8.39	7.79	7.76	-0.60	-0.03	-0.63
19-Nov-82	Fri	22-Nov-82	Mon	9.00	2	Dec-82	92.12	92.20	92.11	8.15	8.07	8.16	-0.08	0.09	0.01
13-Dec-82	Mon	14-Dec-82	Tue	8.50	3	Mar-83	91.76	92.11	92.17	8.53	8.16	8.10	-0.37	-0.06	-0.43
06-Apr-84	Fri	9-Apr-84	Mon	9.00	1	Jun-84	89.99	89.97	90.08	10.41	10.43	10.31	0.02	-0.12	-0.10
21-Nov-84	Wed	23-Nov-84	Fri	8.50	3	Dec-84	91.62	91.68	91.69	8.68	8.61	8.60	-0.06	-0.01	-0.07
21-Dec-84	Fri	24-Dec-84	Mon	8.00	2	Mar-85	91.79	91.83	91.86	8.50	8.46	8.42	-0.04	-0.03	-0.07
17-May-85	Fri	20-May-85	Mon	7.50	2	Jun-85	92.54	92.74	92.75	7.71	7.50	7.49	-0.21	-0.01	-0.22

*Prices are converted to bond equivalent yields using the formula:

$$R = 100\left[\frac{365*(1-P/100)}{360-90*(1-P/100)}\right]$$

APPENDIX D

U.S. TREASURY BOND RATE MOVEMENTS FOLLOWING DISCOUNT RATE CHANGES

Discount Rate Announcements								Futures								
									Prices			Yields				
Date	Day	Following Market Close	Day	Discount Rate Announced	Change	Type	20-yr. Spot Rate	Contract	Settle (-1)	Open	Settle	Settle (-1)	Settle	Settle to Open	Open to Settle	Settle to Settle
12-Jan-73	Fri	15-Jan-73	Mon	5.00	0.50	1	-0.01									
23-Feb-73	Fri	26-Feb-73	Mon	5.50	0.50	2	0.03									
20-Apr-73	Fri	23-Apr-73	Mon	5.75	0.25	1	0.02									
10-May-73	Thu	11-May-73	Fri	6.00	0.25	1	0.01									
08-Jun-73	Fri	11-Jun-73	Mon	6.50	0.50	2	0.02									
29-Jun-73	Fri	2-Jul-73	Mon	7.00	0.50	3	0.04									
13-Aug-73	Mon	14-Aug-73	Tue	7.50	0.50	1	0.01									
24-Apr-74	Wed	25-Apr-74	Thu	8.00	0.50	2	0.05									
06-Dec-74	Fri	9-Dec-74	Mon	7.75	-0.25	2	-0.11									
03-Jan-75	Fri	6-Jan-75	Mon	7.25	-0.50	3	-0.03									
04-Feb-75	Tue	5-Feb-75	Wed	6.75	-0.50	1	-0.05									
07-Mar-75	Fri	10-Mar-75	Mon	6.25	-0.50	2	0.02									
15-May-75	Thu	16-May-75	Fri	6.00	-0.25	1	0.00									
16-Jan-76	Fri	19-Jan-76	Mon	5.50	-0.50	1	-0.02									
19-Nov-76	Fri	22-Nov-76	Mon	5.25	-0.25	1	-0.06									
29-Aug-77	Mon	30-Aug-77	Tue	5.75	0.50	1	0.01	Dec-77*	103.15625	102.96875	103.06250	7.688	7.697	0.018	-0.009	0.009
25-Oct-77	Tue	26-Oct-77	Wed	6.00	0.25	1	-0.01	Dec-77	101.59375	101.65625	101.62500	7.841	7.838	-0.006	0.003	-0.003
06-Jan-78	Fri	9-Jan-78	Mon	6.50	0.50	3	0.15	Mar-78	98.31250	97.62500	97.56250	8.173	8.251	0.071	0.006	0.078
11-May-78	Thu	11-May-78	Thu	7.00	0.50	1	0.00	Jun-78	95.15625	95.12500	95.18750	8.508	8.505	0.003	-0.006	-0.003
30-Jun-78	Fri	3-Jul-78	Mon	7.25	0.25	1	-0.02	Sep-78	93.00000	93.18750	93.09375	8.747	8.737	-0.020	0.010	-0.010
18-Aug-78	Fri	18-Aug-78	Fri	7.75	0.50	3	0.00	Sep-78	94.31250	94.00000	94.59375	8.601	8.570	0.034	-0.065	-0.031
22-Sep-78	Fri	22-Sep-78	Fri	8.00	0.25	2	0.07	Dec-78	94.18750	94.09375	93.68750	8.614	8.670	0.010	0.045	0.056
13-Oct-78	Fri	16-Oct-78	Mon	8.50	0.50	2	0.05	Dec-78	93.53125	93.09375	93.09375	8.687	8.737	0.050	0.000	0.050
01-Nov-78	Wed	1-Nov-78	Wed	9.50	1.00	3	-0.18	Dec-78	91.15625	91.62500	91.90625	8.958	8.872	-0.054	-0.032	-0.086
20-Jul-79	Fri	20-Jul-79	Fri	10.00	0.50	2	-0.01	Sep-79	90.12500	90.12500	90.68750	9.079	9.013	0.000	-0.066	-0.066
16-Aug-79	Thu	17-Aug-79	Fri	10.50	0.50	3	0.00	Sep-79	90.87500	91.15625	90.93750	8.991	8.984	-0.031	0.024	-0.007
18-Sep-79	Tue	19-Sep-79	Wed	11.00	0.50	1	-0.02	Dec-79	88.37500	88.06250	88.71875	9.290	9.248	0.038	-0.080	-0.042
06-Oct-79	Sat	8-Oct-79	Mon	12.00	1.00	3	0.29	Dec-79	86.53125	87.00000**	85.53125	9.518	9.646	-0.060	0.188	0.128
15-Feb-80	Fri	15-Feb-80	Fri	13.00	1.00	3	0.27	Mar-80	69.90625	69.00000	68.31250	12.000	12.289	0.164	0.125	0.289
28-May-80	Wed	29-May-80	Thu	12.00	-1.00	1	0.13	Jun-80	80.68750	80.84375	79.78125	10.297	10.426	-0.022	0.151	0.129
12-Jun-80	Thu	13-Jun-80	Fri	11.00	-1.00	1	-0.14	Sep-80	84.78125	86.46875	85.96875	9.743	9.652	-0.129	0.038	-0.091
25-Jul-80	Fri	28-Jul-80	Mon	10.00	-1.00	1	0.11	Sep-80	78.37500	78.31250	77.59375	10.630	10.706	0.006	0.070	0.076
25-Sep-80	Thu	26-Sep-80	Fri	11.00	1.00	2	0.15	Dec-80	70.37500	69.37500	69.68750	11.917	12.039	0.177	-0.055	0.122
14-Nov-80	Fri	17-Nov-80	Mon	12.00	1.00	2	0.16	Dec-80	67.84375	67.46875	67.03125	12.376	12.529	0.071	0.082	0.153
04-Dec-80	Thu	5-Dec-80	Fri	13.00	1.00	2	-0.08	Mar-81	68.93750	68.56250	69.93750	12.174	11.995	0.067	-0.246	-0.179
04-May-81	Mon	5-May-81	Tue	14.00	1.00	2	0.19	Jun-81	60.40625	59.93750	59.96875	13.908	14.008	0.107	-0.007	0.100
30-Oct-81	Fri	2-Nov-81	Mon	13.00	-1.00	1	-0.01	Dec-81	58.68750	58.68750	58.62500	14.309	14.324	0.000	0.015	0.015
03-Dec-81	Thu	4-Dec-81	Fri	12.00	-1.00	1	-0.30	Mar-82	64.37500	65.78125	65.50000	13.053	12.827	-0.283	0.057	-0.226
19-Jul-82	Mon	20-Jul-82	Tue	11.50	-0.50	2	-0.10	Sep-82	63.28125	63.75000	63.78125	13.280	13.175	-0.098	-0.007	-0.105
30-Jul-82	Fri	2-Aug-82	Mon	11.00	-0.50	2	-0.26	Sep-82	62.81250	63.62500	64.03125	13.379	13.124	-0.170	-0.085	-0.255
13-Aug-82	Fri	16-Aug-82	Mon	10.50	-0.50	2	-0.17	Sep-82	64.90625	65.50000	65.53125	12.945	12.821	-0.118	-0.006	-0.124
26-Aug-82	Thu	27-Aug-82	Fri	10.00	-0.50	1	0.25	Sep-82	67.90625	67.78125	66.59375	12.364	12.613	0.024	0.225	0.249
08-Oct-82	Fri	11-Oct-82	Mon	9.50	-0.50	1	-0.37	Dec-82	74.68750	76.00000	77.68750	11.196	10.732	-0.203	-0.261	-0.464
19-Nov-82	Fri	22-Nov-82	Mon	9.00	-0.50	2	0.01	Dec-82	78.18750	78.25000	77.56250	10.658	10.751	-0.009	0.102	0.093
13-Dec-82	Mon	14-Dec-82	Tue	8.50	-0.50	3	-0.15	Mar-83	75.25000	76.96875	76.00000	11.106	10.989	-0.268	0.151	-0.117
06-Apr-84	Fri	9-Apr-84	Mon	9.00	0.50	1	0.00	Jun-84	66.31250	66.31250	66.59375	12.668	12.613	0.000	-0.055	-0.055
21-Nov-84	Wed	23-Nov-84	Fri	8.50	-0.50	3	-0.13	Dec-84	72.28125	72.68750	73.25000	11.590	11.428	-0.068	-0.094	-0.162
21-Dec-84	Fri	24-Dec-84	Mon	8.00	-0.50	2	-0.03	Mar-85	72.34375	72.43750	72.46875	11.579	11.558	-0.016	-0.005	-0.021
17-May-85	Fri	20-May-85	Mon	7.50	-0.50	2	-0.27	Jun-85	73.87500	75.18750	75.43750	11.326	11.077	-0.209	-0.040	-0.249

*Data for the September 1977 contract was not printed in the Journal, so the December contract was used.

**The decline in the settle to open yield for the December 1977 contract following the October 6, 1979 announcement probably is due to a typographical error in the Journal for the "open" price on October 8, 1979. The open prices of many of the more distant bond futures contracts fell.