Reserve Banks, the Discount Rate Recommendation, and FOMC Policy

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The boards of directors of the 12 District Reserve Banks are the rare private citizens who play a role in government decisionmaking. Although the nine business, labor, financial, and community leaders on each local board do not directly set policy, they do recommend changes in the discount rate to the Board of Governors. On the surface their role in monetary policy deliberations is only advisory; however, their influence could, in fact, be substantially more significant if they actually affect the FOMC votes of their respective Reserve Bank presidents. This paper examines this more significant link to monetary policy by testing the relationship between the discount rate recommendation of the Reserve Bank's board and the vote of that District's Bank president at the FOMC. It is shown that the FOMC votes of Reserve Bank presidents are significantly correlated with their board of directors' current discount rate recommendation.

Given the different responsibilities of the District board and the Bank president, it is entirely possible that the president's vote at the FOMC differs from the discount rate recommendation of the local board. De jure, each Reserve Bank's board of directors must make a discount rate recommendation to the Board of Governors every two weeks. At the eight FOMC meetings each year, the Reserve Bank president decides on his or her own view of the proper course for monetary policy. There is no legal reason the two should conform. De facto, however, it is unclear whether, or by how much, the local board's discount rate recommendation influences the president's FOMC deliberations, or whether, and by how much, the District president influences the local board's discount rate recommendation. This paper presents evidence that the two decisions are made separately but that the discount rate recommendation does help explain the president's FOMC vote.

The determinants of the local board's discount rate recommendation may differ from those of the president's FOMC vote for several reasons. The local boards may have concerns and perspectives that differ from those of FOMC members or even their own president. For example, the District board may disproportionately weight its region's economic performance, while its president may have a stronger national focus. McNees (1993) shows that the discount rate recommendation of most local boards is based on national conditions, but that several boards also rely on regional performance, while Tootell (1991) finds that District presidents do not vote at the FOMC based on the economic conditions in their regions. It is also possible that the District banks' boards of directors have different national goals than members of the FOMC; these boards may have a different view on the relative costs of inflation and unemployment. Finally, the forecasts could differ systematically. Any one of these reasons could produce a schism between the discount rate recommendation of the local board and the FOMC votes of its Bank's president.

On the other hand, there are several reasons why the two decisions should be highly correlated. On one level, the discount rate recommendations should help predict the Bank presidents' FOMC votes, since both the local boards and the Bank presidents react to national economic conditions. It is shown, however, that the macro variables thought to be significant determinants of FOMC behavior do not explain all of the correlation between a Reserve Bank's discount rate recommendation and its president's FOMC vote. Alternatively, the two policy moves could be correlated because either the board or the president is, essentially, making both decisions. The evidence, however, suggests that the two decisions are made separately. Finally, the

District presidents and their boards may tend to agree with each other on monetary policy, and disagree with the rest of the Federal Reserve System, either because they share an outlook for the economy that differs from the rest of the FOMC, because they share goals different from those of the FOMC, or because they use a different model than the FOMC to analyze the data. All three of these explanations are explored in this paper.

The next section briefly describes the data. Section II then examines the correlation between the local board's discount rate recommendation and the Bank president's FOMC vote. It is shown that the discount rate vote contains information not seen in the national or regional data, and no obvious omitted variable accounts for this result. The third section examines other possible sources of the discount rate recommendation's effect on the presidents' FOMC votes. Section IV concludes.

I. The Data

The FOMC votes of District presidents and the discount rate recommendations of the regional boards from 1974 to 1991 are merged with data describing the current and expected future state of the economy. The data on the discount rate recommendation for each Bank, retrieved from the discount rate minutes of the Federal Reserve, go back to 1974. The expectations of the District presidents and their boards are instrumented for, using the forecasts of the Federal Reserve Board staff which are circulated immediately prior to every FOMC meeting in the "Green Book"; these forecasts become available to the public only with a five-year lag. The FOMC votes were recovered from the minutes of the FOMC meetings, published approximately six weeks after each meeting. These minutes outline the policy adopted and the vote of each FOMC

member on that action. When a member dissents from the chosen policy, the dissent is explained and the desired policy articulated. At any one meeting seven governors and five presidents are permitted to vote, so in general 12 votes are registered at each meeting. Since the vote is either to tighten policy, loosen it, or keep it constant, the dependent variable is discrete and trichotomous. Thus, votes provide only the direction of policy, not its strength; for example, a small move to tighten cannot be distinguished from a more aggressive one.

Several problems exist when merging a Bank president's FOMC voting data with his or her Board's discount rate recommendations. The discount rate recommendations are updated every two weeks. The FOMC, on the other hand, met roughly once a month prior to 1980 and has met eight times a year since. The higher frequency of the discount rate series must be altered to conform to the FOMC frequency. Since this paper examines the effect of the discount rate recommendation on the FOMC vote, only the discount rate recommendation that is in at the time of the FOMC meeting is analyzed. Discount rate recommendations during periods when the District Bank president is not a voting member of the FOMC are also dropped from the sample. Although a discount rate recommendation is in whether the District president is currently a voting member or not, the president's reaction to that recommendation cannot be analyzed unless he or she is a voting member of the FOMC.

The discount rate recommendations and the FOMC votes should, in general, be highly correlated, since the Reserve Banks' boards and members of the FOMC are reacting, at least in part, to the same economy. Both the votes and the recommendations are examined here as a function of the current and expected state of the economy. The forecasted variables from the Green Book include

the path of GDP and its components, as well as the unemployment rate and various measures of inflation.[1] Lagged values of the target variables are also examined, to ensure that the results are not an artifact of imposing forward-looking behavior on all the policymakers. Any remaining correlation between the FOMC votes of the District presidents and the discount rate recommendations of their boards should be, thus, independent of the current and expected state of the macro economy.

III. Discount Rate Recommendations and FOMC Votes

The presidents' voting function is estimated as a multinomial logit, since the dependent variable is a trichotomous and discrete. All 12 Reserve Banks are pooled in the analysis, although this constraint is relaxed a bit later. The discount rate recommendation is also transformed into a trichotomous discrete variable equal to -1 if the local board advocates a reduction in the discount rate, zero if it advocates no change in the rate, and 1 if it advocates an increase in the rate, which makes it analogous to the presidents' FOMC votes.[2]

The coefficients from a regression of the Reserve Bank presidents' FOMC votes on a constant and their respective boards' discount rate recommendations are presented in the first column of Table I. The top panel measures the effect of the discount rate recommendation on the probability of the president voting for a tightening relative to the probability of voting for a no change in policy, while the bottom panel presents the estimate of the effect of the recommendation on the probability of the president voting for a loosening relative to the probability of voting for a no change in policy. The coefficients on the discount rate recommendation reveal that the president's

vote at the FOMC is highly correlated with the discount rate recommendation in at the time of the FOMC meeting. A Bank president is much more likely to vote for a tightening, and much less likely to vote for a loosening, the more restrictive is the local board's discount rate recommendation.

As mentioned earlier, the two decisions should be correlated since both the local boards of directors and the District presidents are reacting to the same economic variables. Similar expectations about the same macro targets could be driving both the discount rate recommendation and the FOMC vote. To account for these expectations, column 2 of Table I includes in the regression the Board staff forecasts for real GNP growth and inflation. This specification assumes the FOMC is targeting nominal GNP.

The discount rate recommendation remains a significant determinant of the president's FOMC vote even after controlling for the expected state of the economy. The forecasted variables have the expected effect on the FOMC votes of the presidents. High inflation significantly increases the probability of tightening, and rapid real output growth significantly lowers the probability of loosening. The Green Book forecasts should incorporate all the relevant information available about the future course of the economy. Thus, if the local board's discount rate recommendation and the bank president's FOMC vote were merely reacting independently to the same economic data, then the discount rate recommendation should add no information to the equation explaining the FOMC votes. Inclusion of these forecasts, however, only slightly reduces the correlation between the discount rate recommendation and the District president's FOMC vote; the local board's discount rate recommendation is still statistically and economically significant in predicting the District president's vote at the FOMC.

The significance of the discount rate recommendation does not seem to arise from a misspecification of the equation. In column 3, the coefficients from a less parsimonious specification, again, show that the discount rate recommendation of each Bank's board is significantly related to the FOMC vote of that Bank's president. Money growth and the forecasted unemployment rate are added to the simple nominal GNP targeting rule. The inclusion of the money variable makes sense if some District presidents believe it is a good predictor of future inflation, or if some presidents use monetarist models. The unemployment rate should be included if it, rather than real GNP growth, is in the Bank president's objective functions. The coefficients on the economic variables in column 3 are also, for the most part, significant and correctly signed. In general, higher expected real growth, higher forecasted inflation, and lower expected unemployment increase the probability that the FOMC will vote to tighten policy and decrease the probability that it will vote to loosen policy. The coefficients on the discount rate recommendation remain large and statistically significant. Adding other variables to the FOMC voting function seems to have little effect on the size or significance of the coefficient on the discount rate recommendation.

The specifications in Table I are, however, clearly not exhaustive, and a possible misspecification could still be causing the significance of the discount rate recommendation. One possibility is that the FOMC is not only forward-looking but also backward-looking, and the discount rate recommendation is capturing the effect of an omitted backward-looking variable. Alternatively, the FOMC might look farther out than one quarter ahead; if so, the omission of both backward-looking and more forward-looking variables might explain the significance of the discount rate recommendation.

Finally, some other macro variable may still be missing from the analysis. Each of these hypotheses will be examined in turn.

Different Forecast Horizon

The one-quarter-ahead forecast may be missing an important dynamic element of the economy. For example, policymakers do not care just about the economy's performance next quarter but the performance of the economy in general. One way to capture this longer-run performance is to include either lagged data or longer-horizon forecasts. If this dynamic element is important, the discount rate recommendation in the voting functions estimated in Table I could be picking up the effect of these omitted variables.

Table II explores the effects of altering the forecast horizon in the voting function. The specification in the first two equations is similar to that in column 3 of Table I, except now backward-looking data on the unemployment rate and the core inflation rate are included. The first column of Table II suggest that the presidents do react to backward-looking variables when deciding on their FOMC vote. The lagged unemployment rate is significant and correctly signed; higher lagged unemployment significantly decreases the probability that the presidents will vote for a tightening. Lagged inflation is never significant, although it is always correctly signed; the collinearity of the lagged and forecasted inflation measures makes it difficult to distinguish the effects of backward- and forward-looking inflation.[3]

Thus, it is possible that the significance of the discount rate recommendation in the equations in Table I is accounted for by the omission of lagged data. Equation 2 tests this hypothesis by including the discount rate recommendation in the equation including backward-looking variables. The coefficients on the discount rate recommendation of the Bank's board are still

large and statistically significant beyond the 1 percent level. The omission of the lagged variables does not explain the significance of the recommendation.

Altering the specification to include forecasts as far as one year out does not affect the importance of the discount rate recommendation in the presidents' FOMC vote. In column 3, the forecasts of real GNP growth and inflation over the next six months and the six months after that are included, along with the backward-looking variables, in the Bank presidents' voting functions. As discussed in Tootell (1997), this specification smooths out the quarterly noise in the forecast while examining the reaction to a forecast one year out. The coefficient estimates presented in column 3 reveal that the longer-run forecasts are important. Lagged inflation is never significant, although the long-run forecasted inflation rate is. More forward-looking GDP forecasts are also significant. However, including all of these variables has little effect on the strength of the relationship between the local board's discount rate recommendation and that bank president's FOMC vote. The importance of the discount rate recommendation in the president's FOMC vote does not appear to be an artifact of the exact specification of the forward-looking nature of the District presidents.

Omitted Macro Variables

Although the forecasts should incorporate all the relevant macro information, and the ultimate goals of monetary policy seem to be relatively few and agreed upon, some omitted macro variable may still exist that is causing the discount rate recommendations and the presidents' FOMC votes to move together. One approach to testing for omitted macro variables is to examine the effects on Fed policy of a wide range of potential candidates, as

is done in McNees (1986, 1992). Since the final specification in McNees (1992) looks very much like the specifications examined here, this approach will not be pursued. As an alternative, the coincidence of discount rate recommendations across Districts is examined. If serious omitted macro variables exist, agreement on their macro effects should be widespread, and the discount rate recommendations should be highly correlated both across District Banks and with actual FOMC policy changes.

In fact, most discount rate changes were advocated without widespread agreement across the different Reserve Bank boards of directors, or widespread agreement with the majority of the FOMC. Over 50 percent of all recommended changes in the discount rate were not followed by an FOMC policy change in the recommended direction. When the discount rate recommendation did forecast FOMC policy changes, much of the coincidence could be accounted for by the current and expected state of the economy captured by the economic variables examined in the previous tables. Furthermore, when at least one recommendation to change the discount rate was in, on average the total number of banks in with a recommendation for change was only three. A majority of the time, the FOMC policy overall did not seem to agree with the recommended change in the discount rate, nor did the other banks' boards, which suggests that a pressing omitted macro event probably does not constitute much of the effect of the recommendation on the FOMC vote.

Further, if an omitted variable was driving every Reserve Bank's recommendation in a similar direction, then the correlation across Banks of the residual from a regression of the discount rate recommendation on the included macro variables should be high. The average correlation across Banks of this residual is 0.33, and the average multiple correlation of one Bank's

residuals with all Banks is 0.42.[4] The relationship is positive, as would be expected if omitted macro variables explained the discount rate's importance in the voting equation. However, the correlation is not very high. Most of the movement of the discount rate recommendation unaccounted for by the economic data in these voting functions is not explained by the behavior of the other Reserve Banks' residuals; it appears to be largely idiosyncratic, not shared.

Yet, the District presidents responded to the idiosyncratic recommendations; the local board's discount rate recommendation and the corresponding president's FOMC vote did not coincide only when the rest of the FOMC concurred with the recommendation. Bank presidents dissented about 20 percent of the time when their bank had a recommendation for a change in and the FOMC did not change policy in that direction, which is a much higher frequency than the average dissent rate of 6 percent. In fact, almost 50 percent of all dissents by presidents occurred when their board also had a discount rate request in for a policy change different from the policy taken by the FOMC. The importance of the discount rate recommendation, even when the FOMC disagreed with it, suggests that the results are not driven by an omitted macro variable.

The correlation of the local board's discount rate recommendation with its president's FOMC vote does not seem to be due to macro variables omitted from the analysis. Not only should the forecasts capture most relevant macro events, but neither the discount rate recommendations nor the unexplained part of the recommendations are highly correlated across districts. It appears that some shared perspective of the local board and the District president is affecting the FOMC votes of the Bank presidents. The next section examines

the possible nature of this shared perspective.

IV. The Nature of the Idiosyncratic Information

Although the local board's discount rate recommendation helps predict its president's FOMC vote, the nature of the link is not immediately clear. Certainly there is no necessary correspondence between the two, as the Regional boards can recommend any discount rate move they want and the District presidents can vote any way they wish at FOMC. However, several explanations for the correlation are possible. First, one can simply interpret the correlation as the local board recommendation directly affecting the president's FOMC vote.[5] Alternatively, the reverse could be true; the president could be influencing the discount rate recommendation of the local board. The discount rate recommendation might simply reveal the president's intention before he or she gets to the FOMC. Finally, the correlation may be picking up a joint effect on both the president and the local board's outlook, which may differ from that of the rest of the FOMC; a District president's view of the economy, goals, or model may have more in common with his or her board of directors than with the rest of the FOMC. Any or all three of these explanations could be responsible for the correlation between the discount rate recommendation and the District president's FOMC vote. Which of the above three explanations is more likely is examined below.

Are the District Boards and Presidents Independent?

If the District board reacts differently to the economy when determining its recommendation for the discount rate than the District president does when formulating his or her FOMC vote, then the two decisions would appear to be separate and independent. If, for example, the president determines both the

discount rate recommendation and the FOMC vote, the determinants of both decisions would be identical. Table 3 examines the similarity between these two decisions by modeling the discount rate recommendation as a dependent variable. The discount rate variable is constructed to be comparable to that of the FOMC vote; thus, the top panel provides the estimated effects of the macro variables on the local boards' probability of recommending an increase in the discount rate relative to a recommendation of no change, and the bottom panel gives the coefficients for the same variables' effects on the probability of these boards recommending a decrease in the discount rate relative to a recommendation of no change in that rate.

The first equation in Table 3 estimates the monetary policy stance of both the presidents and the local boards when the coefficients on the determinants of both the discount rate recommendation and the FOMC vote are constrained to be identical. The dependent variable in Column 1 is the monetary policy vote of either the presidents at the FOMC or the desired discount rate move of the local board. Essentially, the vote of a president for tighter policy is marked the same as the recommendation of the local board for a higher discount rate. Equations 2 and 3 present the coefficients from the unconstrained estimation, where the coefficients are allowed to vary between the two decisions. The coefficient estimates presented in columns 2 and 3 suggest that the two decisions depend on the same variables. Yet, it can be rejected well beyond the 1 percent level that the two sets of coefficients are the same. The dissimilarity of the coefficients holds even when the constant terms are allowed to differ, which captures the potentially higher flexibility in the federal funds rate.[6]

Interactive effects, between the economic variables and a dummy variable

indicating whether the decision being made is by the local board, are presented in column 4, in an attempt to uncover the source of the difference between the presidents' and the local boards' policy reactions. In general, it appears that the local boards may be more reactive to the real economy and more backward-looking than the District presidents; the local boards respond much more strongly to the lagged unemployment rate and tend to react more strongly to expected real growth. There is also some evidence that the local boards are more averse to inflation. The results in Table 3 demonstrate that presidents react differently to the state of the economy than their local boards, which suggests that the discount rate recommendation is not simply foreshadowing the president's desires, nor is the president simply responding to the local board's wishes.

Regional Information

Although the two decisions appear to be somewhat independent, the marginal predictive power of the discount rate recommendation on the president's FOMC vote suggests significant interrelation. There are several reasons why the policy desires of the president and the local board might coincide while differing with the FOMC as a whole. The most obvious such reason is that they both weight their District's economic performance more than its share in GDP. Tootell (1991) examined the role played by regional economic indicators in the FOMC voting of District presidents and found that regional economic conditions, as measured by employment growth and the unemployment rate in the District, added no marginal explanatory power to the national data. McNees (1993), however, found that regional economic indicators did affect the discount rate recommendation of some local boards. Some evidence suggests that region-specific economic information affects the

votes of some local boards, but there is little evidence that these effects spill over into the FOMC votes of the presidents.

Table IV merges these two findings by analyzing the role of regional employment growth, the best available indicator of the regional economy, on the formation of monetary policy. The first two equations estimate the effect of the Reserve District's regional employment growth on the local board's discount rate recommendation. Regional employment growth is not significant, whether its national counterpart is included in the analysis or not. It appears that, on the whole, local boards do not determine their discount rate recommendations on the basis of how well the regional economy is doing. The next two equations examine the effect of the local economy on the District president's FOMC vote. When only the regional variable is added, it appears to play a marginal role. However, when national employment growth is also included, the evidence suggests that the District presidents pay attention to the macro, rather than the regional, data. This result is robust to different specifications and consistent with the findings in Tootell (1991). More important for this study, column 5 of Table IV shows that the partial correlation of the discount rate recommendation with the FOMC vote of that District Bank's president is unaffected by the inclusion in the analysis of the region's economic performance. The correlation between the discount rate recommendation and the president's FOMC vote is not due to omitting regional economic performance from the analysis.

The two decisions appear to be fairly independent, and neither group appears to be responding to region-specific economic conditions; however, regional information in a broader sense may explain the correlation. One possibility is that each Reserve Bank has different models or different goals

from the rest of the FOMC. For example, the St.Louis Reserve Bank has a monetarist outlook, while Cleveland tends to have a strong distaste for inflation. Since the local board of directors plays an important role in the selection of the Reserve Bank president, agreement about the economic model and the appropriate goals for monetary policy between the local board and the president may explain why their monetary policy reactions are partially correlated, yet can be somewhat different from those of the other FOMC members.

To capture the effect of potential differences in goals, individual bank dummy variables were included in the regression. The constant term is a linear combination of the coefficient estimates and the goals; thus, different goals could be revealed as different constant terms. Allowing the constants to differ among the District banks has no effect on the results; the discount rate recommendation of the local board continues to have a strong effect on the Reserve bank's president even when a dummy variable for each bank is included. To capture the possible effects of variation in the model used across banks, the most distinctive model difference is examined - whether or not the bank is monetarist. The coefficient on money is allowed to differ for the monetarist banks. Allowing this coefficient to vary fails to account for the size or significance of the coefficient on the discount rate recommendation. Differences in the Banks' goals or models do not seem to be the answer.

It is also possible that the outlook for the national economy could depend on the region. The national forecast could differ because of region-specific experience not associated directly with its economic performance. In this case, the Green Book forecasts would be missing the shadings of the

outlook which depend on the region in which the policymaker lives. The credit crunch in New England in the early 1990s, as examined in Peek and Rosengren (1995), is one possible example of how the national outlook can depend on the region. The credit crunch had the potential to expand to the rest of the country. Any District where real estate values were weak was subject to the shock. It is possible that the assessment of the probabilities that this effect would spread, and the assessment of the consequences if it did, may have been more dire in New England. Thus, both the local board and the Bank president at the FOMC may have been more negative about the national economy than the green book forecasts and the rest of the FOMC.

If these different outlooks are the explanation, other members of the FOMC might find another region's, or another Bank's, shading on the forecast compelling. Sticking to the credit crunch example, other regions where real estate values were falling may also have found reservations about the economy based on the possible effect of the credit constraints more sympathetic. In this way, idiosyncratic differences about the national outlook could influence other FOMC members. This influence is measured in Table 5. The effect of each Bank's discount rate recommendation on the FOMC vote of the other FOMC members, when the state of the economy and the discount rate recommendation of that Bank are also taken into account, is shown. For concision, Table 5 presents only the coefficients measuring the effect of each Bank's discount rate recommendation on all the other FOMC members.

The recommendations of local boards often do affect the other members of the FOMC, as would be true if the Banks brought information to the meeting that the other FOMC members found persuasive. Ten of 24 such coefficients are correctly signed and statistically significant beyond the 10 percent level.

For example, the discount rate recommendation from New York affects the FOMC votes of the other members. New York's effect could be due to capital market information that many of the Bank presidents found important to the shading of the national outlook. The different outlooks or information could be the source of the partial correlation between the discount rate recommendation and the president's FOMC vote - their persuasiveness at the FOMC highlights their value to the FOMC as a whole.

IV. Conclusion

A District's discount rate recommendation is clearly a powerful signal for that Reserve Bank president's FOMC vote. Although the discount rate recommendation does depend on many of the same macro variables as the FOMC vote, it adds marginal predictive power for the FOMC vote beyond these macro variables. Yet, the discount rate recommendation is not simply the District president telegraphing his or her punch, and the FOMC vote is not the president simply following orders from his or her local board, since the determinants of the two decisions are significantly different. The correlation seems to derive from idiosyncratic information, not related to the macro forecasts in the Green Book, but shared at the regional level. Different information appears to be emphasized in the different regions, and there is some evidence that the FOMC as a whole finds this information useful.

The implications for monetary policy are important. If national monetary policy were being influenced by concerns about the local economy, or private interests, policy would be suboptimal. There is little evidence that local conditions in these regions overly affect presidents' votes at FOMC. The meeting of the local boards and District presidents does seem to affect

the presidents' FOMC votes, and that effect could be beneficial if the different votes represent the presentation of different information, points of view, or forecasts at the FOMC. In fact, there is evidence that the discount rate recommendations of Banks, which are related to idiosyncratic information at the District level, often affect the votes of the other FOMC members. In this way, the presentation of different perspectives at the FOMC would justify its structure as a committee including representation from different regions.

Endnotes

1. The local boards of directors do not have access to the Green Book forecasts. Nonetheless, the Green Book projections are used as instruments for more widely available market forecasts. The same results occur if DRI forecasts are used. Any potential informational advantage would bias the results toward rejecting that the local board's discount rate recommendation had a partial correlation with the president's FOMC vote.

2. The discount rate recommendation is transformed this way for two reasons. First, the recommendations tend to be fairly discontinuous anyway; they take on values in 25-basis-point multiples from 100 to -100. Also, it will be useful later to have the discount rate recommendation and the FOMC vote in comparable form. As defined, as the variable increases, the probability of the president voting for a tightening should rise and his or her probability of voting for a loosening should fall.

3. The collinearity between the unemployment rate known at the time of the meeting and the forecasted rate next quarter is so high, only the lagged rate is included in the regressions in Table 2. This specification is discussed in further detail later in the paper.

4. The regressions that formed the basis for the residuals were estimated slightly differently from those shown in the tables. Instead of a multinomial regression, the probability of an increase was estimated as a binomial logit, as was the probability of a decrease. This avoids the problem of ordering the realizations. The residual here is whether a discount rate recommendation change is in, minus the predicted probability of the change being in. Note that since the dependent variable is not continuous, the residuals can take on only two values, given the coefficient estimates and the values of the explanatory variables, but measuring the residuals in this way is one approach to examining the correlation across the Banks of any omitted variable.

5. Note that recommendations for the discount rate affect the discount rate only if the Board of Governors approves the recommendation. Similarly, votes by District presidents could be dissents rather than in the majority, suggesting that monetary policy might not be affected.

6. It is certainly arguable that the federal funds rate and the discount rate serve two different functions, so their determinants should be different. However, it is not clear that the District Bank boards of directors are constrained by the different functions of these two rates. Specifically, these boards are likely to consider their recommendations as a signal for their desired federal funds rate changes. Since the Board of Governors must actually change the discount rate, the constraints caused by the nuances of the rates' different functions may be left for the Board of Governors to grapple with.

Table I
Discount Rate Recommendations and FOMC Voting

	(1)	(2)	(3)
Tightening[a]			
C	-1.15 (-12.40)	-1.83 (-6.06)	-1.13 (-1.82)
Q^E		0.01 (0.42)	0.02 (0.78)
P^E		0.11 (2.60)	0.11 (2.58)
UR^E			-0.19 (-2.37)
M			0.07 (3.85)
Discount Rate Recommendation	1.47 (6.50)	1.38 (6.04)	1.31 (5.66)
Loosening[a]			
C	-1.51 (-14.20)	-1.23 (-3.48)	-0.53 (-0.83)
Q^E		-0.13 (-4.19)	-0.12 (-3.85)
P^E		-0.007 (-0.13)	-0.05 (-0.86)
UR^E			0.02 (0.22)
M			-0.10 (-3.98)
Discount Rate Recommendation	-1.28 (-5.17)	-1.30 (-5.02)	-1.29 (-4.83)
Log of Likelihood	-728.6	-713.0	-693.0
Observations	838	838	838

[a] Q^E, P^E, and UR^E are 1-quarter-ahead Green Book forecasts of output growth, inflation and unemployment. M refers to lagged 3-month average of M1 growth.

Table II
FOMC Voting: Effect of Backward Looking Variables

Dependent Variable	President's FOMC Vote	President's FOMC Vote	President's FOMC Vote
Tightening[a]			
C	-0.63 (-1.03)	-1.11 (-1.76)	-1.37 (-1.81)
Q^E	0.05 (1.78)	0.03 (1.16)	
QH1			-0.04 (-0.75)
QH2			0.31 (4.12)
P^E	0.08 (1.50)	0.05 (0.86)	
PH1			0.13 (1.04)
PH2			0.01 (0.09)
M	0.09 (4.49)	0.08 (4.01)	0.09 (4.32)
URL	-0.32 (-3.70)	-0.22 (-2.55)	-0.41 (-3.90)
CORE	0.11 (1.73)	0.11 (1.73)	0.14 (1.77)
Discount Rate Recommendations		1.27 (5.34)	1.42 (5.66)
Loosening[a]			
C	-0.66 (-1.04)	-0.67 (-1.03)	1.56 (1.83)
Q^E	-0.13 (-4.12)	-0.12 (-3.87)	
QH1			-0.33 (-5.62)
QH2			0.05 (0.58)
P^E	-0.04 (-0.53)	-0.02 (-0.28)	

Table 2
(Continued)

Dependent Variable	President's FOMC Vote	President's FOMC Vote	President's FOMC Vote
Loosening			
PH1			0.15
			(1.08)
PH2			-0.53
			(-2.83)
M	-0.11	-0.10	-0.11
	(-4.31)	(-4.02)	(-4.06)
URL	0.09	0.04	0.02
	(1.15)	(0.53)	(0.20)
CORE	-0.06	-0.04	-0.03
	(-0.84)	(-0.57)	(-0.34)
Discount Rate Recommendation		-1.28	-1.08
		(-4.79)	(-3.93)
Log of Likelihood	-723.8	-691.6	-655.3
Observations	838	838	838

[a] Q^E and P^E are 1-quarter-ahead Green Book forecasts of output growth, inflation. QH1 and PH1 are the Green Book forecasts of output growth and inflation over the next 6 months. QH2 and PH2 are the Green Book forecasts of output growth and inflation over the 6 months starting six months from now. M is the lagged 3-month average of M1 growth. URL is the lagged unemployment rate. CORE refers to the lagged 3-month change of the core CPI.

Table III
Similarity of Discount Rate and FOMC Vote

Dependent Variable	Monetary Policy Vote	Board's Discount Rate Recommendation	President's FOMC Votes	Monetary Policy Vote
Tightening[a]	(1)	(2)	(3)	(4)
C	-0.53	1.17	-0.78	-0.31
	(-1.08)	(1.20)	(-1.30)	(-0.61)
Q^E	0.07	0.16	0.04	0.04
	(3.36)	(3.65)	(1.45)	(1.43)
P^E	0.15	0.19	0.14	0.12
	(4.75)	(3.43)	(3.56)	(3.31)
M	0.08	0.08	0.08	0.08
	(5.22)	(2.82)	(4.25)	(4.25)
URL	-0.39	-0.84	-0.27	-0.32
	(-5.78)	(-5.47)	(-3.38)	(-4.44)
Q^E*DRR				0.11
				(2.15)
P^E*DRR				0.10
				(1.64)
M*DRR				-0.006
				(-0.17)
URL*DRR				0.32
				(-3.83)
Loosening[a]				
C	-1.31	-2.33	-0.56	-1.22
	(-2.70)	(-2.93)	(-0.89)	(-2.48)
Q^E	-0.10	-0.06	-0.13	-0.12
	(-4.18)	(-1.55)	(-4.10)	(-3.94)
P^E	-0.12	-0.20	-0.07	-0.04
	(-2.77)	(-2.69)	(-1.38)	(-0.86)
M	-0.09	-0.07	-0.10	-0.10
	(-4.86)	(-2.35)	(-4.26)	(-4.24)
URL	0.13	0.25	0.07	0.13
	(2.23)	(2.54)	(0.91)	(1.99)
Q^E*DRR				0.05
				(0.97)
P^E*DRR				-0.22
				(-2.74)
M*DRR				0.03
				(0.90)
URL*DRR				0.009
				(0.11)
Log of Likelihood	-1239.7	-451.1	-726.0	-1180.5
Observations	1676	838	838	1676

[a] Q^E, P^E are the 1-quarter-ahead Green Book forecasts of output growth and inflation. M is the lagged 3-month average of M1 growth. URL is the lagged unemployment rate. DRR = 1 if the policy is a discount rate recommendation and zero if the policy is the FOMC vote.

Table IV
Regional Information and Monetary Policy

Dependent Variable	Discount Rate Recommendation	Discount Rate Recommendation	FOMC Vote	FOMC Vote	FOMC Vote
Tightening[a]					
C	1.46	1.34	-2.09	-2.51	-3.05
	(1.31)	(1.12)	(-2.85)	(-3.11)	(-3.68)
Q^E	0.16	0.16	0.02	0.006	-0.02
	(3.64)	(3.49)	(0.56)	(0.20)	(-0.50)
P^E	0.19	0.19	0.15	0.15	0.12
	(3.46)	(3.44)	(3.62)	(3.65)	(2.73)
M	0.08	0.08	0.08	0.08	0.07
	(2.87)	(2.80)	(4.10)	(4.00)	(3.60)
URL	-0.88	-0.87	-0.11	-0.07	0.03
	(-5.13)	(-4.87)	(-1.23)	(-0.73)	(0.32)
Regional Employment growth	-0.03	-0.05	0.15	0.09	0.11
	(-0.54)	(-0.57)	(3.40)	(1.60)	(1.81)
National Employment growth		0.03		0.12	0.11
		(0.27)		(1.36)	(1.26)
Discount Rate Recommendation					1.29
					(5.39)
Loosening[a]					
C	-1.81	-1.27	-0.89	-0.81	-0.96
	(-2.05)	(-1.37)	(-1.26)	(-1.07)	(-1.23)
Q^E	-0.05	-0.04	-0.14	-0.13	-0.13
	(-1.29)	(-0.99)	(-4.15)	(-3.98)	(-3.86)
P^E	-0.20	-0.20	-0.07	-0.07	-0.05
	(-2.71)	(-2.75)	(-1.36)	(-1.32)	(-0.84)
M	-0.07	-0.06	-0.10	-0.10	-0.10
	(-2.28)	(-2.15)	(-4.28)	(-4.25)	(-4.01)
URL	0.18	0.13	0.11	0.10	0.07
	(1.65)	(1.09)	(1.25)	(1.07)	(0.75)
Regional Employment growth	-0.07	0.03	0.04	0.05	0.05
	(-1.19)	(0.35)	(0.85)	(0.84)	(0.79)
National Employment growth		-0.20		-0.03	-0.007
		(-1.66)		(-0.34)	(-0.07)
Discount Rate Recommendation					-1.29
					(-4.83)
Log of Likelihood	-450.3	-448.9	-720.0	-718.9	-686.1
Observations	838	838	838	838	838

[a] Q^E and P^E are the 1-quarter-ahead Green Book forecasts of real output growth and inflation. M is the lagged 3-month average of M1 growth. URL refers to the lagged unemployment rate.

Table V
Effect of Discount Rate Recommendations on other FOMC members

	Tightening[a]	Loosening[a]
Boston Recommendation's effect on rest of FOMC	0.67 (2.38)	-0.19 (-0.59)
New York Recommendation's effect on rest of FOMC	1.12 (4.33)	-0.64 (-1.99)
Philadelphia Recommendation's effect on rest of FOMC	-0.58 (-1.99)	0.23 (0.62)
Cleveland Recommendation's effect on rest of FOMC	-0.52 (-2.46)	-1.79 (-5.78)
Richmond Recommendation's effect on rest of FOMC	-0.83 (-3.07)	-0.40 (-1.16)
Atlanta Recommendation's effect on rest of FOMC	0.76 (3.61)	0.78 (2.48)
Chicago Recommendation's effect on rest of FOMC	-0.41 (-1.86)	0.22 (0.95)
St. Louis Recommendation's effect on rest of FOMC	0.85 (3.67)	0.38 (1.06)
Minneapolis Recommendation's effect on rest of FOMC	0.69 (2.56)	-2.10 (-7.31)
Kansas City Recommendation's effect on rest of FOMC	-0.62 (-2.19)	0.68 (2.43)
Dallas Recommendation's effect on rest of FOMC	0.06 (0.30)	-0.39 (-1.68)
San Francisco Recommendation's effect on rest of FOMC	0.26 (1.28)	-0.74 (-3.47)
Log of Likelihood		-1278.4
Observations		1761

[a] The coefficients for the other variables have not been included for brevity. The Discount Rate variables rise as the recommendation moves toward tighter policy.

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