

# The Empirical Validity of Central Banking Theories in the United States of America: An Evaluation

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As true in other disciplines, generalizations relative to the practice of monetary policy in the United States have become part of the literature in spite of doubts as to empirical validity. In this paper an attempt will be made to evaluate various theories of central banking by testing the performance of monetary policy as pursued rather than as thought to have been pursued.

## I. Models of Central Bank Behavior

The Federal Reserve, like individuals and households, may be assumed to have a utility function which it attempts to maximize. Given its responsibility to help achieve stability, full-employment and price stability, the task of the Federal Reserve would appear quite clear. It would maximize its utility by minimizing the difference between actual and desired unemployment rates, actual and desired price behavior. Since the central bank does have an obligation to achieve financial stability its utility function should be enlarged to include, also, a desired behavior of interest rates. Thus, the utility function of the Federal Reserve ( $\Phi$ ) may be thought of as:

$$\Phi = f(p - p^*) + (u - u^*) + (i - i^*)$$

where  $p^*$ ,  $u^*$ ,  $i^*$  are desired prices, unemployment and interest rates and  $p$ ,  $u$ , and  $i$ , are actual levels.<sup>1</sup>

The generally accepted theories of monetary policy fit in well, and are certainly consistent with a utility function of the federal reserve. Theories of central banking may be grouped under the contracyclical aspects of monetary policy together with the role of the central bank in stabilizing financial markets. As to the former, the central bank is

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<sup>1</sup> This model of the Federal Reserve has been suggested by John Wood, "A Model of Federal Reserve Behavior", in: *Monetary Process and Policy: A Symposium*, G. Horwich, ed. (Homewood, Ill., R. D. Irwin, Inc., 1967).

viewed as acting in such a way, whether by controlling bank reserves, the money supply or interest rates, as to offset cyclical forces. In the upward phase of the cycle, it would tend to restrict the rate of growth of say, money, thus “leaning against the wind.” In the recession phase, it would supply liquidity again leaning against the cycle. William *McChesney Martin*, noted this view of monetary policy:

Our purpose is to lean against the winds of deflation or inflation whichever way they are behaving, but we do not make these winds<sup>2</sup>.

The role of the central bank in guaranteeing stability in money markets is also consistent with the view of utility maximization since it involves supplying reserves when increased credit demands put upward pressure on interest rates. Relative stability in interest rates is an objective of policy implying that instability may lead to disruptions in money and capital markets. At the extreme of this policy position would be the role of the central bank in acting as a lender of last resort when money markets are so strained that a panic is imminent. Injection of liquidity would hopefully stabilize interest rates and the market value of financial assets.<sup>3</sup>

Though these theories fit in well with our conception of the central bank's utility function, certain problems arise when the utility function is translated into policy. For one, there is the obvious problem of reconciling conflicts among objectives. Also, it is necessary to define the desired level of the target variables. Given the changing level of desired unemployment and desired price levels over the post-war period it is obvious that the utility function facing the central bank may be subject to shifts and must be viewed as dynamic in nature.

Assuming a utility function, the implementation of monetary policy also requires a model of the economy on the part of policy makers. The central bank, implicitly or explicitly, must see some relationship between what it manipulates and desired objectives of policy. If the Federal Reserve buys government securities it should have an eye as to the impact of increased reserves on the banking system and ultimately on such real variables as unemployment and prices, or a financial variable as interest rates. For example, the level of unemployment ( $u_t$ ) or prices ( $p_t$ ) may be thought of as being a function of the money supply

<sup>2</sup> Hearings Before the Committee on Banking and Currency, United States Senate, January 1956, p. 5.

<sup>3</sup> Michael W. *Keran* and Christopher T. *Babb*, “An Explanation of Federal Reserve Action”, Review, Federal Reserve Bank of St. Louis, July 1969, p. 14.

( $m_t$ ) interest rates ( $i_t$ ) and economic growth ( $y_t$ ). Thus the model to which the central bank adapts its policy is:

$$u_t = f(m_t, i_t, y_t)$$

$$p_t = f(m_t, i_t, y_t)$$

Though there is no consensus as to what model is accepted by the Federal Reserve it is clear that the central bank must have such a model. Whether one agrees with it is another matter. The exact value of this model will not be treated in this paper. What will concern us is how monetary policy reacted to changes in real and financial variables. If, for example, the money supply is manipulated in such a way as to offset unemployment or inflation the reaction of the Federal Reserve is of significance to us.

The reaction function of the Federal Reserve may be thought of as a form of revealed preference, analagous to the behavior of consumers in purchasing goods and services. Though the central bank does not state explicitly the desired level of target variables or the nature of the model on which policy is based, reaction to these variables may be thought of as revealing its preferences and model. Though alternatives do exist, such as studying policy statements, an empirical testing of policy actions does seem preferable.

In an attempt to determine how the Federal Reserve actually behaved, several models of monetary policy are proposed. The period covered is 1952 through 1975, with three sub-periods, 1952 - 59, 1960 - 66 and 1967 - 75, to determine if significant differences in monetary policy occurred. The models are expressed in reduced form equations to lessen the econometric problems involved in formulating explicit models of the economy. The models to be tested are:

Model I,

$$g_t = f(z_t, u_{t-3}, p_{t-3}, f_t, b_t)$$

where  $g_t$  = changes in the Fed's holdings of government securities between period  $t$  and  $t - 1$

$z_t$  = all those factors causing changes in bank reserves, except for open-market operations, between period  $t$  and  $t - 1$ .

$u_{t-3}$  = changes in the seasonally adjusted unemployment rate between period  $t$  and  $t - 3$ .

$p_{t-3}$  = changes in the consumer price index between period  $t$  and  $t - 3$



$f_t$  = the dollar/D-Mark exchange rate in period  $t$   
 $b_t$  = the high-employment budget in period  $t$

This model may be defended in that the Federal Reserve engages in open-market operations as its main tool of monetary management. The independent variable  $z_t$  is a proxy for all the other factors effecting excess bank reserves, including float, currency in circulation, treasury deposits and required reserves. The variables  $u_{t-3}$  and  $p_{t-3}$  are lagged on the assumption that monetary policy will not react promptly to changes in unemployment and prices. The dollar/D-Mark exchange rate is a proxy for pressures on the dollar in foreign exchange markets:<sup>4</sup>  $b_t$  is the government's national income accounts budget calculated at full-employment reflecting the stance of fiscal policy.

Model II contains much the same independent variables (with the exception of  $z_t$ ). It assumes the central bank can control monetary aggregates as bank reserves ( $r$ ), the monetary base, ( $mb$ ), and the money supply ( $m_t$ ) so as to offset cyclical instability, defend the dollar and offset (or cooperate) with fiscal policy. One variable that has been added is  $t$ , defined as changes in the treasury bill rate on the assumption that changes in interest rates will bring on changes in monetary aggregates so as to help stabilize them. Thus:

$$\begin{aligned}
 r_t &= f(u_{t-3}, p_{t-3}, t_{t-3}, f_t, b_t) \\
 m_t &= f(u_{t-3}, p_{t-3}, t_{t-3}, f_t, b_t) \\
 mb_t &= f(u_{t-3}, p_{t-3}, t_{t-3}, f_t, b_t)
 \end{aligned}$$

Model III, has as the dependent variable the federal funds rate ( $ff_t$ ) over period  $t$ , on the assumption that this sensitive rate reflects the stance of monetary policy and that it will be altered in response to the same designated variables as in Model II. The Treasury bill rate has, however, been omitted because of the econometric problems involved in having interest rates on both sides of the function. Thus,

$$ff_t = f(u_{t-3}, p_{t-3}, f_t, b_t)$$

These models of policy though subject to criticism may be defended as realistic. For one, the choice of the monetary aggregates (in Model

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<sup>4</sup> For another model where the dollar/D-Mark rate is used as a proxy for pressures in the foreign exchange market see: T. *Havrilesky* "Tests of the Federal Reserve's Reaction to the State of the Economy, 1964 - 74" *Social Science Quarterly*, March 1975.

II) as the variables the central bank manipulates is not unrealistic. Even if they cannot be controlled on a day to day basis, they certainly are subject to policy over a larger period. Secondly, the use of quarterly rather than monthly data would appear to capture the main interest of monetary policy. Such data are preferable to those on a monthly basis. Thirdly, the lagging of variables as the unemployment rate and the price index may be justified not only by the various lags of which we are all aware but also by the institutional inertia characterizing policy-making. Failure to lag the  $z_t$  variable, on the other hand, reflects the feeling that the central bank is able to obtain information on those factors influencing bank reserves easily and is likely to respond to them much more quickly and accurately.

The inclusion of the high-employment budget variable may be justified in that the stance of fiscal policy would, of necessity, influence policy decisions of the Federal Reserve. The high-employment budget is a proxy for fiscal policy being preferable to the actual cash budget by eliminating the endogeneous aspects of fiscal policy from the budget. To eliminate fiscal policy from a model of monetary management is, to say the least naive.

The breakdown of the years 1952 - 75 into three periods, namely 1952 - 59, 1960 - 66, and 1967 - 75, rests on two considerations. One that the three periods encompass years that were roughly similar in nature; 1952 - 59, covering the *Eisenhower* years with frequent but not severe business cycles; 1966 - 66 a relatively cycle and inflation free period, and the remaining years 1967 - 75 a period of inflation and economic turbulence. A second consideration was that the breaking into sub-periods, even if imperfect in terms of homogeneity, may serve to illustrate differences in the reaction of the Federal Reserve and thus differences in the philosophy of the central bank.

The models suggested, though attempting to analyze the general reaction of the Federal Reserve over the years, cannot be thought of as capturing all the nuances of monetary policy. Changes in the discount rate and in reserve requirements, lending to the banks in times of market stress, pressure exerted on the banks via moral suasion, changing the ceiling on interest rates via regulation Q, do not lend themselves to quantitative analysis because of the discontinuities involved. The most that can be said is that the variables in our models appear to be the most important to which the central bank would respond.

## II. Testing of the Models

The equations obtained by multiple regression depict in some instances a pattern of behavior expected of the Federal Reserve; in others an inconsistency with normally accepted views of monetary policy. In Model I, when regressing changes in the Federal Reserve System's holding of government securities and seeking to find variables that best explain the use of the Fed's most important tool, the proxy variable for all other factors affecting excess bank reserves, namely  $z_t$ , explains most of the variations in open-market operations. For the whole period, 1952 - 75, the following equation was obtained:

$$\begin{aligned}
 g_t = & 14.76 - .92.0 z_t - 8.52 u_{t-3} + 0.99 p_{t-3} \\
 & (17.98) \quad (0.03) \quad (14.15) \quad (5.18) \\
 & + 17.13 f_t + 0.0021 b_t \\
 & (14.60) \quad (0.0028)
 \end{aligned}$$

$R^2 = .91$   
 $D. W. = 2.140$

The  $R^2$  of .91 indicating that 91 % of the Fed's buying and selling of securities can be explained by this equation, is related to one variable since none of the others are statistically significant. The negative coefficient indicates that the Fed engaged in open-market operations primarily to offset changes in bank reserves emanating from market forces and from changes in required reserves. This is quite consistent with the view of monetary policy, at least in the short-run, as being defensive in nature. For every \$ 100 reduction in reserve availability the central bank offsets 91 % of its impact.

When looking at the sub-periods, the  $z_t$  variable remains the most significant in explaining open-market operations. The three regression equations obtained were:

$$\begin{aligned}
 1952 - 59 \quad g_t = & 4.72 - 0.95 z_t + 0.49 u_{t-3} - 14.41 p_{t-3} \\
 & (31.50) \quad (0.06) \quad (13.29) \quad (21.94) \\
 & + 13.60 f_t + 0.0006 b_t \\
 & (22.20) \quad (0.023)
 \end{aligned}$$

$R^2 = .926$   
 $D. W. = 2.451$

$$\begin{aligned}
 1960 - 66 \quad g_t = & - 18.50 - 0.86 z_t - 35.08 u_{t-3} + 17.90 p_{t-3} \\
 & (73.18) \quad (0.09) \quad (41.03) \quad (48.98) \\
 & + 158.87 f_t - 0.0007 b_t \\
 & (73.50) \quad (0.0299)
 \end{aligned}$$

$R^2 = .826$   
 $D. W. = 2.12$



$$\begin{aligned}
 1967 - 75 \quad g_t = & 90.54 - 0.97 z_t + 41.26 u_{t-3} - 17.54 p_{t-3} \\
 & (51.46) \quad (0.04) \quad (42.30) \quad (9.90) \\
 & + 19.85 f_t - 9.9925 b_t \\
 & (23.74) \quad (0.0033)
 \end{aligned}$$

$R^2 = .947$   
 $D. W. = 2.26$

The consistent negative relationship between open-market operations and the proxy variable for market pressure indicates that the short-run objective of the central bank is to protect the banking system from pressures and to offset supplying of reserves from float, currency in circulation, etc. Despite criticism that central bank policy has been too money-market oriented there is no evidence of a change in policy in later years. On the other hand, failure to obtain statistically significant relationships with other variables does not indicate unresponsiveness on the part of the central bank to cyclical developments. To the extent that monetary policy varied its response to  $z_t$  it would influence bank reserves and money. Thus, the significance of changes in the aggregates in response to cyclical changes.

In Model II the coefficients that might be expected if monetary policy were contracyclical are as follows: positive for the unemployment variable and negative for prices since as increased reserves and money supply would be assumed to increase. The treasury bill rate would have a positive coefficient if the aggregates increased as bill rates rose, while the foreign exchange variable would have a negative coefficient if the aggregates declined as the D-Mark increased in value relative to the dollar. The high-employment budget variable would be expected to have a positive coefficient if the monetary aggregates increased when this budget showed a surplus indicating that monetary policy was independent of fiscal policy.

When related to target variables the aggregates seem to have been dominated by the cycle<sup>5</sup> and to have been accommodative of fiscal policy. They moved with rather than against the cycle and reinforced rather than frustrated fiscal policy. As to the two variables, the treasury bill rate and the dollar/D-Mark rate, their coefficients were in the first case statistically insignificant and in the second nonsensical. Since all of the aggregates displayed the same pattern we will confine ourselves

<sup>5</sup> Patric Hendershott, *The Neutralized Money Stock: An Unbiased Estimate of Federal Reserve Policy Actions* (Homewood, Illinois: Richard D. Irwin, 1968).

to the regression equations of the money supply (defined in the narrow sense). Thus, for the whole period 1952 - 1975

$$m_t = 42.25 - 7.84 u_{t-3} + 10.03 p - 9.92 b_t$$

(10.46) (1.89) (1.51) (0.20)

$R^2 = .860$   
 $D. W. = 1.60$

Omitting the treasury bill rate and the foreign exchange rate, both of which were statistically insignificant, the regression equation indicates 86 % of the money supply's variation can be explained by these variables. The Durbin-Watson statistic of 1.60 indicates an absence of serial-correlation while all the variables with "t" value well above two are statistically significant. The same results were obtained when the first differences of the money supply (absolute and in logarithms) were used. Again omitting the bill rate and foreign-exchange rate both of which were statistically insignificant, the regression equations obtained were:

$$\Delta m_t = 3.62 - 5.60 u_{t-3} + 6.74 p_{t-3} - 0.81 b_t$$

(0.92) (1.55) (2.01) (0.15)

$R^2 = .340$   
 $D. W. = 1.81$

$$\Delta \log m_t = 0.0033 - 0.008 u_{t-3} + 0.0005 p_{t-3} - 0.0001 b_t$$

(0.0004) (0.0003) (0.0001) (0.000)

$R^2 = .456$   
 $D. W. = 2.08$

The negative coefficient of the unemployment rate and the positive coefficient of prices gives rather strong support to the thesis that the money supply tended to increase when the economy was in the upward phase of the cycle and when prices were rising, a definite pro-cyclical behavior. The negative coefficient of the full-employment budget shows the money supply increasing as the high-employment budget was in deficit and decreasing in surplus, a pattern surely accommodative of fiscal policy.

When the period is broken down, several interesting relationships may be seen. In the earlier years, monetary policy displayed more of a contra-cyclical pattern and was less accommodative of fiscal policy. The regression equation for this period, with first differences of the money supply as the dependent variable:



$$\begin{aligned}
 1952 - 59 \quad \Delta m_t = & -220.45 + 0.126 u_{t-3} - 0.498 p_{t-3} + 0.738 t_{t-3} \\
 & (73.35) \quad (0.131) \quad (0.198) \quad (0.232) \\
 & + 9.28 f_t + 0.013 b_t \\
 & (3.16) \quad (0.002)
 \end{aligned}$$

$R^2 = .379$   
 $D. W. = 2.876$

The positive coefficient of the treasury bill rate indicates that the money supply increased as the bill rate rose, a definite money market orientation. The positive (and significant) coefficient of the ( $b_t$ ) budget shows the money supply increasing as the budget was in surplus, offsetting rather than accommodating fiscal policy. In the later years, the pattern evident for the whole period can be seen with the aggregates moving pro-cyclically and the high-employment budget variable displaying a negative coefficient indicating the aggregates moved in the same direction as fiscal policy.

When the federal funds rate is seen as the instrument for monetary policy with the central bank reacting to cyclical forces, the foreign exchange market and fiscal policy, the regressions indicate the federal funds rate being changed in a contracyclical manner. For the whole period, 1952 - 75, the regression equation is

$$\begin{aligned}
 ff_t = & 6.12 - 0.87 u_{t-3} + 1.00 p_{t-3} - 0.15 f_t + 0.014 b_t \\
 & (1.20) \quad (0.12) \quad (0.09) \quad (0.05) \quad (0.010)
 \end{aligned}$$

$R^2 = .820$   
 $D. W. = 1.849$

The coefficients of the unemployment rate and the price index indicate that the federal funds rate rose as unemployment fell and prices increased. Though the coefficient of the foreign exchange rate is statistically significant, it appears nonsensical in that the central bank is viewed as lowering its federal funds target as the dollar declined relative to the D-Mark. When the foreign exchange rate and the budget are omitted the  $R^2$  of .82 remains almost the same. Thus 82 % of the variation in the federal funds rate can be explained by cyclical considerations. The regressions for the three sub-periods all conform to the same pattern of behavior.

$$\begin{aligned}
 1952 - 59 \quad ff_t = & 120.02 - 0.203 u_{t-3} + 0.261 p_{t-3} \\
 & (40.64) \quad (0.090) \quad (0.145) \\
 & + 5.09 f_t - 0.19 b_t \\
 & (1.70) \quad (0.04)
 \end{aligned}$$

$R^2 = .72$   
 $D. W. = 1.574$

$$1960 - 64 \quad ff_t = 5.90 - 0.430 u_{t-3} + 0.559 p_{t-3}$$

$$(3.70) \quad (0.09) \quad (0.142)$$

$$- 9.322 f_t + 0.055 b_t$$

$$(0.152) \quad (0.023)$$

$$R^2 = .54$$

$$D. W. = 1.97$$

$$1965 - 75 \quad ff_t = 6.61 - 0.927 u_{t-3} + 0.813 p_{t-3}$$

$$(1.38) \quad (0.250) \quad (0.161)$$

$$- 0.135 f_t + 0.042 b_t$$

$$(0.065) \quad (0.020)$$

$$R^2 = .920$$

$$D. W. = 2.02$$

Though the coefficients retain the same configuration they do become higher as the period progresses. This would reflect the greater degree of stringency in monetary policy as it reacted to greater turbulence in the late 1960's and the 1970's. Thus, a full in the unemployment rate of 1 % was accompanied by a rise of .92 % in the federal funds rate in 1965 - 75; a rise of 1 % in prices saw the rate rise by .81 %. This represented a much greater reaction than in the earlier period.

### III. Implications of the Findings

The testing of the models yielded results that seem inconsistent with normally accepted views of monetary policy but which upon further consideration are quite plausible. The relationship between open-market operations and the  $z_t$  variable indicates that the main instrument of the Fed has been used mainly in a defensive manner, that is, to offset pressure on the money market, or to absorb reserves that the central bank did not care the banking system to have. Over the whole period (and in each of the sub-periods) the federal reserve consistently maintained this pattern of open-market operations, refuting the consensus of recent years that the central bank has concentrated on monetary aggregates and given up its preoccupation with the money market and interest rates.<sup>6</sup>

This pattern of open-market operations does not preclude, however, a policy on the part of the central bank to influence the reserve base of the banking system and the money supply. To the extent the monetary authorities offset more or less of the reserve gains (or losses) of the

<sup>6</sup> Joseph Lucia, "Money Market Strategy or Monetary Aggregates", *Economic and Social Review*, October 1973.

banking system, they were able to influence the behavior of the aggregates. One is perfectly consistent with the other. The coefficient of the  $z_t$  variable of close to 1 would indicate that a major part of open-market operations were defensive in nature without precluding the dynamic element.

The coefficients of both the unemployment and price variables, indicating a procyclical behavior of the monetary aggregates, point to the endogenous nature of bank reserves and the money supply. With the economy on the upward phase of the business cycle, unemployment falling (and perhaps prices rising) the demands for bank reserves rise as would the money supply. The evidence indicates the central bank has allowed growth in reserves and money in prosperity and decline in the recession phase of the cycle. This is not inconsistent with or contradictory to the finding that the federal funds rate would also rise as say unemployment fell. The central bank can, and has, influenced bank reserves so that even if it responds to the need for liquidity, failure to supply all of the demands would result in upward pressure on federal funds (and other interest rates). Thus, the endogenous nature of bank reserves and the money supply can be reconciled with the behavior of the federal funds rate and with a contracyclical monetary policy. It does not appear illogical to view the federal reserve as going along with the business cycle and also trying to offset cyclical forces by allowing interest rates to rise and fall in different phases of the cycle.

The procyclical behavior of the aggregates and the contracyclical movement of the federal funds rate substantiates not only the endogenous nature of bank reserves and the money supply but also the importance of interest rates as part of monetary policy. Though the central bank did accommodate the liquidity needs of the economy say in the upward phase of the cycle, it did also allow interest rates to rise serving to dampen to some extent the forces of expansion. Interest rate movements, in turn, substantiate the federal reserve's pursuit of not only a monetary policy focused on controlling the aggregates but also a policy concerned with the cost of credit. Though some students of monetary policy regard this concern of the central bank with interest rates as heretical, the importance of interest rate policy seems borne out by the data.

Perhaps the most surprising result of the models tested was the relationship between the aggregates and the high-employment budget. The accepted wisdom is that the Federal Reserve System has been in-



dependent of the treasury (and fiscal policy) since the accord of March 1951. Though the positive coefficient of the high employment budget for the years 1952 - 59 indicates a degree of independence for the central bank in those years, it seems the Federal Reserve was accommodative to fiscal policy from the 1960's on.<sup>7</sup> Whether proper policy or not, a serious question is raised about the avowed independence of the central bank and the need to make monetary policy more responsive to the needs of the Treasury. Though statements on the independence of the central bank abound in the literature it is clear that they must be discounted at least partially. Thus, Arthur *Burns* has stated:

The capacity of the Federal Reserve to maintain a meaningful antiinflationary posture is made possible by the considerable degree of independence it enjoys within our government<sup>8</sup>.

*McChesney Martin* did admit, however, that the Federal Reserve has come to the aid of the Treasury in its financing problems:

If there has been a bias in our activities it has been a bias in favor of leaning over backward to help the Treasury even though at times we have wondered whether we were going too far<sup>9</sup>.

Failure to detect a statistically significant relationship between the instrument variables (as open-market operations and the monetary aggregates) and interest rates does not indicate the central bank was indifferent to movements in interest rates. The actions of the Federal Reserve to offset pressure on the banks stemming from a loss of reserves or from increased loan demand lessened pressure on interest rates and illustrates the importance of financial stability in the Federal Reserve's utility function. Also, attempts at synchronizing monetary with fiscal policy would serve to have the same stabilizing effect on interest rates and was probably motivated by the same objective.

The statistical insignificance of the foreign sector variable (whether the foreign exchange rate or the liquidity balance were used) is not really surprising. It does point out the domestic orientation of monetary policy. At the same time, however, this is not to say that the balance

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<sup>7</sup> When the actual cash deficit is used, the regression results are much less satisfactory. "Budget Deficits and the Money Supply", Monthly Review, Federal Reserve Bank of Kansas City, June 1975.

<sup>8</sup> Arthur *Burns*, "The Importance of an Independent Central Bank". Federal Reserve Bulletin, Sept. 1977, p. 779.

<sup>9</sup> Employment Growth and Price Levels, Hearings Before the Joint Economic Committee, 1959, part 6 A, p. 1274.

of payments problem did not evoke any response since measures as operation twist, the interest equalization tax, and pressures on the banks to reduce lending abroad all were aimed at restoring external equilibrium.

In spite of attempts made to construct trade-offs among objectives of policy by the use of regression coefficients it does not appear feasible theoretically. If, for example, a fall in the unemployment rate of 1 % evokes a rise of 87 % in the federal funds rate while the same 1 % rise in prices evokes a proportionate 1 % rise in that rate does this indicate the central bank places a greater priority on the goal of price stability.<sup>10</sup> Or may it indicate that the employment rate does not vary proportionately with the price index as the economy approaches full employment. This is not to say the authorities do not have priorities among objectives but solely that it is difficult to ascertain their nature from regression analysis.

Though we have assumed all along that the central bank has a clear rational view of what it was trying to achieve and how, it is obvious that this may be inputting to the central bank a degree of rationality and vision it does not have. Arthur Burns, in testifying before the Congress, elaborated on this theme thus:

In the field of unemployment, you know how we have debated over what full-employment means. Does it mean an unemployment rate of 4 percent or 4.5 percent or does it really mean an unemployment rate of 3 percent<sup>11</sup>?

and, to further shatter any pretense of infallibility:

It is very difficult really to state responsibly what the rate of growth of money should be<sup>12</sup>.

The testing of models, instructive as it is of past behavior on the part of the central bank, cannot be extrapolated to predict monetary policy in the future. The dynamic aspect of monetary policy is apparent in the magnitude of the factors affecting bank reserves over which the Fed has little control but to which it responds so as to cushion the

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<sup>10</sup> This error was made in William G. Dewald and Harry G. Johnson, "An Objective Analysis of the Objectives of American Monetary Policy", in: *Banking and Monetary Studies* (ed.) Deane Carson (Homewood, Illinois: Richard D. Irwin, 1963).

<sup>11</sup> 1975 Economic Report of the President, Hearings Before the Joint Economic Committee, p. 495.

<sup>12</sup> 1975 Economic Report of the President, Hearings Before the Joint Economic Committee, p. 501.

money market. Also, the desired level of target variables, as unemployment, prices, interest rates, are subject to change eliciting different responses on the part of the central bank.

Finally, a comparison of the statistical significance of variables expressed in different forms indicates variation in the response of the Federal Reserve. One comparison is to define the  $z_t$  variable excluding and including changes in required reserves; when the former was used (including only market forces affecting reserves) the  $R^2$  declined, indicating the central bank took loan demand influencing required reserves into consideration in supplying reserves. On the other hand, the almost identical results obtained no matter which of the monetary aggregates were used, confirms the close relationship between changes in bank reserves and the monetary base, on the one hand, and the money supply. Such a relationship is certainly favorable to the Federal Reserve's control of the money supply.

### **Zusammenfassung**

#### **Die empirische Gültigkeit von Zentralbanktheorien in den Vereinigten Staaten: Eine Evaluation**

Eine Analyse der Variablen, die von der Zentralbank kontrolliert werden können, zeigt, daß die Geldpolitik sehr stark geldmarktorientiert wurde, da die Zentralbank Mindestreserveüberschüsse oder Mindestreserveverluste kompensiert, die von Marktkräften und von der Kreditnachfrage herrühren. Die Zentralbank läßt mit ihrer Geldmarktorientierung zu, daß sich die monetären Aggregate eher prozyklisch als antizyklisch verändern; andererseits veränderte sich die federal funds rate eher antizyklisch. Im Gegensatz zur allgemeinen Auffassung wurde die Geldpolitik hauptsächlich der Fiskalpolitik angepaßt, indem sie sich in dieselbe Richtung wie der Budget bewegte; dies rief Fragen nach der angeblichen Unabhängigkeit der amerikanischen Zentralbank auf.

### **Summary**

#### **The Empirical Validity of Central Banking Theories in the United States of America: An Evaluation**

An analysis of the variables the Federal Reserve is able to control indicates monetary policy has been very much money market oriented as the Fed offset reserve gains (or losses) stemming from market forces and loan demand. Together with their money market orientation, the central bank allowed the monetary aggregates to behave in a procyclical rather than a contracyclical manner; the federal funds rate, on the other hand, did behave more contracyclically. Contrary to popular impression, monetary policy was,



in the main, accommodative to fiscal policy by moving in the same direction as the budget, raising questions as to the alleged independence of the U.S. central bank.

### **Résumé**

#### **La validité empirique de théories de banque centrale aux Etats-Unis: Une évaluation**

Une analyse de variables qui peut contrôler la banque centrale indique que la politique monétaire a été fortement orientée sur le marché monétaire, car la banque centrale compense les excédents ou les déficits de réserves minimales qui procèdent des forces du marché et de la demande de crédit. Par son orientation sur le marché monétaire, la banque centrale tolère que les agrégats monétaires aient des variations plus cycliques qu'anticycliques. Contrairement aux idées reçues, la politique monétaire est principalement ajustée à la politique fiscale puisqu'elle se meut dans la même direction que le budget; ceci permet de se poser des questions sur la prétendue indépendance de la banque centrale américaine.