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PARTISAN MONETARY POLICIES: PRESIDENTIAL INFLUENCE THROUGH THE POWER OF APPOINTMENT*

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We investigate the channels through which partisan influence from a Presidential administration could affect monetary policy-making. Influence could be a result of direct Presidential pressure exerted on members of the Federal Open Market Committee (FOMC), or it could be a result of partisan considerations in Presidential appointments to the Board of Governors. To investigate these two channels of influence, we devise and apply a method for estimating parameters of monetary policy reaction functions that can vary across individual members of the FOMC Our results suggest that the appointments process is the primary mechanism by which partisan differences in monetary policies arise.

The behavior of the Federal Reserve has often been modeled using monetary policy reaction functions, which empirically link a policy instrument, perhaps an interest rate or a monetary aggregate, to economic goal variables like inflation, output growth, and unemployment. Under the assumption of a stable macroeconomic structure, estimated reaction function coefficients reveal information about the weights the Fed attaches to the various goal variables. More generally, reaction functions conveniently describe the implicit policy rule the Fed has followed over a given sample period.[1]

Reaction functions have also been used to investigate the role of political forces on monetary policies. Some findings support the existence of a political business cycle pattern in which monetary

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1 Dewald and Johnson [1963], Reuber [1964], and Wood [1967] provide early applications of the reaction function technique Abrams, Froyen, and Waud [1980] introduce methodological extensions that have been widely adopted and are useful in our work Barth, Sickles, and Wiest [1982], Gildea [1985], and Khoury [1990] provide comprehensive surveys

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ease is observed before elections.[2] A somewhat stronger case can be made for the existence of partisan influences from Presidential administrations.[3] Conventional wisdom suggests that Democratic administrations prefer "easy" monetary policies, while Republican administrations prefer monetary "tightness." If Presidents can influence members of the Federal Open Market Committee (FOMC), the Fed's primary policy-making unit, then monetary policy is likely to shift with partisan changes in the Presidency. Empirical studies have modeled such partisan influences by adding a dummy variable indicating the party of the President to monetary policy reaction functions, or by estimating separate reaction functions for periods of Democratic and Republican leadership. Most studies show some systematic partisan influence.

The preceding argument assumes that a President's partisan impact on monetary policy is a result of direct influence over FOMC members,[4] but another channel of influence is also available. Members of the Fed's Board of Governors, who are FOMC members, are appointed by the President. One would expect that partisan preferences would affect the appointments process, and evidence from analyses of FOMC voting patterns supports this view.[5]

Specifications for aggregate reaction functions (i.e., those describing the behavior of the Fed as a whole) cannot easily capture partisan influences resulting from the appointments process. The seven Governors serve overlapping terms of fourteen years, so Presidents make appointments infrequently as terms expire or as Governors resign. This implies that changes in the partisan

2. See Allen [1986], Beck [1984, 1987], Grier [1989], Laney and Willett [1983], and Haynes and Stone [1989] for evidence regarding a political monetary cycle. Haynes and Stone and Grier find support for the hypothesis of pre-election stimulus, while Allen and Laney and Willett find some evidence that the Fed accommodates fiscal policy variations that are electorally timed. Beck rejects the hypothesis of a political monetary cycle. Havrilesky [1987, 1988a, 1990a, 1990b] finds support for a "public choice" model of the political business cycle, in which inter-election cycles are motivated by redistributive fiscal policies.

3. See Alesina and Sachs [1988], Beck [1984], Chappell and Keech [1986, 1988], Grier and Neiman [1987], Haynes and Stone [1989], Havrilesky [1987], and Hibbs [1987] for evidence of partisan influences on the Fed.

4. Beck [1982], Havrilesky [1988b], Kane [1980], and Weintraub [1978] have argued that Presidents have substantial influence over the Federal Reserve. Later in the paper we investigate whether Presidential signals influence policy in ways that are not systematically partisan.

5. Puckett [1984], Woolley [1984], and Havrilesky and Gildea [1992] provide evidence that Democratic appointees dissent more frequently in favor of ease, while Republican appointees dissent more frequently in favor of tightness. Other studies of dissent voting patterns include Belden [1989], Canterbery [1967], Gildea [1990], Havrilesky and Schweitzer [1990], and Yohe [1966].

makeup of the FOMC follow changes in the partisan status of the Presidential administration in a delayed, gradual, and somewhat irregular manner. Including a dummy variable for the party of the incumbent President in an aggregate reaction function is not likely to fully capture partisan influences by way of the appointments process.

In this paper we investigate the sources of partisan influence on monetary policy-making using a technique that overcomes limitations of the aggregate reaction function approach. We develop a method for estimating reaction function parameters that vary across *individual* members of the FOMC. Our estimates permit us to infer whether members are directly influenced by the partisan ideology of the *current* President, and whether they systematically differ according to the party of the President *who appointed them* If influence flows through both channels, we can assess the relative importance of the two.

Apart from its focus on the channels of partisan influence, our analysis is distinguished in three important ways from previous studies that have estimated aggregate reaction functions or analyzed FOMC voting patterns. First, our model links policy outcomes to the reaction functions of individuals serving on the FOMC. This linkage provides micro foundations for aggregate reaction functions and permits an empirical appraisal of the balance of power between the Chairman and other FOMC members. Second, by specifying variations across individuals as differences in reaction function parameters, we can control for the state of the economy and prevailing policy stances when we assess individuals' FOMC voting records. Some FOMC members may have frequently dissented favoring tightness *not* because their preferences were much different from other members, but because policy was unusually "easy" during their tenures, or because inflationary conditions warranted additional tightness. Third, the use of reaction functions permits us to interpret differences across individuals in terms of desired settings for a policy instrument. Such comparisons are more meaningful indicators of policy preferences than dissent voting frequencies are.

Our findings will also address broader macroeconomic issues. Chappell and Keech [1986, 1988] and Alesina and Sachs [1988] have proposed models in which partisan changes drive electorally timed business cycles. In these models newly elected Presidential administrations can alter the stance of monetary policy to reflect their partisan preferences. Because election outcomes are uncertain, partisan shifts in monetary policies contain surprise elements that produce business cycle fluctuations. However, if the appointments process provides the major channel of partisan influence, then shifts in monetary policies will lag the election and diminish the importance of election surprises. A finding to this effect would undermine these models of partisan political business cycles.

We begin in Section I by describing our model and the method used to estimate it. The data employed and the empirical specification are presented in Section II. Empirical results are presented in Section III, and extensions are discussed in Section IV. Section V offers conclusions.

I. A Model of FOMC Decision Making

FOMC members' votes on monetary policy directives are observable, but these votes do not directly reveal individuals' most preferred policies. As a result, previous studies have not attempted to estimate conventional policy reaction functions for individuals. Here we develop a model of FOMC decision making that permits reaction function parameters to vary across committee members and that can be estimated using available macroeconomic time series and FOMC voting records.[6] Our presentation in this section proceeds by discussing the specification of policy preferences of individual FOMC members, the linkage between those preferences and resulting policy outcomes, FOMC voting behavior, and issues associated with estimation.

A. Individuals' Reaction Functions

As in aggregate reaction function analyses, we must designate a specific variable as the policy instrument controlled by the Fed. We have chosen the Federal funds rate for that purpose This choice could be challenged on the grounds that the Fed is unable to manipulate the funds rate or that it has chosen alternative targets. However, most observers agree that the Fed has targeted the funds rate with considerable success over the postwar period.[7] Some have

6 Tootell [1991a, 1991b] has estimated individual-level reaction functions, but the dependent variable in his reaction functions is a categorical variable based on FOMC votes His variable describes a member's preferred policy in relation to current policy (i e , tighter, easier, or no change) In contrast, we estimate individual reaction functions that specify a desired setting for a policy instrument as the dependent variable, as do most aggregate reaction function studies

7 Most empirical studies show that, at a minimum, the Fed has attempted to influence short-run interest rates over most of the period studied in this paper In reaction function contexts Beck [1982] and Fair [1984] provide confirming evidence

even argued that the funds rate remained a target during the 1979–1982 interlude when the Fed ostensibly adopted a nonborrowed reserve operating procedure. For example, Goodfriend [1990] reports that "except for the period from 1934 to the end of the 1940s when short term interest rates were near zero or pegged, the Fed has always employed either a direct or an indirect Federal funds rate policy instrument."

We specify individuals' reaction functions so that partisan differences across FOMC members can be represented very simply. We assume that each of the N members of the FOMC (excluding the Chairman) has a desired interest rate reaction function of the following form:[8]

$$(1)\quad r^*_{it} = \alpha_0 + \sum_{k=1}^{K} \alpha_k D_{kit} + \sum_{j=1}^{J} \beta_j X_{jt} + e_{it},$$

$$i = 1, \ldots, N;\ t = 1, \ldots, T.$$

The dependent variable r^*_{it} is member i's desired Federal funds rate for the intermeeting period following meeting t. This variable is unobserved. The independent variables $X_{jt}, j = 1, \ldots, J$, are those that vary over time but not across individuals. Among these are forecast values of macroeconomic variables of concern to the Fed (e.g., inflation, unemployment, and growth). The X_{jt} also include dummy variables to indicate the partisan identity of the *current* President, which should capture the effects of systematic partisan influence from the President and the executive branch in general. The remaining independent variables D_{kit}, $k = 1, \ldots, K$ vary across both members and time. Specifically included are dummy variables indicating Governors *appointed* by Republican and Democratic Presidents, which capture partisan influences channeled through the power of appointment. The model could be generalized to include other measures of individual characteristics or individual-specific dummies, but here we limit our attention to partisan distinctions.

Note that the parameters in (1) are not subscripted by i; we assume that differences between members are completely de-

Cook and Hahn [1989], by examining interest rate reactions to changes in Fed target rates, show that the Fed influences not only the Federal funds rate but also longer term interest rates Bernanke and Blinder [1992] provide evidence that movements in the funds rate are primarily a consequence of Fed policies rather than money demand shifts, and they also argue that the funds rate is the best predictor of future movements of real macroeconomic variables

8. When there are no vacancies or absences on the FOMC, $N = 11$

scribed by intercept shifts captured by the coefficients of the partisan appointment variables. While this characterization of differences is restrictive, data limitations argue against richer distinctions.

We specify a similar desired interest rate reaction function for the Chairman (who is indicated by the position index 0) which differs only slightly from that for other FOMC members:

$$(2)\quad r^*_{0t} = \delta_0 + \sum_{m=1}^{M} \delta_m C_{mt} + \sum_{j=1}^{J} \beta_j X_{jt} + e_{0t}, \qquad t = 1, \ldots, T.$$

The partisan appointment dummies of equation (1) are replaced in equation (2) by a series of dummy variables, C_{mt}, $m = 1, \ldots, M$, indicating specific Chairmen (e.g., Volcker, Miller, etc.). This specification is more general than one that would require each Chairman's intercept to match those of other members falling under the same partisan appointment category Given the special influence often attributed to the Chairman, and given the small number of Chairmen serving in our sample period, this generalization seems appropriate. Because some Chairmen have been appointed by Presidents of both parties, the proper coding of partisan attachments would be questionable in any case. We continue to assume that coefficients of other variables in the reaction function are identical for Chairmen and other members.

Error terms for the reaction functions (1) and (2) are assumed to be identically distributed normal random variables that are uncorrelated over time and across individuals:[9]

$$E(e_{it}) = 0, E(e_{it}^2) = \sigma^2, \qquad \text{for } i = 0, \ldots, N, t = 1, \ldots, T;$$
$$E(e_{it}e_{js}) = 0, \qquad \text{for } i \neq j \text{ or } t \neq s.$$

B. Monetary Policy Choices and FOMC Voting

Monetary policy directives are adopted by a majority vote of the FOMC at regularly scheduled meetings of the committee In these meetings the discussion of monetary policy typically begins with the presentation of a staff report that assesses current macroeconomic conditions and provides forecasts under alternative policy scenarios. This is followed by the policy "go-around" in which individual FOMC members present additional information

9 A generalization permitting correlated errors across members at a moment in time is discussed in note 32 Extensions investigating possible serial correlation are discussed briefly in note 19 and more thoroughly in an appendix available from the authors

and broach policy strategies. The Chairman (or occasionally a member designated by the Chairman) then suggests a proposal for the monetary policy directive. If further discussion indicates that this proposal is deemed suitable by a majority of the voting committee members, then final language for the directive is crafted, and a formal vote is taken. In practice, formal votes are taken only when approval by a majority is assured. The language of policy directives is intentionally vague, but our assumption is that the directive implicitly embraces a target for the Federal funds rate. At times the target has been explicit.

The Chairman plays key roles in FOMC deliberations as a consensus builder and as an agenda setter. By all accounts the Fed places a high value on consensus, and the Chairman must orchestrate that consensus. However, by mindfully choosing his proposed policy directive, the Chairman may be able to tilt policy choices in a direction he favors. Woolley [1984] has suggested that the Chairman may also gain some leverage over the committee through his functions as a liaison between the Fed and the outside world and as an internal allocator of Fed resources. In recognition of his distinctive sway over monetary policy, some have referred to the Chairman as the second most powerful man in Washington.[10]

We believe, therefore, that it is appropriate to model the Chairman as proposing a target for the Federal funds rate on which the committee votes.[11] To reflect both the consensus-building and agenda-setting roles of the Chairman in a tractable formulation, our model specifies that his proposed funds rate r_t be a weighted average of his own desired rate and the mean desired rate of all other members:

$$r_t = \gamma r^*_{0t} + (1-\gamma)\bar{r}^*_t, \qquad 1/12 \leq \gamma \leq 1.0, \tag{3}$$

where

$$\bar{r}^*_t = \left(\frac{1}{N}\right) \sum_{i=1}^{N} r^*_{it} \tag{4}$$

and γ is the weight attached to the Chairman's desired interest rate. We assume that the Chairman has at least as much influence as other members ($\gamma \geq 1/12$), and permit the possibility that he is

10. In an annual ranking of powerful individuals, *U. S. News and World Report* listed Federal Reserve Chairman Paul Volcker in second place, behind only the President [*U. S. News and World Report*, May 10, 1982].

11. The Chairman has a formal vote, but since none has ever dissented, we regard his voting as superfluous.

dictatorial ($\gamma = 1.0$). Since the Chairman's proposed funds rate is ultimately adopted, r_t is observed in the postmeeting period.

Once the Chairman has proposed a Federal funds rate target to the committee, the remaining members can dissent in favor of "ease," dissent in favor of "tightness," or assent. The discrete variable V_{it}, referring to the vote by member i in meeting t, is defined to equal -1, 1, or 0 in these three cases.[12] Because of internal pressures to present a united external front, members are apparently reluctant to dissent; they do so only when disagreements are acute.[13] Accordingly, we assume that a member dissents only when the difference between the proposed Federal funds rate and his desired rate exceeds a threshold level $\lambda > 0$.

(5a) if $r_t - r^*_{it} > \lambda$, then $V_{it} = -1$;

(5b) if $r_t - r^*_{it} < -\lambda$, then $V_{it} = 1$;

(5c) if $-\lambda \leq r_t - r^*_{it} \leq \lambda$, then $V_{it} = 0$.

Condition (5a) says that if the proposed rate exceeds his desired rate by more than λ units, then member i will dissent favoring ease. Similarly, (5b) says that if the proposed rate is less than his desired rate by more than λ units, then member i will dissent favoring tightness. Finally, (5c) says that if the difference

12 The *Record of Policy Actions* for FOMC meetings briefly describes members' reasons for dissenting votes In all but a few cases, these explanations can be coded to indicate dissents favoring ease or tightness For example, at the FOMC meeting held on August 20, 1985, Reserve Bank President Robert Black dissented " because he preferred to direct open market operations promptly toward a somewhat greater degree of reserve restraint and thereby improve the prospects of moderating M1 growth to within the Committee's range for the second half of the year" ["Record of Policy Actions of the Federal Open Market Committee," *Federal Reserve Bulletin,* LXXI, December 1985, p. 954] Black is accordingly coded as having dissented for tightness At the same meeting Governor Martha Seger dissented " because she favored some reduction in the degree of reserve restraint in light of the financial vulnerability of some sectors of the economy and in order to encourage sustained economic expansion" [*Federal Reserve Bulletin,* 1985, p 954] Seger is accordingly coded as having dissented for ease

13 Henry Wallich has said, "It is not a pleasant thing to have to keep dissenting One dissents less frequently than you would think After all, you are a member of a group and you want to get along with the other members" [Greider, 1987, p 201] Nancy Teeters voices similar impressions "Once a consensus is formed, there is a very strong temptation to fall in line" [Greider, 1987, p 221] Preston Martin says. "Unless you were there, an 'insider,' you cannot comprehend the power at play in consensus building, the frustration at times in accepting those decisions for the sake of market stability, and the compelling case at other times for dissent and even for taking your vote public for reasons of conscience" [*Wall Street Journal,* August 5, 1987] The FOMC's *Memoranda of Discussion* for April 18, 1972 [p 467], provides an even more revealing discussion of the calculus of voting in reporting the comments of Alfred Hayes "Mr Hayes said he was reluctant to vote affirmatively because he was dissatisfied with the proposed course He planned to do so, however, because the difference of view was not sufficiently great to warrant his casting a dissenting vote "

between desired and proposed rates is less than λ in absolute value, then member i assents.

We next consider estimation of the model. Parameters to be estimated include not only reaction function coefficients for Chairmen and members, but also γ, the weight attached to the Chairman's preferences in the policy process, and λ, the threshold parameter for dissent voting.

C. Estimation of the Model

Substituting (1), (2), and (4) into (3) yields a reduced-form equation for the postmeeting Federal funds rate:

$$(6) \quad r_t = \gamma\delta_0 + (1-\gamma)\alpha_0 + \gamma \sum_{m=1}^{M} \delta_m C_{mt} + \sum_{j=1}^{J} \beta_j X_{jt} + (1-\gamma) \sum_{k=1}^{K} \alpha_k \overline{D}_{kt} + \gamma e_{0t} + (1-\gamma)\overline{e}_t,$$

where

$$\overline{D}_{kt} = \left(\frac{1}{N}\right) \sum_{i=1}^{N} D_{kit} \quad \text{and} \quad \overline{e}_t = \left(\frac{1}{N}\right) \sum_{i=1}^{N} e_{it}.$$

This equation contains only exogenous variables; its reduced-form coefficients can be consistently estimated by ordinary least squares (OLS). Moreover, OLS can provide direct estimates of the β_ks (the coefficients of economic variables and the current President partisan dummies). Assuming that $\gamma \neq 1.0$, one can also test the null hypothesis of no partisan appointment effects (i.e., that $\alpha_k = 0$ for $k = 1, \ldots, K$). It is not possible to identify all of the structural parameters in (6) from its reduced-form estimates,[14] but additional information is provided by the voting behavior of individual FOMC members.

Again considering voting behavior, we substitute (1) and (6) into conditions (5) to obtain

$$(7a) \quad \text{if } \gamma\delta_0 + (1-\gamma)\alpha_0 - \alpha_0 + \gamma \sum_{m=1}^{M} \delta_m C_{mt} + (1-\gamma) \sum_{k=1}^{K} \alpha_k \overline{D}_{kt} - \sum_{k=1}^{K} \alpha_k D_{kit} + \gamma e_{0t} + (1-\gamma)\overline{e}_t - e_{it} > \lambda, \quad \text{then } V_{it} = -1;$$

14 We can estimate $M + J + K + 1$ reduced-form coefficients by OLS estimation of (6), but the equation includes $M + J + K + 3$ structural parameters.

$$\text{(7b)}\quad \text{if } \gamma\delta_0 + (1-\gamma)\alpha_0 - \alpha_0 + \gamma\sum_{m=1}^{M}\delta_m C_{mt} + (1-\gamma)\sum_{k=1}^{K}\alpha_k\overline{D}_{kt} - \sum_{k=1}^{K}\alpha_k D_{kit} + \gamma e_{0t} + (1-\gamma)\bar{e}_t - e_{it} < -\lambda, \quad \text{then } V_{it} = 1;$$

$$\text{(7c)}\quad \text{if } -\lambda \le \gamma\delta_0 + (1-\gamma)\alpha_0 - \alpha_0 + \gamma\sum_{m=1}^{M}\delta_m C_{mt} + (1-\gamma)\sum_{k=1}^{K}\alpha_k\overline{D}_{kt} - \sum_{k=1}^{K}\alpha_k D_{kit} + \gamma e_{0t} + (1-\gamma)\bar{e}_t - e_{it} \le \lambda, \quad \text{then } V_{it} = 0.$$

Conditions (7) characterize a reduced-form ordered probit model.[15] If we normalize in the standard fashion for probit models by setting the variance of the composite error term equal to an arbitrary constant, then reduced-form coefficients of (7) can be estimated using voting data for member i.[16] Since the $\alpha_k s$ can be estimated, the reduced-form probit model provides an alternative test of partisan appointment effects.

Given reduced-form estimates of *both* (6) and (7), and given restrictions relating error variances and covariances across equations, all of the model's structural parameters can be identified. Even the conventional normalization of the probit equation error variance is not required, since cross-equation restrictions identify that parameter. Methods analogous to indirect least squares (ILS) could be used to infer structural parameters from reduced-form estimates, but ILS can yield a multiplicity of estimates, depending upon which identifying restrictions are imposed in solving for structural parameters. Statistical testing is also problematic under ILS.

Full information maximum likelihood (FIML) methods provide an alternative technique for estimating systems of equations with limited dependent variables.[17] Because of the complexity of

15 McKelvey and Zavoina [1975] describe the ordered probit model and provide an application to roll-call voting in the U S Congress

16 The parameters of (7) can be estimated using a data set containing the vote of just one member per meeting. Pooling over members and time to estimate (7) would also be possible, but the statistical properties of the estimates would be questionable because reduced-form errors are correlated across members within a meeting

17 Heckman [1978] and Maddala [1983] describe FIML estimation techniques for such models Instrumental variables methods like those proposed by Nelson and Olsen [1978] can also be used to estimate probit models with endogenous explanatory variables One disadvantage of the instrumental variables methods is that they fail to make use of cross-equation restrictions like those implied by our model

computing multiple integrals of multivariate normal distribution functions, FIML is feasible only when the number of limited dependent variables in the system is small. In the model considered here, twelve variables are determined in a typical meeting of the FOMC—the postmeeting Federal funds rate and the discrete votes of eleven FOMC members—making FIML estimation impractical.

A related technique based on the maximum likelihood method is feasible, however. A special feature of our model is that the probit equations determining members' votes within a meeting are identical across individuals; individual differences are captured by the series of partisan appointment dummies. Consequently, to estimate all model parameters, we need only estimate a model including one equation determining the Federal funds rate and *one* of eleven identical voting equations. The maximum likelihood method can be applied to the estimation of such a two-equation system. (Appendix 1 presents the likelihood function for this model.) To do so, we employ voting observations for one member per meeting, while discarding the votes of others. This does not make use of all available data, but it does impose all cross-equation restrictions; it can also be repeated using alternative sets of voting observations. For each set of estimates, hypotheses can be tested using conventional statistics based upon the likelihood function.

To carry out the estimation, we proceed in the following way.

1. For each meeting randomly draw, and assign position numbers 1 through 11 across members (without replacement). Specific individuals can be assigned different position numbers in different meetings.
2. Estimate structural parameters in (6) and (7) jointly by the maximum likelihood method, using only the over-time voting observations for members assigned the position number 1.
3. Repeat step 2 separately for members assigned the position numbers 2, 3, . . . , 11.
4. Compute mean values of the estimates for each parameter over the eleven sets of estimates.

This procedure will produce eleven separate sets of consistent estimates for the model's parameters; the means of consistent estimates are also consistent.

II. The Empirical Model

We now consider the empirical counterparts to equations (1) and (2). The individuals' and Chairmen's reaction functions are specified below:

$$(1') \quad r^*_{it} = \alpha_0 + \alpha_{\mathrm{DAP}}\mathrm{DAP}_{it} + \alpha_{\mathrm{RAP}}\mathrm{RAP}_{it} + \alpha_{\mathrm{SSAP}}\mathrm{SSAP}_{it} + \beta_{\mathrm{DCP}}\mathrm{DCP}_t + \beta_{\mathrm{RCP}}\mathrm{RCP}_t + \beta_r r_{t-1} + \beta_{M1}\dot{\mathrm{M}}1_{t-1} + \beta_P \hat{\dot{P}}_t + \beta_U \hat{U}_t + \beta_{IP}\hat{\dot{IP}}_t + e_{it}.$$

$$(2') \quad r_{0t} = \delta_0 + \delta_{\mathrm{VOLCKER}}\mathrm{VOLCKER}_t + \delta_{\mathrm{MILLER}}\mathrm{MILLER}_t + \delta_{\mathrm{BURNS}}\mathrm{BURNS}_t + \beta_{\mathrm{DCP}}\mathrm{DCP}_t + \beta_{\mathrm{RCP}}\mathrm{RCP}_t + \beta_r r_{t-1} + \beta_{M1}\dot{\mathrm{M}}1_{t-1} + \beta_P \hat{\dot{P}}_t + \beta_U \hat{U}_t + \beta_{IP}\hat{\dot{IP}}_t + e_{0t}.$$

For Governors, equation (1′) includes three dummy variables to indicate the partisan identification of the appointing President. Conventionally one would identify Governors as either Republican or Democratic appointees, but Havrilesky and Gildea [1991b, 1992] have found that the "supply-side" appointees of Ronald Reagan differ notably from the appointees of other Republican Presidents. Most studies have suggested that Republicans lean toward monetary tightness, but the Reagan appointees have been strong advocates of monetary ease. Greider [1987] concurs in his historical account, attributing the move toward easier policy in the mid-1980s to the influence of the Reagan appointees. We therefore define the three dummy variables DAP, RAP, and SSAP to indicate Democratic appointees, traditional (i.e., non-Reagan) Republican appointees, and supply-side (i.e., Reagan) Republican appointees. Regional Bank Presidents are represented in the intercept The Chairman's equation adds dummies for Chairmen Paul Volcker, G. William Miller, and Arthur Burns (with William McChesney Martin accounted for in the intercept) and drops the partisan dummies.

The President's direct partisan influence is captured in the DCP and RCP dummy variables in each equation. These dummies indicate that the *current* President is a Democrat or a traditional Republican (with the supply-side current President represented in the intercept). Note that our model includes the conventional two-party classification as a special case in which the coefficients of RAP and SSAP are equal and the coefficient of RCP is zero.

Other independent variables in the two equations include economic indicators conventionally appearing in reaction functions To capture inertia in the policy process, the reaction functions include the last period's Federal funds rate r_{t-1} (the average rate prevailing between meetings $t-1$ and t) as an explanatory variable.[18] Accounting for inertial effects in this fashion also reduces the potential for serial correlation of reaction function errors.[19] Lagged money growth $\dot{M1}_{t-1}$ (calculated as the growth rate of the M1 money stock over the two months preceding the meeting) enters the model because the money stock has often been an explicit intermediate target.[20] The remaining economic variables are forecasts of "goal" variables, $\dot{P}$ (the annualized percentage rate of inflation based on the Consumer Price Index), U (the percentage civilian unemployment rate), and $\dot{IP}$ (the annualized percentage rate of growth in the Federal Reserve's Index of Industrial Production).[21] The forecasts are computed on the basis of data available in the month preceding the month in which meeting t occurs and have a three-month-ahead forecasting horizon. Our use of forecasts of target variables and our method of calculating these forecasts follow closely the example of Abrams, Froyen, and Waud [1980].[22] In addition to these explanatory

18. The likelihood function for the model presented in Appendix 1 does not specifically account for the presence of a lagged dependent variable. If one assumes that the last pre-sample observation of the funds rate is nonrandom, the likelihood function we present is appropriate. Estimates will be consistent in any case.

19. If our model is altered to permit first-order serial correlation of the errors in individual reaction functions, then serial correlation will also be present in (6), the reduced-form equation explaining the interest rate. Moreover, the serial correlation coefficient for the reduced-form errors will approximate that for the individual's reaction functions. We find that estimation of (6) by the Hildreth-Lu method provides evidence of modest first-order serial correlation, with a correlation coefficient $\rho = 0.28$ for the model corresponding to Table I in the text. Although the assumption that $\rho = 0$ can be rejected, correcting for serial correlation in (6) does not substantively alter the results of that equation.

We have also estimated the model using data that have been transformed by generalized differencing. The results are almost identical to those reported here, and the transformation does eliminate evidence of serial correlation in (6). While transforming the data does not strictly correct for serial correlation in the context of our model, it does provide evidence that findings are robust in a more general dynamic specification in which serial correlation is less likely to be present. Further details are available in an appendix available from the authors. We also find that our results are robust to other alternative specifications of the model's dynamics.

20. Hakes and Gamber [1992] support the conclusions of Abrams, Froyen, and Waud in finding that the Fed responded to deviations of actual from targeted money growth prior to 1982.

21. Following other reaction function studies, we also considered exchange rates and balance of payments measures as possible explanatory variables. Like most of those studies, we find little evidence that international variables have consistently influenced monetary policy.

22. Our forecasts are predicted values from "rolling" regression equations explaining each of the three target variables. The regressions employed samples of 60 monthly observations prior to the forecast period. Each forecasting equation included lagged values of the unemployment rate, the rate of inflation, the rate of growth of industrial production, the growth rate of M1, and the federal budget deficit as a fraction of GNP. Lag lengths of up to three months were permitted for included variables, with lag lengths chosen separately for the lagged dependent variable and for all other variables (as a group). The final lag specification was selected on the basis of maximum adjusted R^2 for a regression over the entire sample period.

variables, estimation of the model requires data for the actual postmeeting Federal funds rate, which is measured as the average rate prevailing between meetings t and $t + 1$.[23] (A summary of variable definitions is provided in Appendix 2.)

Our data consist of macroeconomic variables and individual voting records linked to 349 regular meetings[24] of the FOMC over the 1960–1987 period.[25] At a given meeting, the voting members of the FOMC include the seven members of the Board of Governors and five of the regional Reserve Bank Presidents. After excluding the votes of the Chairman (whom our model treats as an agenda setter) and dropping observations associated with vacancies, absences, and several uncodable dissents, the data set includes 3631 individual voting observations.

One further empirical issue requires preliminary attention. We have argued that the Federal funds rate is appropriately viewed as the Fed's primary policy instrument over most of the sample period, but operating procedures have sometimes varied. Of particular significance is the regime of nonborrowed reserve targeting adopted in October 1979 and employed through September 1982. Over this period the Fed paid more attention to the behavior of monetary aggregates and permitted much larger funds rate fluctuations than it did in previous or subsequent periods. In preliminary empirical work our results confirmed shifts in policy rules and voting behavior in the 1979–1982 period. Because policy-making in this period does not conform well to our assumption that the funds rate is the key instrument, we have decided to exclude these meetings from further analysis (although key findings on partisan influences are in fact robust to their inclusion).[26] We retain a

23 Alternatively, we have measured the postmeeting interest rate as the rate prevailing in the first complete week after the FOMC meeting Results are essentially unaffected by this change in the specification

24 Our sample excludes telephone meetings, for which voting information is not complete over the sample period Phone meetings were more frequent, and ordinary meetings less frequent in the latter portion of the period, however, the average frequency of meetings is roughly monthly for the complete sample period

25 Havrilesky [1993] suggests that political influences on monetary policy were limited before 1961 Moreover, because the nature of the FOMC directive changed in 1959 to indicate more gradual adjustments in monetary policy, the meaning of dissents probably differed in the pre- and post-1960 periods Our sample also excludes the final four meetings in 1987, which occurred after Alan Greenspan became the Chairman

26 We found that several key parameters differed in the 1979–1982 period The reaction function error variance, σ^2, was larger, as was the dissent threshold parameter, λ These results indicate greater variability in desired interest rates as well as greater tolerance of deviations between desired and proposed rates when contemplating dissents Lagged money growth also had a larger coefficient during that period, which is consistent with the findings of Fair [1984] Each of these

sample of 3352 voting observations obtained from 323 FOMC meetings, including 99 (3.0 percent) dissents favoring ease, 137 (4.1 percent) dissents favoring tightness, and 3116 (93.0 percent) assents.

III. Empirical Results

Table I summarizes results obtained from estimating the empirical model. Our procedure initially produces eleven estimates for each parameter; the table presents the mean estimate and the mean standard error for each parameter.[27] Sign frequencies record the number of times (out of eleven) that a parameter was positive or negative, and significance frequencies record the number of times (out of eleven) that each parameter differed significantly from zero at the 0.10 level. In the bottom panel of the table, similar significance frequencies are reported for tests involving comparisons of coefficients. Single-equation estimates of the reduced-form equations for this specification have also been estimated and are reported in Appendix 3.[28]

The results appear to give a clear answer to the question we have posed on the channels of partisan influence. The mean coefficients indicate that, other things equal, traditional Republican appointees prefer a Federal funds rate 0.50 points higher than Democrats, who in turn prefer rates 1.13 points higher than supply-side Republicans. The difference between traditional Republicans and Democrats was significant (at the 0.10 level or better) in ten of the eleven individual estimations, while Democrats and

results is intuitively plausible given the change in operating procedures. We find that once these shifts are allowed for, our findings on partisan influences are essentially unchanged from those reported in the text

27 Standard errors are calculated by the method of White [1982], producing estimates that are robust to some specification errors The average standard errors we report are almost surely larger than the true standard errors of the average coefficients, thus, our inferences about statistical significance are conservative. Standard errors for the mean estimates could in principle be obtained through bootstrapping procedures, but computational costs are prohibitive Using the general purpose maximum likelihood routine in TSP, the estimation reported in Table I required over seven hours of CPU time on an IBM 4381 mini-mainframe computer

28 We have estimated reduced-form equations for other specifications developed in the paper, complete results of those estimations are presented in an appendix available from the authors upon request. Results from the reduced-form estimations are in all cases consistent with those derived from the joint estimation procedure In addition, we have employed a single-equation ordered probit model to estimate the structural parameters of (7) under the (unrealistic) assumption that the adopted interest rate is exogenous. Although these estimates are subject to a simultaneity bias, they produce results consistent with our findings on partisan influences These results are also available from the authors upon request.

TABLE I
MONETARY POLICY REACTION FUNCTIONS WITH PARTISAN INFLUENCES

Parameter/variable	Mean coefficient	Mean standard error	Sign frequency	Significance frequency[a]
Chairman's parameters				
γ (Chairman's voting weight)	0 1579	0 0949	11/11+	5/11+
δ_0 (constant)	0 4193	1 1301	10/11+	0/11
$\delta_{VOLCKER}$	1 8842	2 4719	11/11+	0/11
δ_{MILLER}	0 5956	1 2703	11/11+	0/11
δ_{BURNS}	−0 6224	0 7029	11/11−	1/11−
Individuals' parameters				
λ (dissent threshold parameter)	2 1524	0 2125	11/11+	11/11+
α_0 (constant)	1 4839	0.4493	11/11+	11/11+
α_{DAP} (Democratic appointee)	−0 7814	0.2600	11/11−	11/11−
α_{RAP} (Republican appointee)	−0 2804	0 2786	10/11−	5/11−
α_{SSAP} (supply-side appointee)	−1 9119	0 5362	11/11−	11/11−
Shared parameters				
σ (error standard deviation)	1 1299	0 0949	11/11+	11/11+
β_r (lagged funds rate)	0 9336	0 0202	11/11+	11/11+
β_{M1} (M1 growth)	0 0081	0 0045	11/11+	8/11+
β_P (inflation)	0 0620	0 0161	11/11+	11/11+
β_{IP} (industrial production growth)	0 0195	0 0043	11/11+	11/11+
β_U (unemployment)	−0 1205	0.0311	11/11−	11/11−
β_{DCP} (Democratic current President)	−0 4221	0.2837	11/11−	3/11−
β_{RCP} (Republican current President)	−0 3574	0.2840	11/11−	3/11−

Additional tests of hypotheses	
Null hypothesis	Rejection frequency[a]
$\gamma - 1/12 = 0$	1/11
$\alpha_{DAP} - \alpha_{RAP} = 0$	10/11
$\alpha_{RAP} - \alpha_{SSAP} = 0$	11/11
$\alpha_{SSAP} - \alpha_{DAP} = 0$	9/11
$\beta_{DCP} - \beta_{RCP} = 0$	1/11
$\delta_{VOLCKER} - \delta_{BURNS} = 0$	1/11
$\delta_{VOLCKER} - \delta_{MILLER} = 0$	0/11
$\delta_{MILLER} - \delta_{BURNS} = 0$	0/11

a The level of significance is 0 10

supply-siders differed significantly in nine of eleven cases and Republicans and supply-siders differed significantly in all eleven cases. These results provide strong evidence of the importance of the power of appointment in Presidential influence over monetary policy.

Evidence of direct partisan influence from the President is much weaker. A comparison of the coefficients of DCP and RCP indicates that individuals prefer a funds rate just 0.07 points lower while serving under Democrats than under Republicans. These coefficients differed significantly only once in eleven estimations. There is slightly stronger evidence of a shift in policy preferences under the supply-side President. Coefficients of DCP and RCP are consistently negative and are significantly different from zero in three of eleven cases. This indicates that members preferred *higher* interest rates when serving under the supply-side President than when serving under Democrats or traditional Republicans. Thus, the direct and appointment-induced impacts of the supply-side President appear to have worked in opposite directions.

The preceding result sensibly matches the historical record. During the first Reagan administration, monetarists and conservatives, including Beryl Sprinkel at the Treasury and Martin Feldstein at the Council of Economic Advisers (CEA), directly signaled administration preferences for monetary tightness. After 1984 administration supply-siders gained the upper hand as Treasury Secretary Donald Regan shifted his stance and as key personnel changes occurred at the Treasury, the CEA, and the Federal Reserve Board. Signaling subsequently decreased as the power of appointment became the main vehicle for executive branch influence over the Fed; the post-1984 Reagan appointees to the Board led a movement toward easier monetary policies.

Although our results strongly indicate that the distinction between traditional Republicans and supply-siders is appropriately made, we have also estimated the model for the special case in which these groups are combined. These results, provided in Table II, still show some evidence of party differences, with Republican appointees preferring tighter policies. However, both the magnitude of the estimated difference and the frequency of significance decline; the average difference was 0.25 interest rate points, and the difference was significant in just three of eleven estimations. The results again indicate that direct systematic partisan influence from the current President is negligible.

The results in Tables I and II are similar in most other respects. We find that economic conditions are related to the setting of the Federal funds rate in a manner consistent with the results of most previous reaction function studies. The lagged funds rate has a large positive coefficient, indicating the presence of inertia in the policy-making process The coefficient of lagged money growth is also positive and is usually significant, consistent with the role of money growth as an intermediate target. Coeffi-

TABLE II
REACTION FUNCTIONS WITH REPUBLICANS AND SUPPLY-SIDERS COMBINED

Parameter/variable	Mean coefficient	Mean standard error	Sign frequency	Significance frequency[a]
Chairman's parameters				
γ (Chairman's voting weight)	0 1971	0.0828	11/11+	9/11+
δ_0 (constant)	0.1570	0 6590	10/11+	0/11
$\delta_{VOLCKER}$	0 8449	0 9603	11/11+	0/11
δ_{MILLER}	0 1277	0.7841	7/11+	0/11
δ_{BURNS}	−0 7723	0 6238	11/11−	1/11−
Individuals' parameters				
λ (dissent threshold parameter)	2 0572	0 2190	11/11+	11/11+
α_0 (constant)	0 7492	0 2360	11/11+	11/11+
α_{DAP} (Democratic appointee)	−0 6907	0 2458	11/11−	9/11−
α_{RAP} (Republican appointee)[b]	−0 4473	0 2661	10/11−	6/11−
α_{SSAP} (supply-side appointee)[b]	−0 4473	0 2661	10/11−	6/11−
Shared parameters				
σ (error standard deviation)	1.0995	0 1570	11/11+	11/11+
β_r (lagged funds rate)	0 9518	0 0187	11/11+	11/11+
β_{M1} (M1 growth)	0 0077	0 0044	11/11+	8/11+
β_P (inflation)	0 0608	0 0138	11/11+	11/11+
β_{IP} (industrial production growth)	0.0221	0 0042	11/11+	11/11+
β_U (unemployment)	−0 0769	0 0244	11/11−	11/11−
β_{DCP} (Democratic current President)	−0.0378	0 0497	11/11−	0/11

Additional tests of hypotheses

Null hypothesis	Rejection frequency[a]
$\gamma - 1/12 = 0$	3/11
$\alpha_{DAP} - \alpha_{RAP} = 0$	3/11
$\delta_{VOLCKER} - \delta_{BURNS} = 0$	6/11
$\delta_{VOLCKER} - \delta_{MILLER} = 0$	0/11
$\delta_{MILLER} - \delta_{BURNS} = 0$	0/11

a The level of significance is 0 10
b α_{RAP} and α_{SSAP} are constrained to be equal

cients for the forecasts of inflation and industrial production are positive and that for unemployment is negative, as one would expect if the Fed attempts to stabilize the business cycle. Coefficients of each of the three forecast variables differ significantly from zero in each of the estimations underlying Tables I and II.

Our results confirm previous studies that have suggested that Governors and Bank Presidents behave differently.[29] In Table I the

29 Puckett [1984] and Woolley [1984] report that Bank Presidents have dissented more frequently in favor of tightness than Governors Havrilesky and

negative coefficients of DAP, RAP, and SSAP indicate that Democratic, Republican, and supply-side Governors all prefer a lower funds rate than Bank Presidents (who are represented in the intercept). These differences were significant in all eleven estimations for Democrats and supply-siders, and in five of eleven cases for Republicans. Similar results prevail in Table II.

The estimates also reveal information about the preferences of Chairmen. The estimated intercepts of the various Chairmen differ by large amounts, but standard errors are also large, and statistically significant differences between Chairmen are unusual. The ordering of preferences is nevertheless instructive. The results of both tables show that Volcker preferred the highest funds rates, (even though the 1979–1982 observations are deleted), followed by Miller, Martin (in the intercept), and Burns.[30] By constructing the appropriate composite intercepts, we can also compare Chairmen and representative FOMC members of various types. In Table III we report these composite intercepts in a ranking from easiest to tightest, based on the estimates reported in Table I.

Our model is distinctive in permitting the estimation of voting weights attached to the Chairman and to other members of the FOMC in the decision-making process. The Chairman's weight γ is estimated to be 0.158 in Table I (and it is slightly higher in Table II).[31] Assuming a full complement of eleven other FOMC members, the implied weight for each additional member is 0.077. Thus, our estimate indicates that the Chairman has about twice as much voting weight as a rank and file member of the FOMC. This parameter is not estimated very precisely, however, and in only one of eleven estimations was γ significantly different from 1/12, the value that would imply equal weights for the Chairman and all others. The hypothesis that the Chairman is dictatorial ($\gamma = 1.0$) is consistently rejected, however.

Schweitzer [1990] report similar results based on the estimation of a binary probit model. However, Tootell [1991b] fails to find significant differences between Governors and Presidents based upon a multinomial logit analysis See Havrilesky [1993] for a critique of Tootell's analysis

30 Using aggregate reaction functions, Hakes [1990] found evidence of a shift in reaction function coefficients under Arthur Burns (relative to Volcker and Martin). Belden [1989] also reports evidence of changing FOMC voting patterns under the Burns Chairmanship, however, her findings are challenged by Havrilesky and Gildea [1991a] Havrilesky [1993] reports that under Burns the Fed systematically responded to Administration signals for monetary ease but not to signals for tightness Thus, the apparent policy shifts under Burns might best be attributed to executive branch pressures

31. We did not impose the constraint $\gamma > 1/12$ in the estimations summarized in our tables; however, estimated values for γ below 1/12 were infrequent

TABLE III
COMPOSITE INTERCEPTS FOR MEMBER TYPES AND CHAIRMEN

Chairman/member type	Composite intercept	Estimate
Supply-side Governor	$\alpha_0 + \alpha_{SSAP}$	−0 43
Burns	$\delta_0 + \delta_{BURNS}$	−0.20
Martin	δ_0	0 42
Democratic Governor	$\alpha_0 + \alpha_{DAP}$	0 70
Miller	$\delta_0 + \delta_{MILLER}$	1 02
Republican Governor	$\alpha_0 + \alpha_{RAP}$	1 20
Bank President	α_0	1 48
Volcker	$\delta_0 + \delta_{VOLCKER}$	2 30

Table I indicates that λ, the threshold parameter, equals 2.15, implying that dissents occur only when an individual's desired funds rate differs from the selected rate by more than 2.15 points. This is a large number in relation to typical shifts in postmeeting interest rates, but it is also true that dissents are quite rare, occurring on only 7.0 percent of all votes by non-Chairmen. If dissents are infrequent, our model must account for that phenomenon with a high dissent threshold.[32]

IV. EXTENSIONS OF THE BASIC MODEL

The results so far support the proposition that Presidents exert systematic partisan influence on monetary policy by way of their appointments to the Board. In contrast, direct influence from the President, with the possible exception of Reagan-specific effects, does not appear to be strongly related to partisan ideology. In this section we consider extensions of the model in which direct influence from the current President might yet play an important role.

32. In an extension of the model, we have permitted errors to be correlated across members at a given meeting. A positive correlation of errors across members would provide an alternative explanation for the infrequency of dissents It would suggest that dissents occur infrequently because members often agree with one another, perhaps because they respond in similar ways to variables omitted from the model Our results with the generalized model tended to produce estimates of γ that were implausibly low (below 1/12) unless a constraint was imposed When γ was constrained to equal 1/12, the error correlation was never significantly different from zero Estimates for λ were not much lower than those reported in Tables I and II, although standard errors for the λ estimates were considerably larger Apparently, multicollinearity makes it difficult to distinguish between high values for λ and correlated errors as explanations for infrequent dissents Results on partisan differences with the generalized model were similar to those reported in the text

One possibility is that influence from the President is channeled through the Chairman, but not through other FOMC members. This hypothesis is especially plausible for two reasons. First, the Chairman is generally acknowledged to be the FOMC's link to external clients, including the administration. Second, Chairmen serve only four-year terms and, to further their chances of reappointment, may be particularly responsive to the current President.

This hypothesis can be tested in a very simple way. We alter the basic model to allow the coefficients of the current President dummies, DCP and RCP, to differ for Chairmen and for all other members. If coefficients of these variables differ in the Chairman's equation and if the Chairman has a large voting weight, we would conclude that direct partisan Presidential influence by way of the Chairman exists.

For the estimation reported in Table IV the coefficients of DCP and RCP for Chairmen are given by the sums $\beta_{DCP} + \beta_{CHMDCP}$ and $\beta_{RCP} + \beta_{CHMRCP}$ (equivalently, β_{CHMDCP} and β_{CHMRCP} measure *differences* in the coefficients of Chairmen and non-Chairmen). The results for this model provide weak but suggestive evidence for the hypothesis that the Chairman is an agent of the President. The estimates reveal large upward shifts in the Chairman's intercept when the President is a traditional Republican or Democrat relative to the case where the President is a supply-sider. This suggestion of a direct Reagan influence favoring ease through the Chairman is compatible with the ease orientation of the Reagan appointees, but contrasts with our finding, discussed earlier, that the direct influence of monetarists and other nonsupply-siders in the Reagan administration encouraged tighter policy preferences among rank and file committee members. Given the confounding pressures on policy during the Reagan years and the inherent limitations of the data, one should interpret this result with caution.

Table IV also provides weak evidence that Democratic and Republican Presidents exert differing partisan influences through the Chairman. The estimates imply that the Chairman's intercept shifts upward by 0.87 points when a traditional Republican replaces a Democrat in the White House. This is a large shift in the expected direction, but the difference is not statistically significant in any of the eleven estimations summarized by the table.

In a second extension of the model, we investigate whether the partisan identity of the current President could matter in a

TABLE IV
REACTION FUNCTIONS PRESIDENTIAL INFLUENCE VIA THE CHAIRMAN

Parameter/variable	Mean coefficient	Mean standard error	Sign frequency	Significance frequency[a]
Chairman's parameters				
γ (Chairman's voting weight)	0 1782	0 0869	11/11+	7/11+
δ_0 (constant)	−3 0099	3 4946	11/11−	0/11
$\delta_{VOLCKER}$	3 4736	2 9447	11/11+	4/11+
δ_{MILLER}	0 7752	1 2260	11/11+	0/11
δ_{BURNS}	−0 4826	0 6215	11/11−	0/11
β_{CHMDCP} (Chairman Democratic President)	3 8123	3 5044	11/11+	2/11+
β_{CHMRCP} (Chairman Republican President)	4 8320	4 1234	11/11+	3/11+
Individuals' parameters				
λ (dissent threshold parameter)	2 1349	0 2168	11/11+	11/11+
α_0 (constant)	1.8981	0 5346	11/11+	11/11+
α_{DAP} (Democratic appointee)	−0 8000	0 2574	11/11−	9/11−
α_{RAP} (Republican appointee)	−0 2659	0 2734	10/11−	2/11−
α_{SSAP} (supply-side appointee)	−2 0194	0 5544	11/11−	11/11−
Shared parameters				
σ (error standard deviation)	1 1027	0 1032	11/11+	11/11+
β_r (lagged funds rate)	0 9317	0 0201	11/11+	11/11+
β_{M1} (M1 growth)	0 0077	0 0045	11/11+	7/11+
β_P (inflation)	0 0594	0 0164	11/11+	11/11+
β_{IP} (industrial production growth)	0 0197	0 0043	11/11+	11/11+
β_U (unemployment)	−0 1240	0 0314	11/11−	11/11−
β_{DCP} (Democratic current President)	−0 7607	0 4130	11/11−	6/11−
β_{RCP} (Republican current President)	−0 9106	0 4032	11/11−	8/11−

Additional tests of hypotheses

Null hypothesis	Rejection frequency[a]
$\gamma - 1/12 = 0$	3/11
$\alpha_{DAP} - \alpha_{RAP} = 0$	10/11
$\alpha_{RAP} - \alpha_{SSAP} = 0$	11/11
$\alpha_{SSAP} - \alpha_{DAP} = 0$	10/11
$\beta_{DCP} - \beta_{RCP} = 0$	1/11
$\beta_{DCP} + \beta_{CHMDCP} - \beta_{RCP} - \beta_{CHMRCP} = 0$	1/11
$\delta_{VOLCKER} - \delta_{BURNS} = 0$	5/11
$\delta_{VOLCKER} - \delta_{MILLER} = 0$	6/11
$\delta_{MILLER} - \delta_{BURNS} = 0$	0/11

a The level of significance is 0 10

distinctly political, rather than ideological, fashion. Political pressures on the Fed vary over time, but it is reasonable to assume that they most often push in the direction of monetary ease. As politicians, Presidents are likely to respond to political pressures by relaying them to the Fed, and Fed Governors, who are Presidential appointees, may then be especially responsive in their policy-making behavior. Our results indicating that Governors favor "easier" policies than Bank Presidents are consistent with the latter point. Furthermore, political loyalty may lead Governors to be more sensitive to pressure for low interest rates when they serve under a President of the same party as their appointing President. This suggests another modification of the model: allow differences in the intercepts of "in-party" and "out-party" Governors. To do so, we add the dummy OUT to the individuals' reaction function. This variable equals one for Governors appointed by a President of the out-party and otherwise equals zero.[33]

The intriguing results of this estimation are presented in Table V. In all eleven estimations the OUT coefficient was positive and significantly different from zero. The implication is that Governors respond to the needs of own-party Presidents by succumbing to pressures for monetary ease and that they "sabotage" opposition incumbents by promoting monetary tightness. Thus, the partisan identity of the current President does seem to matter, but not in the manner predicted by partisan business cycle models driven by ideological concerns.

The preceding results also offer an appointments-related explanation for a political monetary policy cycle. When partisan change occurs, appointees of the preceding administration push for higher interest rates under the new opposition administration, and this produces early-term tightness. As time passes, the composition of the Board shifts toward appointees of the current President, and pressures for lower interest rates mount. According to this view, pre-election ease occurs not because a new election is imminent, but because the last election is further in the past.[34]

Thus far, we have found only weak evidence to support the view that direct Presidential influence generates partisan movements in monetary policy choices. However, Woolley [1984, p. 109] reports that "there is a substantial consensus that presidents generally get the monetary policy they want from the Federal Reserve."[35] Together, these findings suggest that Presidential

33 Given the focus on political loyalty (not ideology) in this argument, we have considered Reagan as a Republican in defining this variable

34. The conventional argument for political monetary cycles contends that an imminent election induces Presidential pressures on the Fed for ease, which in turn stimulates the economy and gratifies voters (cf. note 2)

35. An anonymous Fed official has directly acknowledged that political signals are heeded: "We believe that credit conditions are reasonable. We aren't getting any signals from politicians I can't see any reason to deviate from current policy" [*Wall Street Journal*, July 21, 1980]

TABLE V
REACTION FUNCTIONS WITH OUT-PARTY EFFECTS

Parameter/variable	Mean coefficient	Mean standard error	Sign frequency	Significance frequency[a]
Chairman's parameters				
γ (Chairman's voting weight)	0 1637	0 1005	11/11+	5/11+
δ_0 (constant)	0 5097	1 0456	9/11+	0/11
$\delta_{VOLCKER}$	1 5760	2 8088	10/11+	0/11
δ_{MILLER}	−0 2360	1 0296	8/11−	0/11
δ_{BURNS}	−0 9066	0.9900	11/11−	1/11−
Individuals' parameters				
λ (dissent threshold parameter)	2 1393	0.2160	11/11+	11/11+
α_0 (constant)	1.4086	0 4528	11/11+	11/11+
α_{DAP} (Democratic appointee)	−0.9659	0 2687	11/11−	11/11−
α_{RAP} (Republican appointee)	−0.4276	0.2843	10/11−	5/11−
α_{SSAP} (supply-side appointee)	−1 8281	0 5336	11/11−	11/11−
α_{OUT} (out-party governor)	0 3681	0 1396	11/11+	11/11+
Shared parameters				
σ (error standard deviation)	1 1132	0 1062	11/11+	11/11+
β_r (lagged funds rate)	0 9377	0.0199	11/11+	11/11+
β_{M1} (M1 growth)	0.0081	0 0045	11/11+	7/11+
β_P (inflation)	0 0630	0.0163	11/11+	11/11+
β_{IP} (industrial production growth)	0.0205	0 0042	11/11+	11/11+
β_U (unemployment)	−0.1177	0 0314	11/11−	11/11−
β_{DCP} (Democratic current President)	−0.3880	0 2869	11/11−	3/11−
β_{RCP} (Republican current President)	−0 3462	0 2866	11/11−	3/11−

Additional tests of hypotheses

Null hypothesis	Rejection frequency[a]
$\gamma - 1/12 = 0$	3/11
$\alpha_{DAP} - \alpha_{RAP} = 0$	10/11
$\alpha_{RAP} - \alpha_{SSAP} = 0$	10/11
$\alpha_{SSAP} - \alpha_{DAP} = 0$	5/11
$\beta_{DCP} - \beta_{RCP} = 0$	0/11
$\delta_{VOLCKER} - \delta_{BURNS} = 0$	1/11
$\delta_{VOLCKER} - \delta_{MILLER} = 0$	0/11
$\delta_{MILLER} - \delta_{BURNS} = 0$	0/11

a The level of significance is 0 10

pressures might be effective *without* being systematically partisan, a possibility which we investigate in a third extension of our model.

To investigate this hypothesis, we drop the current President partisan dummies from the model's reaction functions and replace them with the SAFER index (Signaling from the Administration to the Federal Reserve) described by Havrilesky [1988b, 1993]. The SAFER index measures Presidential preferences by coding statements made by administration spokesmen and reported in the financial press. The index is calculated as the monthly sum of *Wall Street Journal* articles reporting statements advocating easier monetary policy (coded 1.0) and tighter monetary policy (coded −1.0). Our reaction functions employ $SAFER_{t-1}$, the value of SAFER calculated for the month preceding the month of the FOMC meeting. Clearly, the statements coded by SAFER need not follow consistent partisan patterns; in fact, frequencies of ease and tightness signals are similar across administrations.

Results for the SAFER-augmented model are reported in Table VI. In each of the eleven estimations summarized there, the SAFER coefficient was negative and significantly different from zero, in accord with the view that monetary policy accommodates the desires expressed by Presidential signaling. These results confirm and strengthen those reported by Havrilesky, who found that SAFER influenced money growth in the 1979–1984 period [1988b] and the Federal funds rate in the 1964–1991 period [1993]. The results permit us to reconcile our conclusions with the conventional view that Presidential pressures influence monetary policy choices, but they also leave an unanswered question. Why does partisan ideology appear to play an important role in the appointment of Governors but not in patterns of direct Presidential influence?

V. Conclusions

Using a methodology that permits the estimation of individual reaction function parameters, we have analyzed partisan influences exerted by U. S. Presidents on individual members of the FOMC. Our results strongly suggest that the power to make appointments provides an important channel of systematic partisan influence. We find that Democratic appointees favor easier monetary policies than traditional Republicans do, and that supply-side Republicans prefer even easier policies than Democrats do. Regional Reserve Bank Presidents tend to prefer tighter policies than the politically appointed Governors.

Evidence of systematic and direct partisan influence of the current President on Fed Governors is weaker in our estimations, but this does *not* imply that Presidents have no direct influence over the Fed. In this paper we find some evidence of direct

TABLE VI
REACTION FUNCTIONS INCLUDING THE SAFER INDEX

Parameter/variable	Mean coefficient	Mean standard error	Sign frequency	Significance frequency[a]
Chairman's parameters				
γ (Chairman's voting weight)	0 1544	0 0896	11/11+	2/11+
δ_0 (constant)	−0 5219	1 1998	8/11−	0/11
$\delta_{VOLCKER}$	3 6421	3 0447	11/11+	1/11+
δ_{MILLER}	1 4574	1 6479	11/11+	0/11
δ_{BURNS}	−0 0827	0.5533	10/11−	0/11
Individuals' parameters				
λ (dissent threshold parameter)	2 1218	0 2027	11/11+	11/11+
α_0 (constant)	1 0220	0 2553	11/11+	11/11+
α_{DAP} (Democratic appointee)	−0 7373	0 2731	11/11−	9/11−
α_{RAP} (Republican appointee)	−0 3299	0 2731	10/11−	3/11−
α_{SSAP} (supply-side appointee)	−1 6145	0 4754	11/11−	11/11−
Shared parameters				
σ (error standard deviation)	1 1183	0.0928	11/11+	11/11+
β_r (lagged funds rate)	0.9462	0 0172	11/11+	11/11+
β_{M1} (M1 growth)	0 0077	0 0041	11/11+	9/11+
β_P (inflation)	0 0494	0 0139	11/11+	11/11+
β_{IP} (industrial production growth)	0 0120	0 0040	11/11+	11/11+
β_U (unemployment)	−0 1019	0 0261	11/11−	11/11−
β_{SAFER} (signaling index)	−0 0679	0 0229	11/11−	11/11−

Additional tests of hypotheses Null hypothesis	Rejection frequency[a]
$\gamma - 1/12 = 0$	1/11
$\alpha_{DAP} - \alpha_{RAP} = 0$	8/11
$\alpha_{RAP} - \alpha_{SSAP} = 0$	11/11
$\alpha_{SSAP} - \alpha_{DAP} = 0$	9/11
$\delta_{VOLCKER} - \delta_{BURNS} = 0$	3/11
$\delta_{VOLCKER} - \delta_{MILLER} = 0$	1/11
$\delta_{MILLER} - \delta_{BURNS} = 0$	1/11

a The level of significance is 0 10

Reagan-specific effects and suggestions that Presidents exert partisan influence through the Chairman. Moreover, Presidential signaling appears to be effective without being either continual or systematically partisan.[36]

36 Havrilesky [1991] notes that signaling is itself sensitive to the state of the economy and the partisan composition of the Board of Governors, as well as the shifting preferences of Presidential administrations For example, signaling was persistent during Nixon's first term, Carter's term, and Reagan's first term when each faced a troubled economy and a Board dominated by out-party appointees However, signaling fell off during Reagan's second term and during Gerald Ford's interregnum, as economic conditions improved and as the Board came to have a friendlier partisan composition

Our analysis also suggests that strategic political motives are relevant in explaining FOMC voting patterns. Partisan-appointed Governors desire higher interest rates when serving under a President of the opposing party than they do when serving under an own-party President. Given the timing of the appointments process, this politically motivated behavior could produce an apparent electoral cycle in monetary policies.

The institutional arrangements governing Federal Reserve decision-making reflect a balancing of concerns: policymakers should simultaneously be accountable to the public and be resistant to immediate political pressures. To evaluate the balancing of those concerns on the basis of empirical evidence requires an analysis of behavior at the level of individual decision-makers. Our analysis takes a step in that direction; it confirms the importance of partisanship in appointments for the conduct of monetary policy. Further study of the microfoundations of Fed decision-making may ultimately provide a basis for evaluating different appointment procedures and other proposed institutional changes.

Appendix 1: The Likelihood Function for the Model

Appendix 1 provides the likelihood function for the estimated model. For each meeting t, assume that we observe two endogenous variables: a postmeeting interest rate and the vote of a single FOMC member on the monetary policy directive. We arbitrarily denote the member whose vote is observed as member i.

We begin by compactly reformulating equations (6) and (7). Equation (6) can be rewritten as

$$r_t = \mathbf{Z}_t\boldsymbol{\pi} + u_t,$$

where $\mathbf{Z}_t$ is a vector of exogenous variables, $\boldsymbol{\pi}$ is a vector of reduced-form coefficients, and u_t is the composite error term:

$$u_t = \gamma e_{0t} + (1 - \gamma)\bar{e}_t.$$

Conditions (7) characterizing the probit voting model can be compactly reformulated as

$$\begin{aligned} &\text{if } \mathbf{W}_{it}\boldsymbol{\Theta} + v_{it} > \lambda, && \text{then } V_{it} = -1; \\ &\text{if } \mathbf{W}_{it}\boldsymbol{\Theta} + v_{it} < -\lambda, && \text{then } V_{it} = 1; \\ &\text{if } -\lambda \le \mathbf{W}_{it}\boldsymbol{\Theta} + v_{it} \le \lambda, && \text{then } V_{it} = 0. \end{aligned}$$

Here $\mathbf{W}_{it}$ is a vector of exogenous variables, $\boldsymbol{\Theta}$ is a vector of reduced-form coefficients, and v_{it} is the composite error term:

$$v_{it} = \gamma e_{0t} + (1 - \gamma)\bar{e}_t - e_{it}.$$

Let $g(u_t,v_{it})$ be the joint density of u_t and v_{it}. This density is bivariate normal with variances and covariance given below:

$$\text{(A.1a)} \qquad \sigma_u^2 = \gamma^2\sigma^2 + (1 - \gamma)^2\sigma^2/N$$

$$\text{(A.1b)} \qquad \sigma_v^2 = \gamma^2\sigma^2 + (1 - \gamma)^2\sigma^2/N + \sigma^2 - 2(1 - \gamma)\sigma^2/N$$

$$\text{(A.1c)} \qquad \sigma_{uv}^2 = \gamma^2\sigma^2 + (1 - \gamma)^2\sigma^2/N - (1 - \gamma)\sigma^2/N.$$

The joint density of the observed variables, r_t and V_{it}, can be defined for each of three cases $J \in \{\text{I,II,III}\}$. The joint density relevant for case J is denoted $h_J(r_t,V_{it})$.

CASE I. $V_{it} = -1$.

When $V_{it} = -1$, then $v_{it} > \lambda - \mathbf{W}_{it}\Theta$, and the joint density $h_I(r_t,V_{it})$ is given by

$$h_I(r_t,V_{it}) = \int_{\lambda-\mathbf{W}_{it}\Theta}^{\infty} g(r_t - \mathbf{Z}_t\pi,v_{it})\, dv_{it}.$$

A joint density can be expressed as a product of marginal and conditional densities, enabling us to rewrite this equation as

$$h_I(r_t,V_{it}) = \left(\frac{r_t - \mathbf{Z}_t\pi}{\sigma_u}\right)\Phi\left(\frac{-\lambda + \mathbf{W}_{it}\Theta - \mu_{v|u}}{\sigma_{v|u}}\right),$$

where

$f(\ )$ is the standard normal density function,

$\Phi(\ )$ is the standard normal distribution function,

$$\rho = \sigma_{uv}/\sigma_u\sigma_v,$$
$$\mu_{v|u} = \rho(\sigma_v/\sigma_u)(r_t - \mathbf{Z}_t\pi),$$
$$\sigma_{v|u} = \sigma_v(1 - \rho^2)^{0\ 5}.$$

CASE II. $V_{it} = 1$.

When $V_{it} = 1$, then $v_{it} < -\lambda - \mathbf{W}_{it}\Theta$, and the joint density $h_{\text{II}}(r_t,V_{it})$ is given by

$$h_{\text{II}}(r_t,V_{it}) = \int_{-\infty}^{-\lambda-\mathbf{W}_{it}\Theta} g(r_t - \mathbf{Z}_t\pi,v_{it})\, dv_{it}$$
$$= f\left(\frac{r_t - \mathbf{Z}_t\pi}{\sigma_u}\right)\Phi\left(\frac{-\lambda - \mathbf{W}_{it}\Theta - \mu_{v|u}}{\sigma_{v|u}}\right).$$

CASE III. $V_{it} = 0$.

When $V_{it} = 0$, then $-\lambda - \mathbf{W}_{it}\mathbf{\Theta} \leq v_{it} \leq \lambda - \mathbf{W}_{it}\mathbf{\Theta}$, and the joint density $h_{\mathrm{III}}(r_t,V_{it})$ is given by

$$h_{\mathrm{III}}(r_t,V_{it}) = \int_{-\lambda-\mathbf{W}_{it}\mathbf{\Theta}}^{\lambda-\mathbf{W}_{it}\mathbf{\Theta}} g(r_t - \mathbf{Z}_t\boldsymbol{\pi},v_{it})\,dv_{it}$$
$$= f\left(\frac{r_t - \mathbf{Z}_t\boldsymbol{\pi}}{\sigma_u}\right)\left[\Phi\left(\frac{\lambda - \mathbf{W}_{it}\mathbf{\Theta} - \mu_{v|u}}{\sigma_{v|u}}\right)\right.$$
$$\left. - \Phi\left(\frac{-\lambda - \mathbf{W}_{it}\mathbf{\Theta} - \mu_{v|u}}{\sigma_{v|u}}\right)\right].$$

The likelihood function for the sample of T meetings is given by

$$L = \prod_{t=1}^{T} [d_t^{\mathrm{I}}h_{\mathrm{I}}(r_t,V_{it}) + d_t^{\mathrm{II}}h_{\mathrm{II}}(r_t,V_{it}) + d_t^{\mathrm{III}}h_{\mathrm{III}}(r_t,V_{it})],$$

where d_t^{I}, d_t^{II}, and d_t^{III} are dummy variables, respectively, indicating which case characterizes observation t. The reduced-form parameters can be expressed as functions of the structural parameters using the restrictions implied by (5), (7), and (A.1). Maximum likelihood estimates of the structural parameters are those values that maximize L.

APPENDIX 2: SUMMARY OF VARIABLE DEFINITIONS

BURNS_t MILLER_t $\mathrm{VOLCKER}_t$	Dummy variables equal to one for meetings when the indicated Chairman served; otherwise equal to zero.
DAP_{it}	A dummy variable equal to one for Democratic appointees; otherwise equal to zero.
DCP_t	A dummy variable equal to one if the President when meeting t occurs is a Democrat; otherwise equal to zero.
$\hat{IP}_t$	The three-month-ahead forecast of the growth rate of the Federal Reserve's Index of Industrial Production; calculated at time t using information available in the month prior to meeting t.
$\dot{\mathrm{M}}1_{t-1}$	The annualized percentage rate of growth of the money supply; measured as the difference in log M1 over the two months preceding meeting t.

OUT_{it} A dummy variable equal to one for members appointed by a President of the party *not* currently occupying the Presidency; otherwise equal to zero.

$\hat{P}_t$ The three-month-ahead forecast of the rate of inflation (the annualized percentage rate of change in the Consumer Price Index); calculated at time t using information available in the month prior to meeting t.

r_t The average Federal funds rate prevailing in the interval between meeting t and meeting $t + 1$.

r_{t-1} The average Federal funds rate prevailing in the interval between meeting $t - 1$ and meeting t.

RAP_{it} A dummy variable equal to one for traditional (i.e., non-Reagan) Republican appointees; otherwise equal to zero.

RCP_t A dummy variable equal to one if the President when meeting t occurs is a traditional (non-Reagan) Republican; otherwise equal to zero.

$SAFER_{t-1}$ For the month preceding the month in which meeting t occurs, the sum of *Wall Street Journal* articles reporting administration statements favoring easier monetary policy (coded 1.0) and tighter monetary policy (coded -1.0).

$SSAP_{it}$ A dummy variable equal to one for supply-side Republican appointees (i.e., Reagan appointees), otherwise equal to zero.

$\hat{U}_t$ The three-month-ahead forecast of the unemployment rate; calculated at time t using information available in the month prior to meeting t.

V_{it} A discrete variable indicating the vote of FOMC member i in meeting t; equal to -1.0 for a dissent favoring ease, 1.0 for a dissent favoring tightness, and 0 for an assent.

APPENDIX 3: SINGLE-EQUATION ESTIMATES OF REDUCED-FORM EQUATIONS

As noted in the text, it is possible to estimate the reduced form given by (6) and (7) with single-equation estimation methods. Equation (6), explaining the postmeeting Federal funds rate, can be estimated by ordinary least squares; inequalities (7) can be estimated as an ordered probit model. In Table VII we provide reduced-form estimates for the model corresponding to Table I in the text.

Estimates of the OLS equation employ 323 time series observations corresponding to FOMC meetings from 1960–1987 (excluding the 1979–1982 period of nonborrowed reserve targeting). For the ordered probit model, two sets of estimates are provided. First, we provide estimates that use data pooled over all 3352 voting observations. Alternatively, we provide averages of estimates obtained from eleven mutually exclusive subsets of the data, such that only one vote per meeting is included in each data subset. This is done because error terms are correlated across members within a meeting, so that pooling results in a violation of an assumption of the ordered probit model. For the ordered probit model we normalize by setting $\sigma_v = 1.0$ and adopt the sign convention that

TABLE VII
MONETARY POLICY REACTION FUNCTIONS WITH PARTISAN INFLUENCES
REDUCED-FORM OLS AND ORDERED PROBIT ESTIMATES

	OLS estimates equation (6)		Pooled ordered probit estimates equations (7)		Averaged ordered probit estimates equations (7)	
Variable	Coefficient	Standard error	Coefficient	Standard error	Mean coefficient	Mean standard error
CONSTANT	1 3123	0.5623	0 2597	0.4720	0 1703	1.5767
BURNS	−0 0237	0 0933	−0.1368	0 0703	−0.1594	0 2478
MILLER	0 1862	0 1463	−0 8443	0 1962	−0.7361	0.5389
VOLCKER	0 6293	0 2995	−0 2583	0.1945	−0 3370	0.5752
$\overline{DAP}$	−0 8647	0.5838	−1 5660	0 9107	−1 4698	3 0471
$\overline{RAP}$	−0 3662	0 5881	−0 0574	0 9217	0 1104	3 0798
$\overline{SSAP}$	−2 1958	0.8871	−1 7454	1 2721	−1 2608	3 9649
DAP			0 7715	0.0872	0 8055	0 2995
RAP			0 1013	0.0894	0 1365	0 3116
SSAP			1 4675	0.2059	1.4159	0 5396
r_{t-1}	0 9264	0 0185				
$\dot{M1}_{t-1}$	0 0079	0.0046				
$\dot{P}$	0 0534	0 0144				
$\dot{IP}$	0.0185	0 0041				
$\hat{U}$	−0 1392	0 0320				
DCP	−0.1911	0 3354				
RCP	−0.1044	0 3376				
λ'			1.9571	0 0379	2 0515	0 1393
σ_v			1 0000		1 0000	
σ_u	0 3540					

the underlying latent variable should be interpreted as a "propensity to dissent favoring monetary ease." In Table VII, λ is the threshold parameter for the reduced-form ordered probit model, and σ_u and σ_v are standard deviations for the error terms for (6) and (7).

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