

BOARD OF GOVERNORS
OF THE
FEDERAL RESERVE SYSTEMSTRICTLY CONFIDENTIAL (FR)
CLASS II - FOMC**Office Correspondence**Date October 29, 1987To Federal Open Market CommitteeSubject: Definition of the BorrowingFrom Donald L. KohnObjective

The attached memorandum responds to questions about the treatment of two types of discount window credit in the implementation of monetary policy under an operating procedure keyed to an objective for discount window borrowing. The first section of the memorandum (beginning on page 2) deals with "special situation" borrowing--borrowing classified as adjustment credit that does not share the usual characteristics of such credit. Generally the Desk treats such borrowing analogously with extended credit by excluding it from borrowing levels sought under its basic borrowing objective. The question was raised as to whether such treatment, perhaps acting through effects of published data on market expectations, might not result in tighter money market conditions than intended. The second section (beginning on p. 8) addresses the issue of whether the inclusion of seasonal credit in the borrowing objective imparts a systematic seasonal pattern to the federal funds rate.

As discussed in the previous memorandum to the FOMC on the federal funds rate and the borrowing objective, the relationship between those two variables is fairly loose. The evidence presented in this memorandum suggests that the current treatment of the two types of credit in question has not contributed to the imprecision of that relationship or to systematic movements in the federal funds rate. Thus, the results do not present a case for altering current procedures.

This subject has been tentatively scheduled for discussion at the upcoming FOMC meeting, depending on whether there is time available once the Committee has completed its regular business.

BOARD OF GOVERNORS
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FEDERAL RESERVE SYSTEM

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Office Correspondence

Date October 29, 1987

To Mr. Kohn

Subject Treatment of Special Situation and

From David E. Lindsey and Gary Gillum¹

Seasonal Borrowings in Desk Operations

At a recent Board meeting, questions were raised about the appropriate treatment of special situation borrowing in Desk operations aimed at attaining the FOMC's specified level of adjustment plus seasonal borrowing. Also reemerging was the issue of the appropriate treatment of seasonal borrowing, which had been briefly reviewed in a previous memorandum to the Federal Open Market Committee,² discussed by the Committee at its July 7 meeting, and examined in more detail at a Board seminar on July 30. The body of this memorandum addresses the implications for policy implementation of both of these issues. Appendix A presents econometric evidence on the relation of special situation borrowing and the funds rate. Appendix B presents econometric evidence on the relation of seasonal borrowing and the funds rate.

1. James Glassman and Mary Hoffman assisted in the preparation of this memorandum.

2. David E. Lindsey and James Glassman, "A Review of the Relation of the Funds Rate and Intended Discount Borrowings," Board staff memorandum to Donald Kohn, July 1, 1987, page 7; transmitted to the Federal Open Market Committee with a cover memorandum from Donald L. Kohn, "Attached Study of Borrowing and the Federal Funds Rate," July 1, 1987.

Special situation borrowing

Special situation borrowing is discount credit that, while classified officially as adjustment credit, occurs in circumstances that disrupt the normal interaction of bidding for funds in the market and administrative pressures at the discount window. Frequently, such borrowing is by a troubled institution whose normal market access has been cut off, but whose borrowing is classified as adjustment until the protracted nature of the funding problem becomes clearer and the credit is reclassified as extended credit. At other times, random events such as computer breakdowns may give rise to very large short-term funding needs that force a depository institution temporarily to use the discount window in volume to avoid an overdraft. Finally, when borrowings surge on the settlement day just prior to a Thursday holiday, borrowing in the next maintenance period begins at an artificially high level -- unrelated to reserve pressures in the new statement period -- and the Desk often will make an allowance by considering such borrowing to be of a special situation nature.

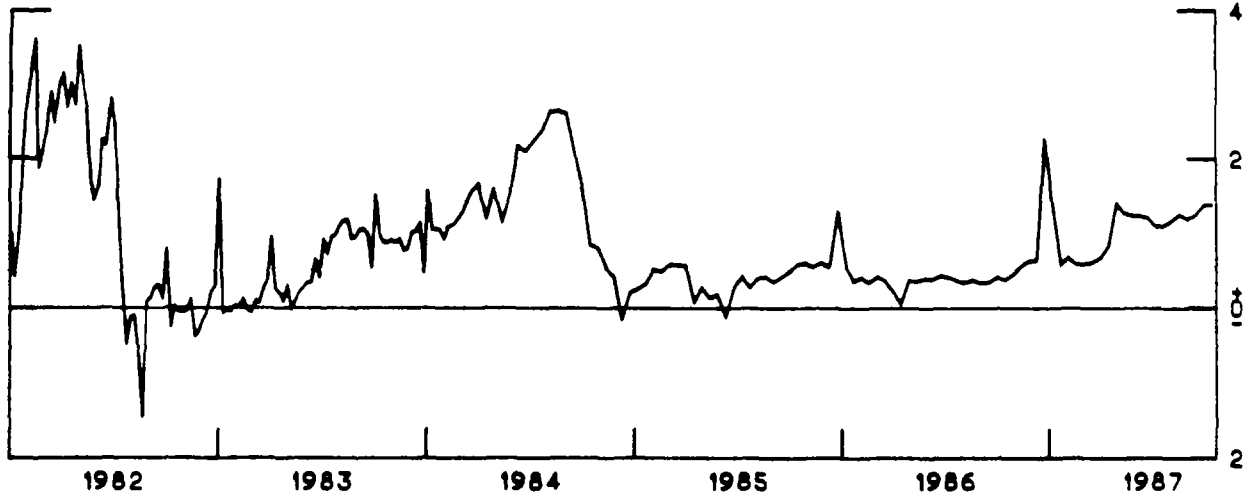
An extreme example of the first type of special situation borrowing occurred in May and early June of 1984 when Continental Illinois borrowed massive amounts of adjustment credit -- at one point nearly \$5 billion -- before its borrowing was reclassified as extended credit. The computer outage at the Bank of New York on November 21, 1985, which resulted in the bank borrowing nearly \$23

billion in adjustment credit that night, is a notable example of the second type of special situation borrowing. Although the Federal Reserve put considerable pressure on the Bank of New York to resolve its computer problems as soon as feasible, and the bank obtained some funds in the federal funds market, it was impossible for that bank to raise more than a small fraction of needed funds, and adjustment credit was provided to cover the bulk of the associated account deficiency. As a final example, borrowing surged on settlement day prior to the Thanksgiving Day holiday in 1984, giving rise to considerable special situation borrowing in the following maintenance period, as may be seen in chart 1.

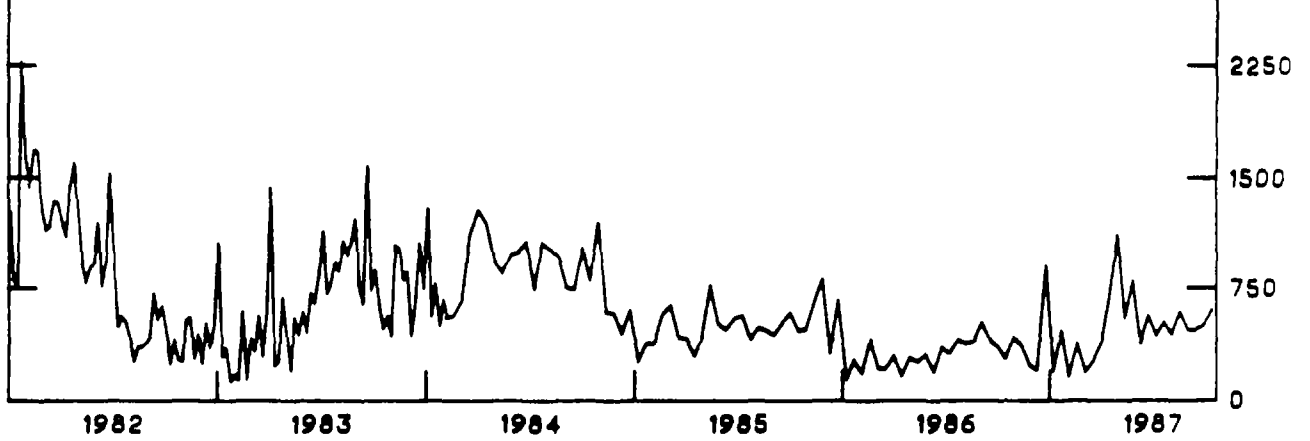
Because of the character of the circumstances giving rise to special situation borrowing, the operating presumption has been that such borrowing is akin to extended credit in its impact on funds market conditions. That is, given an offsetting reduction in nonborrowed reserves to maintain a predetermined volume of other adjustment plus seasonal borrowing, special situation borrowing should have little effect on the federal funds rate. Thus, the Desk normally makes either a formal or informal adjustment to treat special situation borrowing along with extended credit as similar to nonborrowed reserves and to exclude it from the measure of adjustment plus seasonal borrowing that the Desk attempts to keep at the FOMC's specified level.

Chart 1

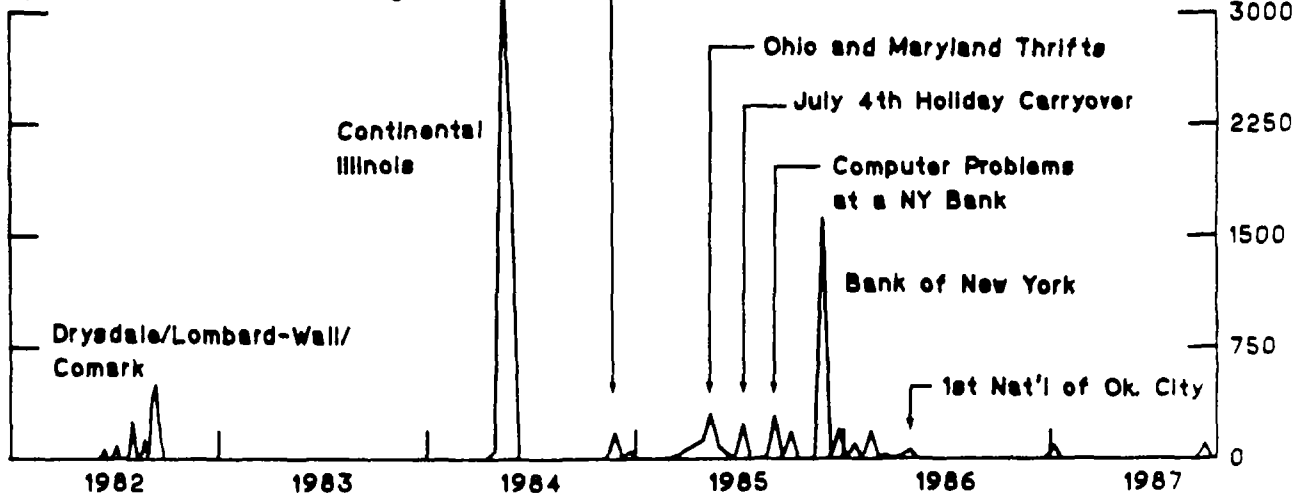
Federal Funds Less Discount Rate



Adjustment Plus Seasonal Borrowing
(Excludes Special Situation Borrowing)



Special Situation Borrowing



NOTE: Maintenance period averages.

The issue raised at the recent Board meeting involved the potential in this approach for market participants to misperceive the FOMC's intentions. Market participants monitor published values of adjustment and seasonal borrowing for indications of the FOMC's current specification of intended pressure on reserve positions. However, special situation borrowing is not identified as a separate component of adjustment credit in the published statistics. Thus, market participants could incorrectly interpret a figure for adjustment credit that is enlarged by special situation borrowing as a sign of Federal Reserve tightening of reserve provision when no such policy move is intended. The resulting altered expectations of the Federal Reserve's policy stance could place temporary upward pressure on the federal funds rate independent of actual reserve provision.

The alternative approach would be to forego the adjustment for special situation borrowing and for the Desk to try to keep all adjustment plus seasonal borrowing, including special situation borrowing, at the FOMC's specified level. However, if the analysis behind the current treatment of special situation borrowing is correct, this alternative approach would result in an undesired easing of funds market conditions when such borrowing occurred. Including special situation borrowing in a targeted amount of adjustment plus seasonal borrowing would imply a dollar-for-dollar decline in the rest of adjustment plus seasonal borrowing as

special situation borrowing occurred. Lessened pressure on reserve positions as the rest of borrowing fell would tend to induce a decline in the spread of the funds rate over the discount rate that would be at variance with the expected funds rate outcome given the FOMC's intended policy stance.

In fact, the occurrence of special situation borrowing does not appear to have systematic effects on the federal funds rate. Chart 1 plots the funds rate-discount rate spread in the top panel, adjustment plus seasonal borrowing excluding all special situation borrowing in the middle panel, and special situation borrowing in the lower panel. The maintenance-period data span the years from early 1982 to date. Although a loose association between the spread and adjustment plus seasonal borrowing excluding special situation borrowing is apparent to the naked eye, no clear distortion of the relationship resulting from the occurrence of special situation borrowing, apart perhaps from the aftermath of the Continental Illinois episode, is evident.

Econometric evidence reinforces this judgment. It strongly suggests that, since early 1982, special situation borrowing apart from the fallout of the Continental Illinois episode in the summer 1984 has had no significant impact on the funds market once account is taken of the effect of the rest of adjustment plus seasonal borrowing. (See Appendix A.) The Continental Illinois episode, moreover, appeared not to reflect a direct impact of Continental's borrowing on

the funds rate, but rather an indirect effect on the willingness of other banks to tap the discount window. With Continental's funding difficulties shaking public confidence in the banking system generally, large institutions in particular became more reluctant to use the window out of a desire to avoid rumors about their own financial condition.

This evidence thus suggests that special situation borrowing in itself has not systematically added to funds market pressure through any mechanism. The Desk's procedure has been to offset the reserve injections from special situation borrowing by reductions of nonborrowed reserves. If such borrowing had put independent upward pressure on the funds rate, either through market misperceptions of FOMC intentions or through the market pressures usually associated with adjustment borrowing, the econometric evidence (in Appendix A) would be expected to reveal a positive association between the funds rate and such borrowing. But it does not. Thus, the treatment of special situation borrowing in the Desk's implementation of the FOMC's monetary policy in general does not seem to have given rise to funds market distortions.

The lack of a systematic effect on the funds rate through a market misperception channel seems to have reflected market participants' knowledge of the way the Desk treats such borrowing and their reasonably accurate estimates of its approximate size when it appears in published reserve statistics. Their estimates have been

derived in part from the breakdown of Wednesday borrowing data by Federal Reserve district that appears on the weekly Federal Reserve condition statement published on Thursday for the week ending the previous day. This information, combined with market intelligence about funding difficulties of particular institutions, at the very least alerts market participants that adjustment plus seasonal borrowing may be unusually high, but may even enable them to identify the approximate magnitude of the special situation component of published adjustment borrowing. As an important supplemental source of information, the press officer at the Federal Reserve Bank of New York normally indicates to reporters at the Thursday afternoon press conference when the amount of borrowing has been appreciably distorted by a special situation. In addition to reporting this information, the press may well attempt to develop the story further through their own independent inquiries. The market also has made inferences about FOMC intentions from the behavior of the funds rate itself.

In the recent instance, when average adjustment borrowing for the week ending September 30 was distorted by about \$150 million of special situation borrowing associated with wire problems in the New York district, market participants had a good handle on the size of the impact on adjustment borrowing. More special situation borrowing, arising from further wire problems and the California earth-

quake, early in the following week helped to bloat the two-week average effect on adjustment plus seasonal borrowing to around \$100 million, which the Desk treated as akin to non-borrowed reserves. Even so, the market apparently correctly inferred from the actual borrowing of \$725 million and emerging conditions in the funds market that the borrowing assumption used by the Desk in constructing reserve paths was in the area of \$600 million.

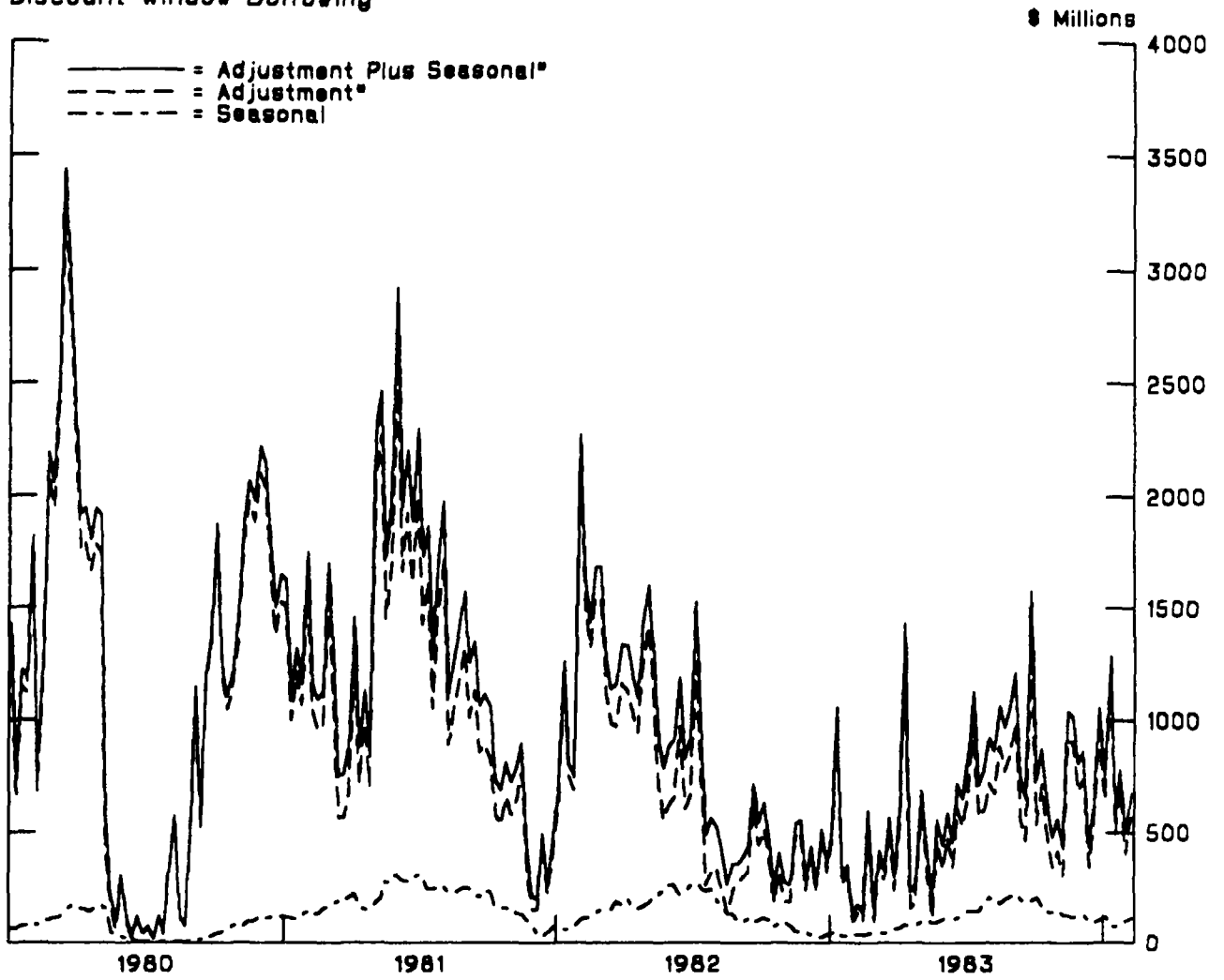
Seasonal borrowing

Seasonal borrowing has displayed a significant seasonal pattern in the 1980s. The top panels of charts 2 and 3 show seasonal borrowing as the irregular broken line for the subperiods of lagged and contemporaneous reserve accounting, respectively. (Adjustment borrowing is the dashed line, while adjustment plus seasonal borrowing is the solid line.) With seasonal borrowing related primarily to the financing needs of small agricultural banks, such borrowing reaches a harvest-season peak during in the third quarter, and a trough early in the first quarter.

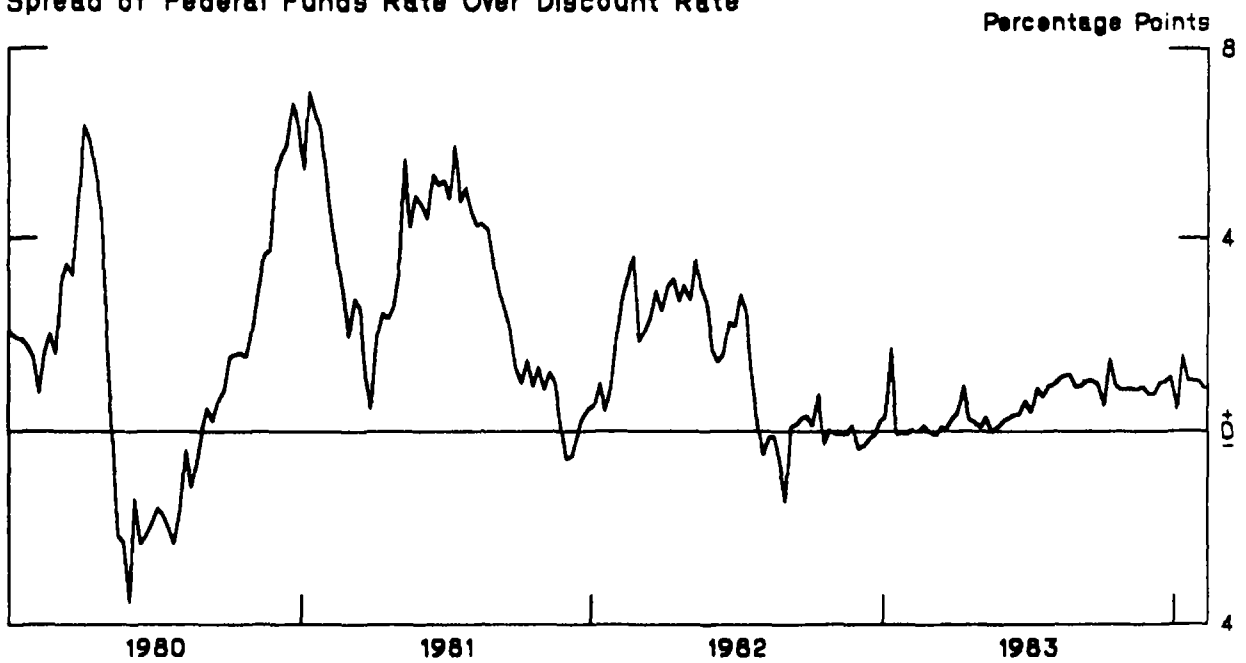
Seasonal borrowing also seems responsive to the spread of the funds rate over the discount rate, shown in the lower panel. For example, the negative spread in 1980 brought seasonal borrowing down to minimal levels, even in the third quarter of that year, while the relatively sizable spreads in 1981 and 1984 induced relatively large amounts of seasonal borrowing. The evident interest responsiveness of

Chart 2

Discount Window Borrowing



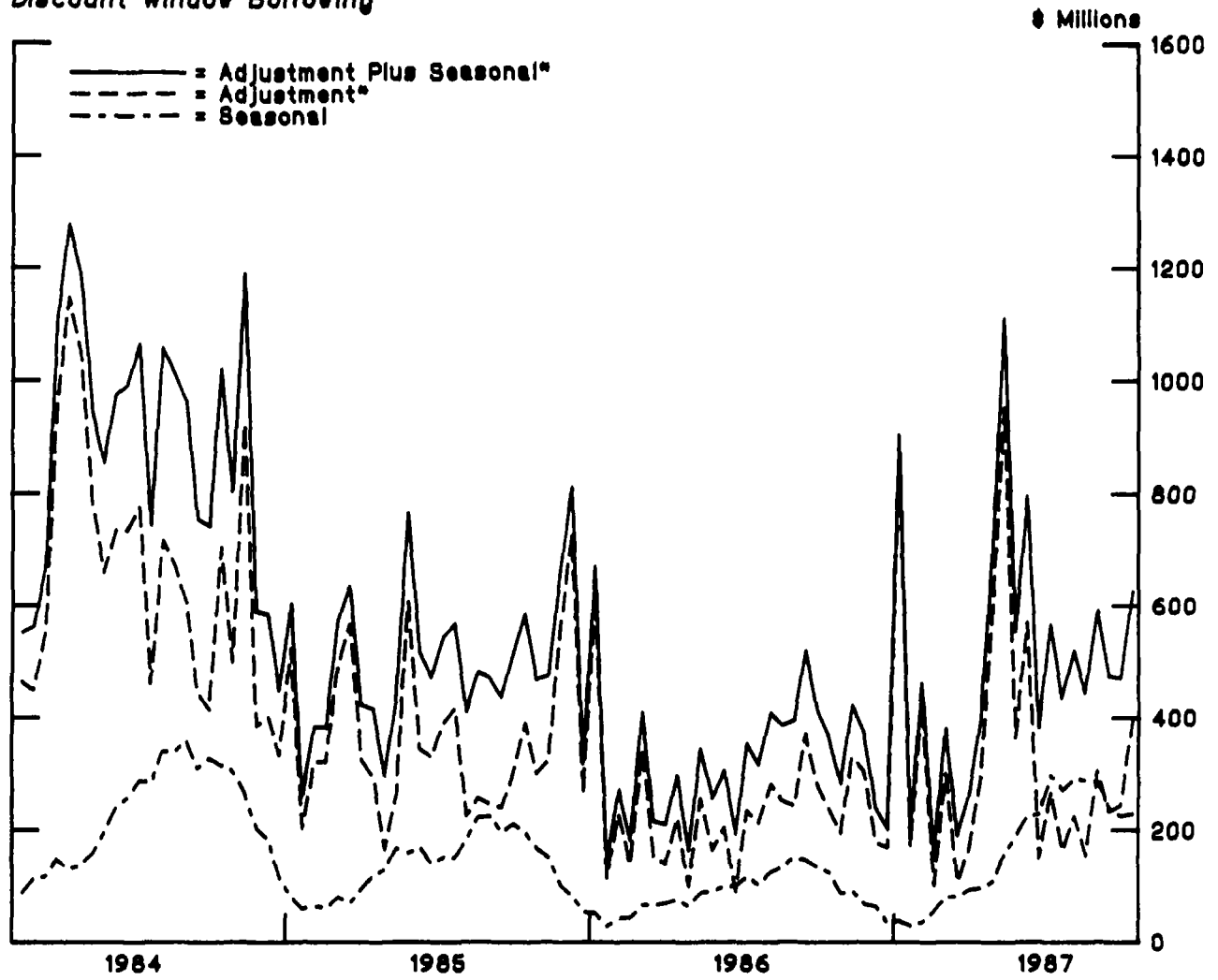
Spread of Federal Funds Rate Over Discount Rate



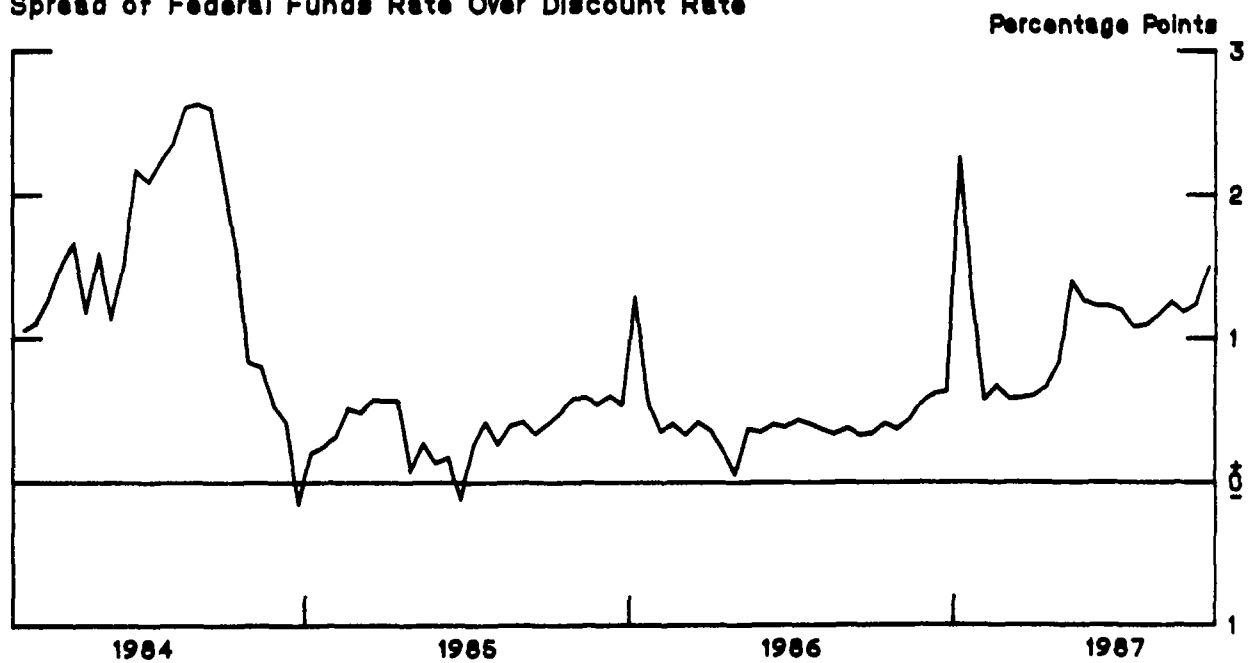
* Excludes special situation borrowing.

Chart 3

Discount Window Borrowing



Spread of Federal Funds Rate Over Discount Rate



* Excludes special situation borrowing.

seasonal borrowing is clearly less pronounced than for adjustment borrowing.

Primarily in recognition of the interest sensitivity of seasonal borrowing, the FOMC has included such credit in the borrowing measure used to index its intentions for pressure on reserve positions. This treatment, though, has produced a long-standing debate about whether or not the seasonality in seasonal borrowing could tend to induce an inverse seasonal pattern in the federal funds rate. For example, as seasonal borrowing rises for a given spread going into the third quarter of the year, adjustment credit will have to decline for the Desk to maintain the sum of the two at an intended level. Given the discount rate, the funds rate in principle would tend to fall each summer to bring about the needed decline in adjustment borrowings.

One alternative procedure would be to exclude seasonal borrowing from the targeted measure, and for the FOMC to specify its intentions in terms of adjustment borrowing alone. This approach would be designed to eliminate the potential for induced seasonality in the federal funds rate. Even if seasonal borrowing is responsive to the spread, the lack of seasonality in the adjustment borrowing relation to the spread would then preclude seasonality in the funds rate. And if the relationship between adjustment borrowing and the spread is at least as predictable as that for adjustment plus seasonal borrowing, the funds rate would

then be at least as predictable given the FOMC's intentions as under the current procedure.

Another alternative procedure would be for the Desk to alter its target for adjustment plus seasonal borrowing over the course of the year to account for the estimated seasonal movements in seasonal borrowing. That is, the borrowing target would be raised in the third quarter above its basic level as seasonal borrowing rose and would be reduced in the winter below its basic level as seasonal borrowing fell.

Charts 2 and 3, however, do not suggest a tendency for the funds rate spread to vary inversely with the level of seasonal borrowing, by falling in the third quarter and rising in the winter.³ Nor do charts 2 and 3 suggest that this lack of pattern in the funds rate reflects an offsetting seasonal pattern in the sum of actual adjustment plus seasonal borrowing -- for example, a systematic rise in the third quarter and fall in the winter.

Econometric methods confirm the absence of a statistically significant seasonal pattern in the relation of adjustment plus seasonal borrowing to the spread despite a significant seasonal pattern in the relation of seasonal borrowing alone to the spread under the two-week maintenance period regime in place since early 1984. (See Appendix B.)

3. A year-end spike in the funds rate has emerged in the last two years, but it appears to have been related to special year-end pressures, such as heavy financial transactions volume and larger-than-expected demands for excess reserves, rather than to low seasonal borrowing.

One possible explanation is that market expectations of Federal Reserve intentions and arbitrage by larger banks across maintenance periods prevent potential seasonality in the relation of the spread to the sum of adjustment plus seasonal borrowing from showing through in the funds rate-discount rate spread. Another possibility is simply that the seasonal movements in seasonal borrowing, which are relatively small in magnitude despite their statistical significance, are swamped by random noise in the relation of total borrowing to the spread and thus difficult to detect with statistical methods.⁴

Additional statistical evidence (also reported in Appendix B) indicates that if the Desk had simply been targeting the level of adjustment credit since early 1984, no significant change in the predictability of the funds rate would have resulted. Nor would the funds rate have been more or less predictable if the Desk had formally adjusted the operating target for adjustment plus seasonal borrowing to account for the estimated seasonal movement in the seasonal borrowing relation over the same period, according to another test.

4. Another possible explanation -- that the seasonal pattern in seasonal borrowing tends to be offset by opposite movements in adjustment borrowing, as institutions substitute one form of discount credit for the other -- is rejected by the lack of statistically significant seasonality in the relation of adjustment borrowing to the spread.

Appendix A

Econometric Estimates of the Impact of Special Situation Borrowing on the Funds Rate

The econometric evidence reported in table A1 bears on the responsiveness of the spread of the federal funds rate over the discount rate to special situation borrowing given the remaining amount of adjustment plus seasonal borrowing. Column 1 simply updates through the October 7 maintenance period an equation relating the spread as the dependent variable to adjustment plus seasonal borrowing, excluding special situation borrowing, a constant term, and two dummy variables representing shifts in the constant term for the Continental Illinois episode of the summer of 1984 and for the period since 1986. An equation of this form was reported and discussed at length in an earlier memorandum to the FOMC.¹ Column 2 then adds to this equation three variables representing special situation borrowing by Continental Illinois, the Bank of New York, and all other institutions, respectively.

1. See Lindsey and Glassman, *op. cit.* In this appendix, though, the equations are estimated with ordinary least squares rather than the two-stage least squares procedure with instrumental variables reported in the earlier memorandum. This change is designed to isolate better the interaction in the current maintenance period of different borrowing variables in affecting the funds rate spread over the discount rate. The results for special situation borrowing were little different when two-stage least squares were employed, while the other regression coefficients were more in accord with a priori expectations.

Table A1

Estimates of Borrowing Functions¹
 (The Spread of the Funds Rate over the Discount Rate is the Dependent Variable)
 (Percentage points; early 1982 to present)

	(1) Without Special Situation Borrowing	(2) With Current Special Situation Borrowing	(3) With Current and Lagged Special Situation Borrowing
1. Constant	.40 (2.1)	.41 (2.1)	.42 (2.0)
<u>Adjustment plus seasonal borrowing²</u>			
2a. Excluding special situations	.06 (6.7)	.06 (6.6)	.06 (6.5)
Special situation borrowing			
2b. Continental Bank		-.02 (-1.7)	-.02 (-1.6)
2c. Lagged one period			.01 (.1)
2d. Bank of New York		-.01 (-.5)	-.01 (-.6)
2e. Lagged one period			.01 (-.3)
2f. Other special situations		-.01 (-.2)	.00 (-.1)
2g. Lagged one period			.01 (.3)
<u>Dummy variables representing shifts</u>			
3. Summer 1984	.38 (1.3)	.37 (1.3)	.45 (1.5)
4. 1986 to present	.28 (1.0)	.29 (1.0)	.22 (.6)
<u>Summary regression statistics</u>			
5. R ² (adjusted)	.81	.81	.81
6. Standard error of estimate	.38	.38	.39

1. Uses an ordinary least squares procedure. Fit over maintenance periods between January 6, 1982 and October 7, 1987. T-values appear in parentheses.

2. Coefficients represent the rise in the funds rate in percentage points associated with a rise in borrowing of \$100 million.

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None of the three variables is statistically significant, judging by the t values in parentheses. The fit of the equation also is not altered, as may be seen by comparing the standard error of estimate (line 6) and the adjusted R^2 (line 5) in columns 1 and 2. The variable measuring special situation borrowing by all institutions other than Continental and Bank of New York has no systematic effect on the funds rate. Of course, Continental's funding crisis had in indirect effect on the borrowing function by altering the attitudes of other banks toward use of the window, as represented by the dummy variable for the summer of 1984.² But once account is taken of the impact on the readiness of other banks to rely on discount window credit in the summer of 1984 through the first dummy variable shown, no additional effect of Continental's special situation borrowing per se is indicated. The results in column 2 suggest that the occurrence of special situation borrowing has not perceptibly affected the funds rate in the same maintenance period when the Desk has operated in a manner that treats special situation borrowing as akin to extended credit by including it with nonborrowed reserves.

Given that data for adjustment borrowing including special situation borrowing in the second week of a two-week

2. This impact shows up as statistically significant using two-stage least squares, even when Continental's and other special situation borrowing is included. The indirect effects of Continental's funding problems surfaced in the reserve maintenance period following the reclassification of its borrowings as extended credit.

A-3

maintenance period are published on the first day on the next maintenance period, column 3 adds special situation borrowing lagged by one maintenance period to the regression. Any effect on market perceptions of FOMC intentions arising from publication might at times occur in the next maintenance period and the lagged variable would pick up this delayed effect if it is present in the data. Once again, however, these added variables are not statistically significant and the goodness of the equation's fit is little changed by their inclusion. A systematic tightening impact on the funds rate of special situation borrowing via market misperceptions in either the current or next maintenance period does not appear to be confirmed by the data.

Appendix B

Econometric Estimates of the Impact of Seasonality in Seasonal Borrowing on the Funds Rate

The results of estimating alternative borrowing functions using two-week maintenance period data since early February 1984 are presented in table B1 for seasonal borrowing (column 1), adjustment borrowing (column 2) and their sum (column 3). The borrowing measures are the dependent variables, with independent variables represented by a constant, the spread of the funds rate over the discount rate, and two dummy variables for shifts in the constant term for the Continental Illinois episode in the summer of 1984 and for 1986 to date.¹ Results without seasonal dummy variables appear in lines 1-6, while results with seasonal dummy variables are given in lines 7-14.

For seasonal borrowing, the addition of seasonal dummies improves the fit of the equation significantly, with the standard error falling from around \$70 million (line 6) without accounting for seasonality to around \$45 million (line 12) with explicit account taken of seasonal effects. Many of the estimated additive seasonal factors in seasonal borrowing for individual maintenance periods are significantly different from zero, as indicated by the asterisks. The largest negative seasonal influence is in the

1. This specification is discussed in Lindsey and Glassman, op. cit.

Table B1
 Estimates of Borrowings Functions With and Without Seasonal Variables¹
 (Borrowing Measures are the Dependent Variables)
 (Millions of dollars; early 1984 to present)

	(1) Seasonal Borrowing	(2) Adjustment Borrowing	(3) Adjustment + Seasonal Borrowing
<u>Without Seasonal Variables</u>			
1. Constant	76 (4.4)	290 (7.5)	366 (9.4)
2. Funds rate less discount rate	120 (5.8)	290 (6.3)	410 (8.7)
<u>Dummy variables representing shifts</u>			
3. Summer 1984	-45 (-1.0)	-369 (-3.7)	-414 (-4.1)
4. 1986 to present	-39 (-2.5)	-221 (-6.4)	-260 (-7.4)
<u>Summary regression statistics</u>			
5. R ² (adjusted)	.31	.53	.64
6. Standard error of estimate	72	161	163
<u>With Seasonal Variables</u>			
7. Constant	107 (10.6)	277 (7.4)	384 (10.5)
8. Funds rate less discount rate	80 (6.8)	292 (6.7)	373 (8.7)
<u>Dummy variables representing shifts</u>			
9. Summer 1984	-47 (1.7)	-297 (-2.9)	-344 (-3.4)
10. 1986 to present	-41 (-4.3)	-207 (-5.9)	-248 (-7.3)
<u>Summary regression statistics</u>			
11. R ² (adjusted)	.76	.54	.67
12. Standard error of estimate	43	158	154
<u>13. Bi-weekly seasonal variables</u>			
1	-123*	165	42
2	-99*	-185*	-283*
3	-66*	65	-1
4	-77*	-112	-189*
5	-51*	39	-12
6	-60*	-38	-98
7	-44*	2	-43
8	-42*	87	45
9	-19	143	125
10	-15	124	109
11	15	64	79
12	31	47	79
13	35	-40	-5
14	60*	27	87
15	45*	-89	-44
16	80*	-36	44
17	81*	-94	-13
18	87*	-93	-6
19	60*	-103	-43
20	69*	-88	-20
21	50*	-34	16
22	46	-52	-5
23	27	139	167
24	-11	46	35
25	-27	67	40
26	-53*	-52	-105
14. <u>Joint test of seasonality</u>	Significant at 1% level	Not Significant	Not Significant

*--Significantly different from zero at the 5 percent level.

1. Uses instrumental variables in a two-stage least squares procedure. Fitted over maintenance periods between February 15, 1984 and October 7, 1987. T-values are in parentheses.

B-2

first maintenance period of the year, averaging \$123 million. Though the shortfall diminishes, lower-than-average seasonal borrowing continues to be statistically significant through the eighth maintenance period. The buildup in seasonal impacts is evident through the summer, with a peak seasonal boost to seasonal borrowing estimated at \$87 million in the 18th maintenance period of the year. Taken together, the seasonal dummy variables are highly statistically significant, as indicated in line 14.

By contrast, though not surprisingly, seasonal effects are not significant in the estimated relation of adjustment borrowing to the spread (column 2). The standard errors (comparing lines 6 and 12) and the adjusted R^2 s (lines 5 and 11) improve by only small amounts with the addition of seasonal dummies.

The central issue of seasonality in the relation of adjustment plus seasonal borrowing to the spread is addressed in the third column. Apart from factors for two maintenance periods, the individual seasonal effects are not statistically significant, and jointly (row 14) they are not at all significant. The standard error of estimate is lowered and the adjusted R^2 raised only by relatively small amounts when seasonal dummy variables are added to the estimated equation. These results suggest the absence of a stable seasonal pattern in the relation of adjustment plus seasonal borrowing to the spread. In addition, without

B-3

accounting for seasonality, the standard errors of estimate in lines 6 for adjustment plus seasonal borrowing together (column 3) is about the same size as for adjustment borrowing alone (column 2), while the adjusted R^2 (line 5) is improved by including seasonal with adjustment borrowing. These results suggest there is little to gain in terms of the predictability of the borrowing relationship from attempting to account for seasonality, whether adjustment borrowing is taken by itself or considered together with seasonal borrowing.

Supplemental evidence for this conclusion is provided in table B2. The first column simply repeats the third column of the previous table, in which seasonal factors for the adjustment plus seasonal borrowing function are estimated freely by the regression. Column 2 takes the seasonal factors estimated for seasonal borrowing alone in column 1 of table B1 and forces them into the equation for adjustment plus seasonal borrowing. The fit deteriorates despite the fact that, unlike the first column, 26 degrees of freedom are no longer being used up in estimation of seasonal influences in the regression. In effect, this column shows that seasonally adjusting the sum of adjustment and seasonal borrowing with seasonal factors derived from the seasonal borrowing function alone results in a slight degradation in quality of fit compared with using the regression equation in column 1 with freely estimated (but

Table B2

Adjustment Plus Seasonal Borrowing Functions with Alternative Seasonal Variables¹
 (Adjustment Plus Seasonal Borrowing is the Dependent Variable)
 (Millions of dollars; early 1984 to present)

	(1)	(2)
	Seasonal variables estimated in the:	
	Adj. + seas. borrowing function	Seasonal borrowing ₂ function
Constant	384 (10.5)	397 (10.5)
Funds rate less discount rate	373 (8.7)	370 (8.1)
<u>Dummy variables representing shifts</u>		
Summer 1984	-344 (-3.4)	-415 (-4.2)
1986 to present	-248 (-7.3)	-262 (-7.7)
<u>Summary regression statistics</u>		
R ²	.77	.67
R ² (adjusted)	.67	.66
Standard error of estimate	154	158
<u>Bi-weekly seasonal variables</u>		
1	42	-123
2	-283*	-99
3	-1	-66
4	-189*	-77
5	-12	-51
6	-98	-60
7	-43	-44
8	45	-42
9	125	-19
10	109	-15
11	79	15
12	79	31
13	-5	35
14	87	60
15	-44	45
16	44	80
17	-13	81
18	-6	87
19	-43	60
20	-20	69
21	16	50
22	-5	46
23	167	27
24	35	-11
25	40	-27
26	-105	-53

*--Significantly different from zero at the 5 percent level.

1. Uses instrumental variables in a two-stage least squares procedure. Fitted over maintenance periods between February 15, 1984 and October 7, 1987. T-values are in parentheses.
2. The seasonal dummy variables were estimated in the seasonal borrowing equation of column 1 of table B1 and forced into the adjustment plus seasonal borrowing equation shown here.

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jointly insignificant) seasonal factors. Moreover, comparing the results in column 2 of table B2 with the upper panel of column 3 in table B1, in which seasonality in adjustment plus seasonal borrowing is not accounted for, suggests that only a negligible improvement in goodness of fit emerges from attempting to take seasonality into account in this way.

Table B3 presents results of regression equations with the spread of the funds rate over the discount rate as the dependent variable. In the top panel, the spread is related without regard to seasonal influences either to adjustment borrowing alone or to adjustment and seasonal borrowing together.² This test is designed to contrast the predictability of the funds rate under current procedures (column 2) with that under a procedure expressing the FOMC's intended borrowing level in terms of adjustment borrowing by itself (column 1). The results in the top panel in fact indicate a slightly, though not significantly, closer relationship between the spread and adjustment plus seasonal borrowing together than for adjustment borrowing alone, judging by summary statistics for goodness of fit in lines 5 and 6.

These similar results in the top panel are not surprising given the lack of seasonality in the relation of the

2. To isolate effects on the funds rate of alternative ways of accounting for current seasonality in borrowing quantities, ordinary least squares rather than two-stage least squares are employed in this table.

Table B3
 Estimates of Borrowings Functions With and Without Seasonal Variables¹
 (The Spread of the Funds Rate Over the Discount Rate is the Dependent Variable)
 (Percentage points; early 1984 to present)

	Adjustment borrowing (1)	Adjustment plus seasonal borrowing (2)	
<u>Without Seasonal Variables</u>			
1. Constant	-.02 (-.2)	-.25 (-2.4)	
2a. Adjustment borrowing ²	.14 (7.9)		
2b. Adjustment plus seasonal borrowing ²		.14 (9.4)	
<u>Dummy variables representing shifts</u>			
3. Summer 1984	1.54 (11.2)	1.31 (9.9)	
4. 1986 to present	.36 (4.4)	.41 (5.3)	
<u>Summary regression statistics</u>			
5. R ² (adjusted)	.70	.75	
6. Standard error of estimate	.35	.32	
	(1a)	(2a)	(2b)
	Seasonal dummies	Seasonal dummies	Seasonally adjusted ³
<u>With Seasonal Variables</u>			
7. Constant	-.08 (-.7)	-.36 (-2.9)	-.27 (-2.6)
8a. Adjustment borrowing ²	.15 (6.9)		
8b. Adjustment plus seasonal borrowing ²		.16 (8.7)	.14 (9.8)
<u>Dummy variables representing shifts</u>			
9. Summer 1984	1.44 (8.4)	1.27 (8.1)	1.40 (11.0)
10. 1986 to present	.36 (4.0)	.43 (5.1)	.42 (5.5)
<u>Summary regression statistics</u>			
11. R ² (adjusted)	.66	.73	.76
12. Standard error of estimate	.38	.34	.32
13. <u>Bi-weekly seasonal variables</u>			
1	.06	.16	
2	.30	.47*	
3	-.25	-.11	
4	.17	.30	
5	-.08	.00	
6	.08	.17	
7	.05	.10	
8	-.07	-.03	
9	-.29	-.25	
10	-.06	-.08	
11	-.07	-.11	
12	.02	-.06	
13	-.05	-.07	
14	-.11	-.19	
15	.09	.04	
16	.00	-.11	
17	.15	.02	
18	.17	.03	
19	.16	.07	
20	.08	-.01	
21	.23	.11	
22	.05	-.02	
23	-.24	-.28	
24	-.13	-.10	
25	-.16	-.11	
26	-.09	.04	
14. <u>Joint test of seasonality</u>	Not significant	Not significant	

Footnotes on next page.

*--Significantly different from zero at the 5 percent level.

1. Uses an ordinary least squares procedure. Fitted over maintenance periods between February 15, 1984 and October 7, 1987. T-values are in parentheses.
2. Coefficients represent the rise in the funds rate in percentage points associated with a rise in borrowing of \$100 million.
3. Adjustment plus seasonal borrowings were seasonally adjusted by subtracting from this sum the seasonal dummy variables estimated for seasonal borrowing alone that are reported in column 1 of table B1.

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spread to either adjustment or adjustment plus seasonal borrowing, as indicated in columns 1a and 2a in the lower panel. In these columns, seasonal influences on the inverted borrowing functions are represented directly as dummy variables. They are designed to pick up any seasonal movements in the spread that arose from the actual outcomes generated as the Desk sought to attain the FOMC's intention for adjustment plus seasonal borrowing without considering seasonality.

The regression results shown in column 2a indicate that a statistically significant seasonal influence on the spread given adjustment plus seasonal borrowing is apparent in only one maintenance period during the year, while the joint test for seasonality rejects the presence of seasonal influences on the spread over the year as a whole. Reflecting the lack of significant seasonality, the inclusion of seasonal dummies has an adverse effect on the goodness of fit, with the standard error of the estimate and the adjusted R^2 (rows 11 and 12) being worse than those reported in the top panel for column 2 (rows 5 and 6). For column 1a, no significant seasonality in the relation of the spread to adjustment borrowing alone is indicated for the maintenance periods either individually or jointly.

The lower-panel results in column 2b are designed to test whether adjustments to the FOMC's basic intention for borrowing to take account of estimated seasonal influences

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would produce a more predictable funds rate than current procedures as represented by column 2 in the top panel. Column 2b in the lower panel represents an alternative method for taking seasonality into account in the inverted function for adjustment plus seasonal borrowing. This column seasonally adjusts the sum of adjustment and seasonal borrowing by subtracting from this sum the seasonal factors estimated for seasonal borrowing alone that are shown in column 1 of table B1.³ These results are intended to represent the predictability of the funds rate if the intended borrowing target were adjusted period-to-period for the estimated influence of seasonality in seasonal borrowings.⁴

This alternative approach of adjusting borrowings for estimated seasonal influences does little to improve the predictability of the funds rate spread shown in column 2 in the top panel, which ignores seasonality. Neither the standard error of estimate nor the adjusted R^2 is much affected by adjusting the sum of adjustment plus seasonal borrowings for estimated seasonal influences. Overall, then, these

3. This regression procedure is analogous to that employed in column 2 of table B2 in the sense that the seasonal dummies in that regression were forced to take on the values of seasonal dummies estimated in the seasonal borrowing equation.

4. It might be noted that using seasonal factors estimated over the entire period of fit for seasonal borrowing provides more information in the exercise than in fact would have been available to the Desk in operations going through this period, and hence biases the results in favor of this alternative procedure.

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regressions show little evidence of seasonal influences on the spread given the level of adjustment plus seasonal borrowing.