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MONETARY POLICY INDICATORS
AND TARGETS: SOME ISSUES

DISSERTATION

Presented in Partial Fulfillment of the Requirements
for the Degree Doctor of Arts in the Graduate
School of the Ohio State University

by

Joseph William Hoebler, B.S., M.A.

* * * * *

The Ohio State University
1974

Reading Committee:
Ernst Baltensperger, Ph.D.
Belton M. Fleisher, Ph.D.
Richard U. Sherman, Ph.D.

Approved by

Adviser
Department of Economics
I wish to acknowledge my gratitude to Professors Karl Brunner, William G. Dewald, Ernst Baltensperger, Belton M. Fleisher, and Richard U. Sherman for the instruction, discipline, and patient guidance they have provided.

Bill Hoebler

The Ohio State University

April, 1974
VITA

October 20, 1942. Born - Pittsburgh, Pennsylvania

1966. B.S., Duquesne University, Pittsburgh, Pennsylvania

1970. M.A., The Ohio State University, Columbus, Ohio

1970-1973. Teaching Associate, Department of Economics, The Ohio State University

1974. D.A., The Ohio State University, Columbus, Ohio

FIELDS OF STUDY

Major Field: Economics


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INTRODUCTION

The central concern of monetary theory is the determination of and role of the money supply. Two distinct sets of linkages can be discerned: those running from changes in variables affecting the money supply (whether by conscious policy design or not) to the money supply; and those running from money to aggregate variables on the so-called real side of the economy, e.g. expenditures, prices, and employment. The two are, of course, hardly independent. This paper will be concerned with the former set of linkages; that is, the specifics of the problem "how do (or should) we go about controlling the money supply? Should we focus on free reserves, the base, or some other aggregate; what are the linkages between various aggregates and money; what is the timing involved; what is the role of the rate of interest?"

This involves facing up to the issue of indicators and targets, which must be confronted as we cross from the realm of theory to that of policy. This issue is discussed in the first section of the paper, following the analysis of Brunner and Meltzer (1).
OVERVIEW

Much attention has been directed in the literature to the issue of whether the market rate of interest is an appropriate policy target variable. The question of whether the monetary authorities have in fact historically viewed the rate of interest as a primary target variable (as opposed, say, to some aggregate, e.g. the monetary base or unborrowed reserves) is essentially empirical, and outside the scope of the paper. The assertion will be made that the authorities ought to focus on some monetary aggregate.

Historically, the Fed supposedly has recently come to put less emphasis on interest rates and more on aggregates, specifically reserves. The Fed has also relied on more-or-less imprecisely defined measures as "money market conditions" or "feel of the market" from time to time, these being conglomerates of various reserve and interest rate variables.

Zecher classifies the participants in the indicators debate as (a) price (i.e. interest rate) watchers, versus (b) aggregate watchers (2). In what follows, the discreditation of the position of the so-called interest rate watchers will be amply documented. Thus it will soon become apparent that the focus of the paper is on monetary

---

1 But see Appendix A.
aggregates.

THE INDICATORS AND TARGETS PROBLEM

The meaning given to the terms "indicator" and "target" is not always clear from the context of policy discussions. We have chosen to associate these terms with specific problems that arise in the interpretation and implementation of policy. The indicator problem of monetary policy is the problem of constructing a scale that is invariant up to a monotone transformation and that provides a logical foundation for statements comparing the thrust of monetary policy. The target problem is the problem of choosing an optimal strategy or strategies to guide monetary policy operations in the money markets under conditions of uncertainty and lags in the receipt of information about the more remote goals of policy.

An indicator of monetary policy provides a scale that permits policy makers, economists, and others to compare the thrust of monetary policy on economic activity, that is, to characterize one policy as more expansive than another or to characterize policies as more (or less) expansive than before. Statements comparing current policies to other policies that might have been chosen or to policies chosen at other times require such a scale (3).

In another paper, Brunner writes:

The indicator problem, understood in its technical sense, is the determination of an optimal scale justifying interpretation of the authorities' actual behavior by means of comparative statements (4).

THE CHOICE OF AN INDICATOR

Frequently used indicators are interest rates and various monetary aggregates, including the money supply and base. Unfortunately, these often give conflicting inter-
pretations as to the stance of policy. In the early 1930s, for example, large rises in the reserve and currency ratios (5) meant a drastic decline in the monetary multiplier; if we use the Brunner-Meltzer or Cagan framework to view movements in the money supply and its determinants during that period, we find the drop in the multiplier more than offset sizable increases in the base; thus the money series declined. As would be expected, interest rates were typically very low (and declined throughout the decade). Thus an interest rate watcher would classify policy as expansive; a base watcher would draw the same conclusion; a money supply watcher would draw the opposite conclusion.

Interpretation of monetary policy is seen to depend very much on which indicator is chosen; and one's choice of an indicator depends on one's view of the structure of the economy. A more complete knowledge of the structure is therefore obviously a much desired state of affairs; in fact, this is a pervasive theme echoed by many authors in the Brunner-Meltzer edited book on indicators and targets. A few writers go so far as to assert that effort spent on the indicator problem is wasted given the present lack of knowledge of the economy. The most explicit statement of this view is by Teigen (6). However, the author shares the view of the majority of the contributors in the book, as
succinctly summarized by Dewald: While better knowledge of the structure is to be sought after, the policy problem remains and must be dealt with given the constraints of the present level of uncertainty. Though far from perfect, information of the structure of the economy is at hand on which to base policy actions, and select indicators (such that policy actions can be measured or compared) (7). We proceed on this basis.

Returning to the question of the relative merits of interest rates versus aggregates as indicators, Brunner cites cyclical influences as a source of misinterpretation of the stance of policy.

Both market interest rates and the growth rate of money generally rise in periods of economic expansion and fall during contractions. If changes in market interest rates are the more reliable indicator, the procyclical movements of money and interest rates should be interpreted as a result of countercyclical monetary policy. On this interpretation, the fact that changes in money have a procyclical pattern is of no particular consequence. On the other hand, if changes in money are the more reliable indicator, the procyclical pattern in money is evidence of a procyclical policy (8).

Brunner goes on to construct a case of procyclical changes in both market interest rates and money supply, where the former indicator leads to an incorrect interpretation of policy (9).
THE CHOICE OF A TARGET

However, ... Some of those who propose or defend the use of interest rates as an indicator might accept much of our argument but regard it as irrelevant. Market interest rates (or variables closely correlated with market rates) are used frequently as a target of monetary policy. When interest rates are used as a target, changes in market rates are said to define a suitable indicator. Changes in money are described as the result of policy operations designed to achieve the interest rate target (10).

In this view, the choice of an indicator is not unrelated to the choice of a target: when the market rate of interest is viewed as the proper target of monetary policy actions, then a decline in the rate\(^2\) may be unambiguously interpreted as a signal of (intended) monetary ease, regardless of the direction (and magnitude) of changes in the money stock, the base, or any other aggregate. But whether the decline in fact represents an easy monetary policy depends upon complex linkages among interest rates, reserves, money, and price anticipations, and upon the timing involved. That is, it depends upon the structure. And it is the actual (and not the intended) actions of

\(^2\) Relative to what the rate would have been had the Fed taken no policy action. In other words, allowance would still have to be made for shocks emanating from the demand side in the financial sector.
the policy makers which must be assessed when characterizing a policy as easy or tight. The issue, then, ultimately rests on the desirability of adopting a market interest rate target (which in turn rests on the structure); and this position seems adequately discredited in the empirical literature. See for example (11).

Some of the relevant empirical work on this aspect of the target problem is summarized by Dewald:

A common finding was the reliance of the monetary authorities in the United States and elsewhere on interest rates or closely related measures as proximate targets for monetary policy. The monetary mechanism was thought to operate through policy actions that affect interest rates directly and only indirectly affect bank reserves, credit, money, and other quantities. Both Andersen and Schwartz demonstrated that these magnitudes have not been closely related to the proximate objectives of the authorities, at least not in any simple relationship (12).

Brunner summarizes the target problem as the problem of choosing an optimal strategy to guide policy operations. Under conditions of uncertainty about the structure and lags in the receipt of information about prices, output, employment, or other variables that are among the more remote goals of policy, policy makers try to relate policy actions to current conditions (13).

A careful distinction must be made between the "more remote goals of policy" and proximate targets. Brunner, for example, uses the term targets in the latter sense
(referring to such variables as money, the base, reserves); whereas Duesenberry uses the term in the former sense (to include such variables as income, price level, and employment) (14). The relationship between remote or ultimate targets of policy and proximate targets is beyond the scope of this paper.

About the most explicit statement of the target problem is that of Saving (15). The problem arises due to imperfect knowledge of the structure, and informational lags in the observation of "goal" variables. Saving makes the critical distinction between ultimate targets, or goals, and proximate targets. The term target is then used only in the latter sense. "Under these conditions it is reasonable for the policy maker to choose an endogenous variable, observable with minimal lag, and aim his policy at making this endogenous variable take on some desired (target) value" (16).

TARGETS: SUMMARY

Some (at least qualitative) knowledge of parts of the structure is seen to be requisite; more exactly, the policy maker should be "reasonably certain of the relationship between some observable endogenous (target) variable and the

\[\text{\textsuperscript{3}See Appendix B.}\]
goal variable(s), even if he is uncertain about the exact effect of his instruments on the goal variable(s). Thus an ideal target variable is "(1) readily observable with little or no lag, (2) rapidly affected by the policy instruments, and (3) related to the goal variables in the sense that policies resulting in the target variable taking on certain values must in turn result in the goal variables taking on certain values. The choice of an optimal monetary policy target variable will require a structural hypothesis and a goal function. However, the choice will not require complete knowledge of the structure, since it is lack of knowledge of the structure that gives rise to the need for a target variable. Thus, if complete knowledge is available, and the goal variables are observable with little or no lag, the need for a target variable disappears." 

The target variable may be influenced by changes in noncontrolled factors. The possibility that changes in the economy will occur during the implementation of policy raises the need for an indicator of the effect of the policy being pursued. Thus in Saving we have a clear distinction between targets and indicators, although it is not clear that it is essential to have separate indicator and target variables.
INDICATORS: SUMMARY

Clear as his exposition on targets is, there are some fundamental questions raised by Saving's analysis of the indicator problem; these are dealt with below (see pg. 33). Returning to the Brunner-Meltzer article, the desirable properties of an indicator variable are summarized; note the similarity between these and the ideal properties of a target variable elaborated above by Saving. Following Brunner, two major criteria for selection of an indicator are explicitly discerned: (a) the indicator variable must be closely related to policy actions; (b) information becomes available with minimal lag (21). Suppose, however, that a certain indicator responds not only to policy, but to endogenous factors (as does any endogenous variable). As the effect of other (i.e. noncontrolled) factors, whatever they may be, on the indicator cannot reasonably be eliminated, we should want to choose indicators upon which such influences are minimal, and/or highly predictable.4 Thus we recognize a third criterion, as noted by Dewald (22), and Zecher: (c) "Stated differently, an indicator of monetary policy should be relatively insulated from shocks

4 It is largely on such grounds that Brunner and Meltzer (among others) discard interest rates as unsatisfactory indicators.
other than those generated by policy actions" (23).

**MONEY AND INTEREST RATES AS INDICATORS: AN EMPIRICAL STUDY**

As stated, Zecher groups the participants in the indicators debate as price (interest rate) watchers, and quantity (money) watchers. The policy implications of the two indicators are examined by running simulation on four expenditures-type econometric models. "In comparing the quality of two indicator candidates, one is said to be superior if it is more likely to yield true and less likely to yield false information than its competitor" (24). The interest rate variable employed is the treasury bill rate. Exogenous variables are the monetary base, \( B_0 \) (lagged), and government expenditures, \( G_0 \). Of central interest is the question "are (lagged) monetary actions \( dB_0 \) and fiscal actions \( dG_0 \) more likely to cause the interest rate, \( i \), or money stock, \( M \), to yield false information about the stance of monetary policy" (25)?

For interest rate watchers,

(a) \( \frac{\partial i}{\partial B_0} < 0 \), \( \frac{\partial i}{\partial B_0} < 0 \)

(b) \( \frac{\partial i}{\partial B_0} dB_0 > \frac{\partial i}{\partial x} dx \)
where \( X \) is any argument other than \( B_0 \).

For money supply watchers,

\[
\frac{\partial M}{\partial B_0} > 0, \quad \frac{\partial M}{\partial X} > 0
\]

\[
\frac{\partial M}{\partial B_0} dB_0 > \frac{\partial M}{\partial X} dX
\]

In essence, the first set of conditions requires that the indicator give the proper interpretation of the thrust of policy actions (as measured by \( dB_0 \)); the second set requires that the indicator is "relatively insulated" from influences \( dX \) other than those generated by policy actions and implies, further, that \( \frac{\partial i}{\partial X} dX \) and \( \frac{\partial M}{\partial X} dX \) are small in absolute magnitude.

An unlikely result emerges that (for all four models) for sizable declines in either \( B_0 \) or \( G_0 \) separately, \( i \) is to be preferred over \( M \); and when \( B_0 \) and \( G_0 \) move in opposite directions, the same holds true (26). For all other cases, including the one most generally observed, namely that \( \frac{dB_0}{dt} > 0 \) and \( \frac{dG_0}{dt} > 0 \), \( M \) is distinctly preferable (27). The conclusions are presented concisely at the end of the study; as it would be difficult to condense them any further, I merely reproduce them:

The following general statements are implied
by all four of the models. (1) Past monetary policy actions \( dB_0 \) make changes in the money stock yield false indicator information only if base money changes direction, and if the absolute change in base money decreases sufficiently from its last quarter level. (2) Past monetary policy actions make changes in the interest rate yield false information only if base money moves in the same direction in succeeding quarters and decelerates sufficiently. (3) Current changes in government expenditures \( dG_0 \) can make money yield false indicator information only if \( dG_0 \) and \( dB_0 \) have opposite signs and \( dG_0 \) is very large relative to \( dB_0 \). (4) Current changes in government expenditures can make the interest rate yield false information only if \( dB_0 \) and \( dG_0 \) move in the same direction and \( dG_0 \) is very large relative to \( dB_0 \).

When only the effects of past monetary actions and current fiscal actions are considered, these models imply the money stock is a more reliable indicator of the impact on income of current policy actions than is the interest rate. This follows from the unlikely variability of monetary and fiscal policy necessary to make the interest rate a better indicator than the money stock. We would have to observe frequent reversals in the direction of change in base money or reserves, erratic magnitudes of these changes, and monetary actions affecting income in the opposite direction from fiscal policy in order to reverse this conclusion (28).

Not the least important aspect of the study owes to the fact that four essentially Keynesian (expenditures) type macro models were employed, yet the result emerges that the money supply is generally to be preferred over the interest rate as an indicator: this is significant in that it demonstrates that a theoretical preference for expenditures-type models as opposed to quantity-theory-type models (and vice versa) does not imply a position on the indicators issue.
Still, it is hardly surprising to find that the same economists who adopt a neo-Keynesian view of the structure, the role of the interest rate, and monetary linkages, are those who also award the interest rate a place of eminence in indicators/targets discussions. Tobin, for example, advocates the use of changes in money to offset rises or falls in the rate of interest. Evidently some combination of money and rates is viewed as a composite target, given some (presumably inverse) functional relation between the two variables (29). This long-accepted relation (namely, that increases in money tend to lower the rate of interest) is open to serious challenge in light of recent empirical work, notably (30). This evidence regarding the response of rates to monetary impulses forms the main thrust of Meltzer's third criticism of the view (which he attributes to Samuelson and Tobin) that changes in interest rates are mainly the result of (and thus a good indicator of) changes in money. First, argues Meltzer, market rates are determined in credit (i.e. financial) markets, and only indirectly influenced by changes in the money stock. A second and not unrelated argument is that both money and interest rates are affected by endogenous factors (e.g. cyclical movements in income). Thus increased economic activity might cause upward pressure on both money and interest rates (31). Thirdly, the initial (liquidity) effect of
(say) an increase in money is a lowering of interest rates; but there are lagged income (or wealth) and price-anticipations effects, as described and empirically tested by Gibson (32), which largely if not entirely offset the initial effect within one to two months (33).

A quite similar case against the reliability of interest rates is made by Cagan, who discusses the role of financial market determinants in shaping interest rates, as well as positive wealth and price-anticipations effects which, over time, tend to offset the initial negative effect (34). The author also points out that in reality there are rates of interest on many assorted instruments; the interest-rate effects of monetary impulses depend upon how and where these impulses are transmitted to the economy, and upon financial market compartmentalization (35). Cagan concludes

The dynamic adjustment of interest rates to changes in monetary growth creates difficulties of interpretation for Federal Reserve officials. There is a time pattern of effects on interest rates from a change in the money stock which is complicated and distributed over a period of time. . . . To assess the effects on spending (i.e., the restrictive or stimulative stance of policy) from particular levels of interest rates, one must be able to interpret the dynamic adjustment pattern. In fact, whether rates are at any moment restrictive or stimulative is difficult to judge" (36).
The monetary experiences of 1959-1961 and 1965-1967 illustrate some of the difficulties of interpreting interest rate movements. Late 1960 and early 1961 saw a dramatic decline in bank reserves and in the base; the increasing value of the multiplier partly offset this. On balance, there was little monetary growth. Yet interest rates remained quite low throughout the period; interest rate watchers would conclude that policy was expansionary. Both money and the base rose appreciably over the second half of 1961; the accompanying (slightly lagged) upward movement in interest rates would be interpreted as restrictive by rate watchers.

Rapid growth of both money and the base from mid-1965 through the end of the year were again accompanied (again with a slight lag) by rising interest rates, which rate watchers regarded as restrictive. A slowdown of monetary growth developed in mid-1966, resulting in immediate upward movement in rates, followed by a sharp decline toward the end of the year, which continued through the second quarter of 1967. Policy in late 1966 through early 1967 was moderate or perhaps slightly restrictive; interest-rate watchers would have to regard it as quite easy.

Movements in the money supply, base, multiplier, reserve to deposit ratio, and interest rate are shown in Appendix C.
Forces shaping market interest rates during the 1965-1967 period are examined in some detail by Jordan (37), who finds evidence consistent with the lagged wealth and price anticipations effects hypothesized by Gibson. These same effects form the substance of Fand's analysis of monetary events and "perverse" interest rate movements during this period, which seemingly confused interest-rate watchers (Maisel and Brownlee are mentioned) (38).

Regarding the 1959-1961 and 1965-1967 experiences, Brunner comments: "The necessary conditions for rational policy are certainly not satisfied if policies actually retarding economic activity are viewed to be expansionary, as in the case of the 1960-61 recession, or if inflationary actions are viewed as being restrictive, as in the first half of 1966" (39).

Gramley correctly points to instances where changes in money demand, relative to money supply, resulted in interest rate movements which transmitted the proper signals. For example:

... It is hard to explain the sharp upward movement of interest rates that occurred during 1967, given the growth rate of GNP, without appealing to a shift in liquidity preference. Once again, interest rates provided informational content about the posture of monetary policy (40).

However, the central issue - that other forces shape
movements in interest rates - is not dealt with; and an indicator which provides correct signals some of the time is not a generally trustworthy indicator of the stance of policy. The difficulties summarized by Meltzer and Cagan, and elaborated above, remain.

If pro-cyclical endogenous influences on the money supply are recognized by most monetary economists, they are accorded a place of eminence in the Gramley-Chase model (41). Logical inconsistencies of the model are pointed out by Dewald:

The analysis to this point has established that Gramley and Chase may be quite correct in pointing out that in assessing the effects of the exogenous variables on such endogenous variables as the quantity of money and the rate of interest on private securities, interaction in the endogenous variables must be accounted for. But this in no way implies that the exogenous variables or the constraints of the model are not important. In particular, the assumptions of their analysis have been shown to imply that the supply functions for money and demand deposits are constrained by the availability of monetary reserves, their explicit statements to the contrary (42).

and the failure of the authors (and "New View" theorists in general) correctly to perceive the role assigned to the commercial banking and public non-bank sectors in the Brunner-Meltzer and similar monetarist frameworks is pointed out by Brunner (43). Finally, and most crucially, the importance Gramley and Chase attach to the time-deposit-
substitution mechanism in explaining pro-cyclical variation in the money supply simply does not stand up empirically (44).

ANOTHER STUDY OF THE PROPERTIES OF MONEY SUPPLY AND INTEREST RATES AS INDICATORS

Another paper dealing with the relative merits of those two ubiquitous competing indicator variables is (45). Kareken posits a standard type utility function where the monetary authority realizes disutility from missing a target, say $\tilde{y}$:

$$U = -(y - \tilde{y})^2$$

and proceeds to develop an optimality condition based on the comparison between the expectations $EU(\tilde{i})$ and $EU(\tilde{M})$; these in turn are given in terms of generalized expressions for the variances of $i$ and $M$ as derived from the specific structure of the model and the constraints on the monetary authority (46). While the approach is ingenious, several practical difficulties arise. (a) The admittedly unrealistic assumption is made that $i$ and $M$ are (or can be) controlled by the monetary authorities. (b) The results follow from a terribly over-simplified structure. (c) By Kareken's own admission, "it has proved less than easy (even for this simplified structure) making the optimality condition more revealing - or, alternatively, getting the
means and variances of the reduced form variables, as functions of the means and variances of the underlying random variables” (47). Finally, the approach is theoretical; the selection of indicators should proceed on empirical considerations.

The money supply and interest rates are by no means the only (or even primary) candidates in the indicators debate. In the following sections we focus our attention on money market conditions and "feel of the market", the monetary base, and various reserve measures, in turn.

MONEY MARKET CONDITIONS

Four classes of variables relevant to monetary policy are discerned by Andersen (48):

(I) Policy tools: open market transactions, reserve requirements, discount rate.


(III) Intermediate guides: money, bank credit, long-term rates.

(IV) Ultimate targets: income, price level, employment.

The general hypothesized transmission mechanism from policy actions to money market "guides" (indicators) to ultimate targets is described succinctly by Keir:
Changes in the availability and cost of reserves are reflected immediately in money market conditions. Their influence spreads to bank credit and money, to interest rates in markets for longer-term debt, and to the entire range of spending financed by borrowed funds. In the end the ultimate targets of policy actions—total income and spending, total output and employment, the general level of prices, and international trade and capital flows—come to be influenced (49).

Pressure in the money market is high when the demand for money market funds exceeds the supply at prevailing interest rates (50). Variables used to gauge money market pressure are those given under (II) above. In the spirit of Brunner's argument for the necessity of a scale, Andersen devises a quantification of money market pressure—his F variable.

According to the money market condition theory of monetary management, instructions by the FOMC for changes in money market conditions are followed by desired changes in the committee's intermediate guides. For example, if the FOMC adopts a restrictive policy, instructions are given for firmer money market conditions which, in turn, are expected to bring about slower rates of expansion in bank reserves, money, and commercial bank credit and an increase in long-term interest rates (51).

The empirical thrust of the work is the comparison of the stated policy intentions of the Fed with changes in F; and those in turn with changes in intermediate (group III) variables. While a significant positive relation is found between avowed policy intentions and money market pressure
these changes do not appear to affect intermediate variables in the hypothesized manner. Andersen concludes that "the results give little support to the money market conditions theory of monetary management" (52).

Andersen's F variable is an amalgam of essentially two types of variables: interest rates and reserve measures. Unfortunately, it is probably no simple matter to separate the influences of the two; and no attempt was made. One suspects that perverse interest rate relationships might have obscured much of the relation between the intermediate guides and the F indicator (or more specifically, reserve measures as opposed to interest rate measures subsumed in F).

The monetary experience of June 1959 to June 1960 shows clearly the inadequacies of money market conditions in general and interest rates in particular as policy indicators. Both the money supply and base declined during the period, yet interest rates declined sharply through the first half of 1960, and the money market indicators (e.g. short-term rates and free reserves) were interpreted as indicative of "looseness" of money and credit. In retrospect, it seems clear that a significant decrease in demand for bank credit occurred during the early part of the period; concomitant restrictive policy actions (i.e. open market sales of short-term securities) were successful in
reducing the money stock, yet the "tone and feel of the market" remained loose. Toward the end of 1959 the money market indicators began to give conflicting signals: the "mopping up" process gradually reduced banks' free reserves, and bill yields were rising, but other indicators reflected monetary ease.

The February 9 meeting was particularly significant because it demonstrated the problems of using money market conditions as a guide for monetary management. At this meeting, the Manager reported that market yields had dropped further and that 'the market finds it difficult to reconcile the situation in the securities market with the degree of restraint being exerted on bank reserves'" (53).

In a similar but less ambitious work by Atkinson, the concept of "tone and feel of the market" (tfom) is compared to net borrowed reserves (nbr) as an indicator (54). While Andersen's F indicator correlates reasonably well with stated policy intentions of the Fed, tfom does not; implying that some measure based on reserves is to be preferred over interest rates as an indicator. The general result that seems to emerge from the Atkinson study is that for the 1957-1960 period when both tfom and nbr were purportedly used as guides (indicators), tfom was the superior indicator if one wanted (for whatever reason) to stabilize (i.e. minimize the variance of) short term rates; that is, if interest rate stability were viewed as a desired proxi-
mate target (55). This result is hardly surprising, when the treasury bill rate is used as the sole proxy variable for tfom. The nbr indicator was found to be superior on more general policy criteria. The hypothesis (56) is not sufficiently well formulated to allow any stronger statements to be made regarding policy implications.

Notice that this does not tell us anything about the appropriateness of interest rates as indicators of policy ease or stringency (in fact, there is considerable evidence that interest rates are quite poor indicators); only that the variability of interest rates was, as we might have expected, smaller when tfom (as reflected by the bill rate) was used as an indicator, as opposed to nbr or some alternative reserve measure. But it is not clear that smallest-variability-of-short-term-rates is a desirable state of affairs, even assuming that it can be achieved without the sacrifice of other policy objectives. It has been suggested that preventing interest rates from moving in response to market forces creates distortions in the so-called real sector of the economy...

OTHER INDICATORS: RESERVES AND THE MONETARY BASE

Another possible indicator that has received much attention recently is the monetary base. Problems arise,
however, when money and the base give conflicting signals, as already noted. Thus in the early 1930s period we would want to classify monetary policy as restrictive, even though the base increased. Notice that if we focus on an intermediate aggregate, e.g. reserves or the monetary base, we may get misleading results. The large observed increase in unborrowed reserves during the early 1930s might easily be interpreted as an expansive policy; this is a proper interpretation when bank reserves are created (say via open market purchases) in response to pressure in the money market, i.e. increased demand for bank credit. But, with a given reserve base, the accumulation of reserves by the banking sector as occurred during the 1930s must be construed as a restrictive action. This interpretational problem is cited by Dewald:

Increases in free reserves have the effect of providing banks with an opportunity to expand their credit without resort to borrowings from the Federal Reserve. But one cannot infer that an increase in free reserves reflects an expansionary monetary policy, since it could be induced by declining demand for credit as the result, for example, of an autonomous decline in planned spending. Thus, about the same problems exist with free reserves as an indicator of monetary policy as with interest rates (57).

The same argument can be extended to any measure of banking sector liquidity as an indicator, such as the L.G.S. ratio. A similar misinterpretation of an accumulation of
reserves is cited in the Australian experience, for the same time period (58).

Duesenberry is another writer, among many, who recognizes that "credit conditions" – short term interest rates and bank liquidity – are inadequate indicators due to this interpretation problem (59).

It is very important from the standpoint of policy to recognize that this interpretational difficulty usually is resolved only in retrospect – that is, with the aid of large doses of hindsight. See, for example, (60). The increase in free reserves during the 1930s "was interpreted as an indicator of an excessively expansionary monetary policy, and reserve requirements were increased in mid-recession" (61).

An earlier but similar argument by the same author against the use of free reserves as either indicator or target appears in (62).

Of exceedingly great significance is the fact that the Committee often interprets a decline in free reserves and/or an increase in the rate of interest as a contractionary policy, and the reverse developments as expansionary. Whether tight money is contractionary, and easy money expansionary, depends critically on the extent to which economic instability results from instability in investment demand and other determinants of the commodity-equilibrium relation.

So the significant increase in unborrowed reserves as
occurred at this time could be interpreted (incorrectly) as expansive; certainly the rise in the base should be interpreted as expansive. Yet the money supply decreased. So although the base increased, it did not do so by enough; in the presence of dramatic rises in the reserve and currency ratios, the money stock declined. Thus if we use money as the indicator, we can unambiguously interpret the policy of that period as restrictive.

THE OLD INSTABILITY-OF-INTEREST-RATES ARGUMENT

A persistent argument against controlling the stock of money is that increased instability in interest rates would result. See, for example, "Could the Federal Reserve Control the Money Supply and What Would Happen if it Did?" where Dewald answers yes, the Fed could control (but has not) the money supply; but such a policy could be pursued only at the expense of increased (short-run) interest rate variability (63). This traditional argument is examined by Meltzer (64).

A basic error lies behind the notion that the average level of interest rates would change if money replaced interest rates as the indicator. The source of the error is the belief that the Federal Reserve is able to control market interest rates, and the cause of the error is the neglect of the role of changes in the actual and anticipated rate of price change in the determination of market interest rates. There is no reason to
doubt the Federal Reserve's ability to reduce or increase the level of market interest rates temporarily. However, there is also no reason to believe that the Federal Reserve can maintain rates above or below their equilibrium level, if it is unwilling to produce an ever-increasing rate of inflation or deflation. As before, it is important to recognize the roles of anticipations in the determination of market rates and to separate nominal and real changes (65).

In fact, a plausible hypothesis for the case of greater interest rate stability can be easily constructed. If the relation between real and nominal (market) interest rates and price anticipations is given by

\[ i = r_0 + \left( \frac{1}{P} \frac{dP}{dt} \right)^a \]

where \( r_0 \) is assumed to be shaped mainly by technical (exogenous) factors, emphasis on the money stock as a target might reasonably be expected to reduce the variability in money, in turn reducing variability in the price anticipations variable, resulting in a more stable structure of short term rates. A small piece of empirical evidence of greater short run interest rate instability is reported by Meek and Thunberg for the April 1970 experience. However, their general conclusion is that the "greater steadiness in the growth of the narrowly defined money supply in 1970 does not seem to have been at the cost of larger week-to-week movements in interest rates than in the past" (66). It is likely that the consequences of closer control of the
money supply will be some (probably slight) increase in interest rate variability in the short run, with greater long run stability in rates obtaining, owing to the interest rate – price anticipations relation as described. Evidence supporting this hypothesis comes out of Cagan's classic study of hyperinflation (67).

While the issue of greater interest rate instability is largely a false issue, the money supply will be rejected nonetheless as a target, mainly on grounds of exogeneity. We will opt for a target over which the monetary authority is able to exorcise a greater degree of control.

MONEY AS AN INDICATOR: SOME PROBLEMS

The money supply is probably more suitable as an indicator than as a target, yet some problems exist here too.

For a given setting of policy instruments, an increase in liquidity preference would thus increase interest rates and reduce expenditures, provided that expenditure varies inversely with interest rates. Interest rates signal a contractionary policy; money, an expansive policy. But no policy actions have been taken. In fact, policy action to stabilize money is contractionary during periods of growing demand for money. It is contractionary even if the money supply is permitted to rise but less than it would have risen without any change in policy instruments. It follows that the quantity of money gives misleading indications of the stance of monetary policy when the economic structure is one where there are unaccounted for shifts in the demand for money (68).
This crucial point is reaffirmed by the same author in "A Review of the Conference on Targets and Indicators of Monetary Policy" (69). The policy implication of all this is that the indicator we (ideally) would like to look at is changes in money supply relative to changes in money demand. Hendershott clearly understands this point when he argues that movements in the money stock must be assessed relative to the level of economic activity (70).

Duesenberry also reflects the idea that central bank action (whether measured by "credit conditions" or changes in the money supply or the base) must be assessed relative to demand conditions. "When the monetary base is expanding at a somewhat higher than average rate during a period of rapid expansion, interest rates are likely to rise and bank liquidity to decline. In those circumstances, it is commonly said that 'the Fed is pursuing a tight money policy'. Perhaps it would be more correct to say that 'unusually expansive monetary policy interacting with strong demand is producing tighter credit conditions'" (71).

A second problem concerns influences on the money supply emanating from noncontrolled factors. It is recognized (by most of us) that money is influenced by policy (controlled) factors, and also by endogenous (noncontrolled) factors. According to Dewald, in order to assess the
stance of monetary policy, it is desirable to isolate as much as possible changes in the money supply emanating from the former (72).

In a study of the Australian monetary system (73), Dewald proposes an indicator which he calls "potential money" in an attempt to do precisely this.

\[ dM = \sum_{X} \frac{\partial M}{\partial X} \, dX \quad X = G^*, \, c_b^*, \, G^*, \, g_b^*. \]

where \( X \) represents a policy variable: the four such variables are government securities \( G^* \), cash \( C^* \), minimum cash ratio \( c_b^* \), and minimum L.G.S. ratio for banks \( g_b^* \). The minimum cash and L.G.S. ratios are variables specific to the Australian banking system, and would be replaced by the minimum required reserve ratio(s) for a fractional reserve system similar to that of the United States. Dewald emphasizes the pervasive caveat regarding knowledge of the structure. "If econometric estimates were available and could be trusted, it would be appropriate to use them to weight policy instruments (as above). The expected effects of changes in policy instruments on money depend on such estimates of the structure of the economy" (74).

"The proposed monetary policy indicators measure the effects of policy actions on the quantity of money, ab-
stracting from any induced change in money..." (75).

While it is clearly desirable to obtain such estimates of how changes in the settings of policy instruments affect the money supply, the desirability of an indicator of the overall thrust of policy based solely on the exogenous influences on the money supply is questionable. Hendershott's neutralized money stock is subject to precisely this same criticism, as pointed out by Keran (76).^ Doing nothing (or not enough) while the money supply is buffeted by noncontrolled factors must be construed as a policy, albeit a passive one. If (say) negative influences of noncontrolled factors dominate smaller positive influences of controlled factors, we would still (want to) interpret monetary policy as restrictive; assuming a constant (or rising) money demand.

TWO CRITICAL ISSUES REGARDING MONETARY POLICY INDICATORS

The preceding argument is illustrative of one of the

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^Keran distinguishes between defensive and dynamic policy operations, and presents empirical evidence (77) that (undesired) movements in noncontrolled factors are largely offset by the former type operations. If this is true, then Keran's assertion that Hendershott's neutralization procedure mixes the two type operations (while only the latter should be interpreted as policy actions) is correct; and is precisely equivalent to the present argument that movements in both policy controlled and noncontrolled factors must be included when evaluating the stance of policy.
two fundamental problems with Saving's analysis of the indicator problem referred to earlier. That is, in evaluating the stance of policy, only conscious policy actions are considered. Thus, the monetary base is preferred to the money stock as an indicator, on the criterion that it is more insulated from endogenous disturbances. "The stock of base money need not move cyclically at all, and thus may be the ideal indicator, since changes in it will completely reflect changes in policy as long as that policy is confined to open market operations" (78). Thus Saving would classify the monetary policy of 1930-33 as expansionary, when moderate increases in the base were more than offset by movements in other determinants, causing a decrease in the money supply.

Secondly, Saving classifies policy as restrictive or expansionary based on the effect on ultimate goal variables; which combines the assessment of the stance of policy and the effectiveness of policy, two issues which ought to remain separate. For expositionary purposes, consider a trivial example. Assume a highly interest-elastic money demand function (and LM function), and suppose that the money supply doubles. (Those who wish can assume this large increase in money is largely due to conscious policy design, but according to the immediately preceding argument
this assumption is not required.) While there is relatively little effect on real variables (ultimate goals), e.g. nominal income, this is a highly expansionary—though ineffective—monetary policy. In summary, the two sets of linkages referred to at the outset must remain conceptually distinct. That is, the indicator problem should be confined to the first set of linkages, and not extended to encompass ultimate policy objectives. The question of the stance of monetary policy (first set of linkages) must remain separate from the question of the effectiveness of monetary policy (second set of linkages).

While Saving clearly recognizes this distinction, he still opts for a classification of policy as "expansionary" or "restrictive" based on its effect on ultimate goals, as opposed to what he calls a taxonomic classification.

If policy statements are of the (second) type, that is, purely taxonomic, then the classification of policy will have no effect on subsequent policy actions. The reason is that future policy action, whether this entails a continuation of present policy or some change in policy, depends on the policy-maker's view of the effect of policy and not on the taxonomic classification of current policy. On the other hand, if policy statements are interpreted in the (first) sense, that is, as descriptive of the effect of policy, then a particular description will affect the decision to continue or change policy because this description reflects the policy-maker's view of the effect of current policy (79).

It is surely true that "if policy statements are of the
(second) type, then the classification of policy will have no effect on subsequent policy actions." Still, changes in subsequent policy actions might just as easily be based on considerations of both stance (taxonomic criteria) of policy and effectiveness of policy in terms of ultimate goals, in the event that one accepts the position that it is desirable (in fact, essential) to keep the questions of stance of policy and effectiveness of policy separate.
SECTION II

Having completed the formal discussion of the indicators and targets problem, we turn to a closer examination of the structure. In particular, the relation between various reserve measures, money, and interest rates will come under scrutiny. The thrust of the examination will continue to be empirical.

BANK BEHAVIOR, RESERVES, AND INTEREST RATES

An explicit model of the response of free and excess reserves to the market rate of interest and the discount rate, and the linkages running from interest rates to reserves to money is given in (80). Increased demand for bank funds, with a given money supply, results in upward pressure on market rates (assume the discount rate is fixed), and thus a drawing down of banks' free reserves. If free reserves fall below the desired (target) level, the Fed purchases securities sufficient to increase free reserves to the "desired magnitude". Although the "desired magnitude" might be changed, rendering policy more or
less restrictive; this is essentially a "real-bills doctrine" (as opposed to a counter-cyclical) approach to money management, with the supply of money responding to demand-side factors (81).

An interesting implication is that if \( \frac{\partial M}{\partial I} > 0 \), we get a more interest-elastic LM function than under the conventional assumption that M is exogenous. (Note that the same result obtains for the Brunner-Meltzer model, where \( \frac{\partial m}{\partial I} > 0 \).) The interest elasticity of what is equivalent to an LM curve is seen to depend on the interest elasticity of demand for free reserves and excess reserves (where \( \rho \), the nominal discount rate, is fixed).

Two by-now-familiar propositions turn up in this early (1963) writing by Dewald: the notion that ease or stringency of policy must be judged not by changes in money supply alone, but by changes in money supply relative to money demand; and the oft-cited interpretational problem: should (say) an increase in free reserves be construed as an expansionary policy (82)?

The same interpretational difficulty is also an important part of Meigs' analysis. Meigs asserts that free reserves is not a suitable target, on essentially two counts: (a) is the familiar interpretation problem; (b) there is unacceptably large potential variability in noncontrolled
factors, in that the level of (free) reserves depends on the behavior of the banking sector (83). But these same arguments can be extended to total reserves or unborrowed reserves; the only advantage of the latter measures is their greater predictability, i.e. smaller variance, as demonstrated by Dewald (84). Both conceptual difficulties (a) and (b) remain.

Another reserve measure that has gained the recent attention of policy makers is so-called RPDs, a construct consisting of total reserves minus two sources of irregular variation: reserves against government deposits, and (net) inter-bank deposits.

\[
TR = r_{AVE} \cdot (D + T + DG + IBD) + ER
\]

\[
RPDs = TR - rDG - rIBD = r(D + T) + ER
\]

It is probably worth noting that the FOMC adopted RPDs as its operating target in February 1972. Concise descriptions of this newest policy target are found in (85) and

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7The essence of the free reserves versus total reserves argument seems to be, in very simplistic terms, that total reserves includes \( r_{DG} \), a large exogenous component, and thus is both more stable (predictable) and more closely related to \( M \), and is thus to be preferred over free reserves as a proximate target. It seems clear that by an extension of this same argument, the monetary base is preferable over free reserves, total reserves, or any other reserve measure.
Ruebling writes

Since fewer factors affect the relationship between RPDs and demand deposits than those involving the base or total reserves, the relationship between RPDs and the money stock may exhibit greater stability than either of the others. If this is so, errors involved in selecting the correct path of RPDs might be smaller than those involved in selecting an appropriate path for the monetary base or total reserves (87).

This entire matter is clearly empirical; the comparative stability of the money-RPD relation is examined later in the paper.

Although this particular construct is purged of two sources of non-controlled variability, the above criticisms still apply. However, it should be observed that criticism (a) is more pertinent to the indicators issue; (b) to the targets issue. And RPDs are probably an improvement over total or unborrowed reserves as a target, based on (expected) reduced variability. Reserve measures in general, RPDs included, are quite poor indicators; but probably fare better as targets. As stated, this is an empirical issue, and will be dealt with below.

Might some other aggregate not be preferred as a proximate target; one, of necessity, observable with minimal information lag, and for which a more-or-less stable relation to the stock of money can be demonstrated? One such
aggregate that immediately suggests itself is the monetary base, sometimes called high-powered money. The first necessary condition for a policy target variable is met; on a daily basis, the Federal Reserve has information on the value of the previous day's net source base (88).

As used by Brunner and Meltzer and a score of other empiricists (Andersen, Burger, etc.) the base by source consists primarily of Federal Reserve Credit (F) + Gold Stock (G) + Treasury Currency (C). For a precise statement, see (89). The base contains noncontrolled elements, to be sure; that is, like other reserve-type aggregates, it is a variable "in principle subject to control". But unlike the other reserve-type aggregates, it is relatively well insulated from shocks emanating from the behavior of the banking sector, e.g. desired adjustments in free reserve positions.

It might be argued that variation in banks' (desired)

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8 In addition to the open market account, there are two other items under Federal Reserve Credit: float, and discounts & advances. A study by Dewald and Gibson finds that much of the variation in float can be explained by weekly and monthly dummies; the same authors find discounts significantly positively related to the federal funds rate (for the six month period in 1961 covered by the study) (90). Additional empirical literature on this issue, by Cagan and Frost, will be considered shortly. Further, international movements in gold are supposed to be related to such endogenous variables as price levels, anticipations, and interest
reserve ratios has merely been shifted from an aggregate target, the base, into the monetary multiplier; and nothing gained. But something has been gained: a more stable target, the monetary base, as opposed to total or unborrowed reserves. The critical issue now becomes the stability of the multiplier relating money to the base, relative to the stability of multipliers relating money to various other reserve-type aggregates. The resolution of this issue is empirical, and constitutes the major contribution of the paper.

It is crucial to perceive the importance surrounding the comparative stability of the (multiplier) relations between various policy aggregates and the money stock: if one particular aggregate is more insulated from variations emanating from non-policy behavior (e.g. desired excess reserve adjustments by the banking sector) and the multiplier relating that aggregate to money is at least as stable as other multipliers, then we can state unambiguously that that particular aggregate is to be preferred to the other aggregates as a policy target.

Empirical work by Burger et al (92) indicates a highly

rates. Keran finds, however, that variations in gold movements are largely offset by ("defensive") open-market transactions (91). More extensive empirical study is called for on the important subject of variability in these noncontrolled components of the source base.
stable (multiplier) relation between money and the base, for the years 1964-1971. Control of the money stock was attempted by taking the source base as the given policy variable, and predicting the (monthly) value of the multiplier by regression using lagged values of the multiplier and the Treasury bill rate.

\[ m_t = m(m_{t-j}, i) \quad j = 1, 2, 3. \]

In essence, this is a very mechanical method that does not attempt to incorporate any information the Federal Reserve might have concerning expected movements of key factors such as Treasury deposits in the forecast month. Therefore, the results of simulations based on this procedure should not be viewed as an indication of the best control the Federal Reserve could attain (93).

The influence of the monetary authorities' actions on parameters comprising the multiplier could be captured by the inclusion of the average minimum legal reserve requirement, the (nominal) discount rate, and ceiling rates specified by Regulation Q; the settings of these policy variables could reasonably be expected to influence the values of the reserve, borrowing, and time deposit ratios, respectively; and their inclusion should deliver a significant improvement in the simulation results. For example, the root mean square forecasting error for months when reserve requirements were changed and the following month is about 63% larger than for the whole sample period (94). Much
of the variability in the other two parameters, the currency and government deposit ratios, is due to seasonal factors, and is accordingly reduced by using seasonally adjusted data.

Nonetheless, the simulation results achieved with this "naive" forecasting model can be viewed as acceptable.9 A summarization of the results is found in the appendix of the article, pg. 17-18.

An important precursor of this study is (96), where Kalish employs the \( M = m \cdot B_0 \) framework, and utilizes simulation in attempt to achieve an arbitrarily set growth rate of money (4%) by forecasting the multiplier. "Each month's forecasted multiplier is considered a function of the average multiplier in the previous six months and monthly (seasonal) dummy variables" (97).10 Results are presented in the appendix; the mean percent forecasting error using this technique is 0.7%, for the years 1958-1968.

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9 "The mean forecasting error is $140 million, and the mean percent forecasting error is less than 0.1 percent; this indicates that the procedure, on average, does not substantially over or underestimate the money stock associated with a set value of the net source base" (95).

10 The chart (pg. 7-8) suggests that much of the short-run movement in the multiplier is caused by seasonal factors. See also Appendix C.
The study includes a discussion of the implications of lags in the receipt of information (specifically, on the magnitude of the money stock) for the length of the forecasting period (98). It is concluded that a period of one month to one quarter is optimal. Information is not available soon enough to permit a period shorter than a month; with a period longer than a quarter too much (potential) variability in the multiplier is allowed.11

The problem of the possible destabilizing interdependence of the base and multiplier is also examined. In discussing and measuring the interest-rate effects of changes in the base, three components roughly analogous to Gibson's liquidity ($E(i, B) < 0$); wealth ($E(i, B) > 0$); and expectations ($E(i, B) > 0$) effects are found. Estimates of $E(i, B)$ indicate that no serious difficulties are presented for the simulation procedure employed (99).

The possible interest sensitivity of the multiplier presents another potential difficulty for monetary control

11It must be emphasized that the monetary multiplier is relatively very stable over time (under "normal" conditions, i.e. barring major wars and depressions); but that even seemingly small variations in the multiplier, if not predicted and allowed for, can result in unacceptable variance in the monetary control realized.
via determination of the level of the monetary base or some reserve-type aggregate. The primary (and desired) effect of open market securities operations is on the aggregate; but a secondary effect on interest rates is likely to result. A purchase (sale) of securities raises (lowers) the level of bank reserves and the monetary base, and (initially, at least) results in upward (downward) pressure on the price of securities, and thus downward (upward) pressure on interest rates. Recalling that \( \frac{\partial m}{\partial i} > 0 \), this secondary or feed-back effect is seen to be offsetting. The magnitude of this effect has obviously significant policy implications, and is an empirical issue.

The empirical literature dealing with the interest-sensitivity of the money supply and the multiplier (and the various parameters comprising the multiplier) is summarized by Rasche (102). Studies by DeLeeuw (103), Goldfeld and Kane (104), and Brunner and Meltzer (105) are cited. E(M, i) and E(m, i) are found to be positive, and quite small. The short-run interest-elasticities are approximately .10 to .15; the long-run elasticities are somewhat higher, but less than .5.

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12 For a theoretical development of the interest-sensitivity of the various parameters in the monetary multiplier, see (100) or (101).
The available evidence suggests quite conclusively that the (short-run) feedbacks through interest rate changes, generated by policy changes in reserve aggregates, are very weak, and should cause little difficulty in the implementation of policy... (106).

Brunner and Meltzer also find that the elasticity of the money supply function with respect to the adjusted monetary base is insignificantly different from one (107). Equivalently, the elasticity of the multiplier with respect to the base is insignificantly different from zero.

Summarizing: changes in the monetary base via open-market securities transactions do not seem to have significant interest rate effects, that is \( E(i, B) \) is small; and the monetary multiplier does not appear to be highly sensitive to changes in the rate of interest, that is, \( E(m, i) \) is small. The important policy implication is that secondary or feed-back effects of changes in the monetary base on the multiplier, operating through changes in the rate of interest, are not sufficiently large to present any

\[\text{This result is highly suggestive of some rather profound limitations for the application of an aggregative reduced-form approach (such as the Brunner-Meltzer model) over time, where there may be changes in the underlying structure. It would be remarkable indeed if this matter had escaped the notice of New View theorists; and it hasn't. Yet, in spite of such limitations (which ought to be clearly recognized and admitted), this aggregative approach can be a powerful tool for analyzing general movements in the money stock and the (short-run) stability of various monetary relations, as is done in this paper.}\]
major difficulties in achieving monetary control.

BANK BEHAVIOR, RESERVES, AND INTEREST RATES; II

Returning to Meigs, and the question of the adjustment of banks' reserve positions in response to policy actions or interest rate movements, some important evidence is produced that banks readjust their (free) reserve positions, and within a period of a few days, in response to a policy action which initially creates or absorbs free reserves (108). The readjustment of free reserves over time in response to a specific policy action—a change in the legal required reserve ratio—is also cited in an earlier work by Cagan (109). While the results imply that open market operations (or, presumably, changes in requirements) have the desired expansive or restrictive impact, there is an obvious negative implication for the use of free reserves as either indicator or target.

With respect to changes in legal requirements, total or unborrowed reserves would be a superior indicator to free reserves, in that they pick up the change in requirements, given sufficient time for adjustment. With respect to open market transactions, none of the three reserve measures is a reliable indicator of the thrust of policy. This owes largely to adjustments by the banking sector of
free (and thus total and unborrowed) reserves to desired levels. Meigs finds that, allowing time for adjustment, the overall effect of open market operations on free reserve ratios is small (110). Repeated open market operations, however, may affect free reserve ratios owing to (a) insufficient time for the banking sector completely to adjust to its desired position, and (b) possible interest rate alterations (111). Consider the case where there are repeated open market purchases of significant magnitude. Initially, free reserves are created; also, we might expect a decline in the market rate of interest. This decline is the initial so-called liquidity effect, presumably causing the banking sector to adjust toward a higher free reserve ratio (112). This yields the correct interpretation, namely that policy has been expansive. But even as the banking sector is adjusting, there are wealth and anticipations effects working to offset the initial decline in the market rate. Gibson has found that within two months or less the initial decline is largely erased; if the monetary expansion persists, the price anticipations effect might raise the market interest rate above its initial level (see pg. 15). The Cagan hyperinflation study produces empirical evidence of such an effect (113); a recent study of nominal and effective
market interest rates during the Brazilian hyperinflation of the 1960s provides another piece of supporting evidence (114). Even though under normal circumstances the price anticipations effect is not likely to be so drastic, the point is that lagged offsetting movements in interest rates do occur, which may not be of a trivial magnitude, rendering it nearly impossible to focus on adjustments in banks' reserve positions in response to any particular set of policy actions.

The arguments against the use of any reserve measure as a policy indicator can now be summarized.

(a) Reserve positions depend on banking behavior, and banks are found to readjust their (free) reserve positions rather quickly. The central issue here is controllability; the monetary authorities are quite simply unable to control free, total, or unborrowed reserves, as these depend on the behavior of the banking sector, within the same limits as they are the monetary base.

(b) Perverse lagged interest rate responses may cause banks to readjust their reserve positions in a perverse direction over time, rendering it nearly impossible to determine what reserve changes are in response to any given policy actions.
(c) The frequently cited interpretational difficulty remains. Essentially, this is an identification problem: has some given change in reserves come about as a result of shifts in demand or supply schedules?

Of the above criticisms, (a) is also pertinent to the target problem; (b) and (c) pertain mainly to the indicator problem. It should be made clear that reserve variables (including RPDs) have been dispatched as poor indicators largely on theoretical grounds; the empirical work in this paper focusing on the comparative stability of various multiplier relations is pertinent to the targets issue.

THE PROFIT MOTIVE HYPOTHESIS: A SLIGHT DIGRESSION

The pronounced historical correlation between interest rates and free reserves (115), and the implications for the long-accepted so-called "profit motive" of bank reserve adjustment behavior are explored by Cagan. The profit motive hypothesis implies that \( \frac{\partial FR}{\partial (1 - FR)} < 0 \), and is of greater (absolute) magnitude than \( \frac{\partial FR}{\partial i} \). Cagan finds evidence that seemingly strongly discredits the profit motive hypothesis. \( \frac{\partial FR}{\partial (1 - FR)} \) is smaller in magnitude, and is even frequently positive or not signifi-
cantly different from zero (116).

Two possible explanations for the poor showing of the "profit" hypothesis suggest themselves: the omission of non-quantifiable (except possibly as dummy variables) constraints on borrowing (what Brunner terms \( p_o' \)); and a possible feed-back running from adjustments in the free reserve ratio back to the differential \((i - p_o)\). Each is discussed in turn; see Appendix D.

A more recent and highly sophisticated examination of the "profit" theory is the work by Frost and Sargent (hereafter F-S) (117). The authors show that if the hypothesis is reformulated in such a way that the differential is truncated, as described (118), the federal funds market is explicitly included as an alternative source of borrowing, and adjustment costs are specified, a much improved model of member bank borrowing results. F-S assert that misspecification of the cost variable not only reduces explanatory power, but creates the appearance of long lags in the response of borrowing to changes in costs (119). The model is summarized in Appendix E.

Another piece of empirical evidence bearing on the indicators issue is now briefly examined; we then turn to the critical empirical issue of the comparative stability
of various monetary control relations; we then wind up in traditional fashion with a listing of assorted conclusions.

FIVE INDICATORS: ANOTHER EMPIRICAL STUDY

Tanner (120) follows Brunner-Meltzer in his description of the nature of the indicator problem, that problem being one of finding a variable which will both isolate and scale the effects monetary policy actions have on economic aggregates; that is, correctly isolate and gauge the stance of policy. Thus a good indicator has the properties (a) It is controllable by the monetary authorities (more precisely, it is "in theory subject to control"). (b) Something is known of the linkages between this variable and economic activity (the structure problem). (c) Information becomes available with minimal lags. (d) It is relatively isolated from endogenous influences.

While measures such as "full-employment interest rates" (FEi) and Hendershott's "neutralized money stock" ($M_s^N$) (121) are presumably constructed to be superior based on criterion (d), they fail (c) and are thus unsuitable as indicators on pragmatic grounds (if no other). A

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14But recall the important criticism voiced by Keran (among others) (122); see page 32.
sophisticated version of the familiar Andersen-Jordan single equation reduced form approach is employed, where allowance for exogenous (fiscal) influences on the IS curve is made in measuring effects of (monetary) policy influences on the LM curve. First differences and Almon lags are employed in the estimation procedure (124). The indicators tested are \( i, FE_i, M_s, M_s^N, \) and the Base.

The empirical results are as follows:

- \( i \) generally yields the wrong sign (suggesting movements in \( i \) such as discussed by Gibson).
- \( FE_i \) yields the right sign, \( \frac{\partial AD}{\partial FE_i} < 0 \). \( AD = \text{aggregate demand} \)
- \( M_s \) yields the right sign, \( \frac{\partial AD}{\partial M_s} > 0 \), and has the highest t-values.
- \( M_s^N \) usually yields the right sign, but coefficients are smaller than those for \( M_s \), and t-values are not always significant.
- \( BA \) yields the right sign, and significant t-values.

\(^{15}\text{Time lags, as found in several studies (notably Andersen-Jordan) (123) render the money supply undesirable according to (c) if one is interested in the effects of policy on ultimate targets; if one is interested in proximate targets (as in Brunner-Meltzer, and in this paper), the problem is minimal. In short, the implications of lags for the problem of the choice of an indicator require a distinction generally muddled in the literature: are we dealing with linkages running from policy actions to money, or those running from money to other economic aggregates?}
Tanner concludes that i is unacceptable as an indicator; FEi and MsN are acceptable; and Ms and BA are strongly preferred. "Only these (the latter two) variables consistently yielded theoretically correct signs" (125). "The two most reliable indicators are the observed money stock and the monetary base. On a statistical comparison, the results suggest a slight edge to the money stock. However, because the monetary base is more directly under the control of the Federal Reserve System than is the money stock, the edge appears to go to the base" (126). Thus Tanner slightly prefers the base, on an exogeneity criterion; however, as we have seen, this criterion is more pertinent to the targets issue than to the indicators issue. If we desire separate indicator and target variables (an issue not directly addressed in this paper), we then want as autonomous a target as possible (see Appendix F), and thus might prefer the base as a target, and some money supply measure - specifically, something akin to money supply relative to demand - as an indicator.

It is usually assumed that it is preferable to have separate target and indicator variables (127), although, as indicated, Dewald voices the opinion that the same variable may serve as both target and indicator (128). Con-
ceptually, there is no clear reason why the same variable cannot serve as both target and indicator. However, the monetary base is simply not a good indicator. Perverse movements in the determinants comprising the monetary multiplier can effect strong movements in money, which must be regarded as providing stimulating or retarding impulses to the economy. The most striking historical example is provided by the experience of the 1930s. The behavior of the commercial banking sector and the non-bank public dominated movements in the money series (129) as reflected by dramatic increases in the reserve ratio and the currency ratio. The monetary policy of this period must be regarded as highly restrictive, even though there were moderate increases in the level of the monetary base.

A concise statement of the arguments favoring the base as the optimal target is provided by Meltzer in (130). The two essential points are (a) The base is more controllable than other potential target variables; that is, we are safe in asserting that it is "in principle subject to control". (b) The base is related to money in a positive, highly predictable way.

Implicit in the latter assertion is the notion that the relation between the base and the money stock is at
least as stable as the relation between any other possible target variable and the money stock. This is, of course, the critical empirical issue referred to throughout the paper. And yet little research seems to have been done in this very important area. It is hoped that this paper will make some small contribution in this regard.

THEORETICAL RESULTS

Multipliers relating money to the base (BA), total reserves (TR), and unborrowed reserves (UBR), respectively, are given by

\[ m_{BA} = \frac{1+k}{ar+k} \]
\[ m_{TR} = \frac{1+k}{ar} \]
\[ m_{UBR} = \frac{1+k}{a(r-b)} \]

where \( a = (1+t) \)

Solving for the partial of each multiplier with respect to the reserve ratio, we obtain comparative expressions for the potential destabilizing influence of reserve adjustment behavior on the part of the banking sector.

\[ \frac{\partial m_{BA}}{\partial r} = \frac{-(1+k)}{a(r+\frac{k}{a})^2} \]
Noting that all parameters are positive; it is easily seen that 
\[(r + \frac{k}{a}) > (r) > (r - b)\]
so that 
\[|\frac{\partial m_{BE}}{\partial r}| < |\frac{\partial m_{TR}}{\partial r}| < |\frac{\partial m_{UBR}}{\partial r}| .\]

The important implication is that the multiplier relating money to the monetary base is more stable (for all positive values of r, b, k, t) with respect to reserve and borrowing variations than the multipliers relating money to either total reserves or unborrowed reserves. The RFD multiplier is omitted as it is not derivable in suf--

16 When the total reserve ratio is decomposed into a required and an excess reserve ratio; \(r_T = r_R + r_E\), the partials with respect to \(r_R\) and \(r_E\) are identical to the partial with respect to \(r_T\), for each multiplier, signifying that a one dollar increase in total reserves is indistinguishable from a one dollar increase in required or excess reserves, insofar as they affect the stability of the respective multipliers. Thus results for the comparative stability of the various multiplier relations are invariant with respect to the frequency or magnitude of policy changes in the legal reserve requirements.
ficiently generalized terms to permit comparison. Dewald has pointed out that the result should be interpreted as indicative of the potential destabilizing influence of movements in noncontrolled factors (emanating from the banking sector), assuming that offsetting actions are not taken by the monetary authority.

EMPIRICAL RESULTS

Monthly time series data are used, seasonally adjusted, from 1959 to 1972 inclusive. Source: Federal Reserve Bulletin. Simulation is employed to predict monthly values of the multipliers relating the money stock (conventionally defined, i.e. currency in circulation plus adjusted demand deposits) to the monetary base, total reserves, unborrowed reserves, and RPDs, respectively. Predetermined variables are values of the multipliers, lagged one-to-four months \((m^*_t-j, j=1, 2, 3, 4)\), the market rate of interest \((i)\), the required reserve ratio \((\psi)\), the discount rate \((\rho)\), and the maximum allowable rate payable by member banks on time deposits, as specified by Regulation Q \((\tau)\). The short-term market rate employed is the Treasury bill rate; the required reserve ratio is given by total required reserves divided by total time deposits and adjusted demand deposits subject to require-
ments; the time deposit rate is for deposits of up to $100,000, one-to-two years.

The first table of summarized results is for lagged values of each multiplier plus the rate of interest as predetermined variables; the second table is for the inclusion of the reserve requirement variable, the discount rate, and the maximum rate on time deposits. These policy variables are thought to explain much variation in the parameters in the monetary multipliers; the reserve ratio (r), the borrowing ratio (b), and the time deposit ratio (t), respectively; much of the variation in the currency ratio (k) is thought to be seasonal in nature and is allowed for by using seasonally adjusted data.

When the respective multipliers are regressed on the market interest rate variable and the policy variables, \( \psi \), \( \rho \), and \( \tau \), excluding lagged values of the multipliers; for each multiplier all variables except \( \psi \) yield significant t-values (at the .99 level) and the coefficients have the expected signs in all cases. But when lagged values of the respective multipliers are included in the simulation, along with the interest rate, the marginal improvement in predictive power delivered by the policy variables is not great, as readily seen in the tables below. The poor performance of the reserve requirement variable is an un-
anticipated result, and no explanation is offered.

As expected a priori, the RPD multiplier is more stable than the total reserve or unborrowed reserve multipliers; this is thought to owe largely to the exclusion from the former of treasury deposits, a singularly large source of irregular variation.

1. \( m^*_t = m^* (m^*_t-j, i) \quad j = 1, 2, 3, 4. \)

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2. \( m^*_t = m^* (m^*_t-j, i, \psi, \rho, \tau) \)

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SUMMARY AND CONCLUSIONS

The first section of the paper was devoted to the more-or-less formal discussion of the indicators and targets problem. It was asserted that movements in endogenous (noncontrolled) factors must be included in interpreting the stance of policy.

Two of the empirical issues regarding bank reserve adjustments, raised in Appendix B, can be tentatively answered: Banks do tend to readjust their free reserve positions back to (desired) initial levels, and within a rather short period of time. Using the differential \((i - \rho_0)\) in place of the market rate of interest does not apparently result in any improvement in explaining bank reserve adjustment and borrowing behavior.

On the surface, the latter result appears to deal a damaging blow to the "profit motive" hypothesis. Cagan interpreted his results as indicative of an accommodation-of-important-loan-customers motivation dominating bank borrowing behavior. This may be construed as a "long-run profit" motivation.

When the differential \((i - \rho_0)\) is truncated as described by Frost and Sargent, the federal funds rate included in
the model, and adjustment costs specified, a much improved model of bank reserve adjustment and borrowing behavior results.

All evidence indicates that the interest-elasticity of free reserve ratios is negative and almost certainly significantly different from zero.

Interest rates and concepts such as "money market conditions" are clearly unsuitable as either indicators or targets; some reserve-type aggregate seems preferable. However, reserve variables (including RPDs) are suspect on two counts. (a) There is the oft-cited (Meltzer, Saving, Dewald, etc.) interpretational difficulty attaching to a change in the level of (free) reserves, which is essentially an identification problem. (b) Reserve variables are not completely (or at least, sufficiently) policy controllable; that is, they are not reasonably well insulated - as is the monetary base - from variation emanating from behavior of the banking sector. It should be noted that the interpretational problem is more pertinent to the indicators issue; the exogeneity problem to the targets issue. While the money stock is preferable over these variables as an indicator, problems also arise for the use of a money indicator, and for such constructs as "potential money" and the "neutralized" money stock.
Presuming the monetary authorities are interested in controlling the (rate of growth of the) money stock, the optimal procedure is to aim at some intermediate reserve-type aggregate (proximate) target variable for which some stable linkage to the money stock is demonstrable. Two separate empirical issues are discernible: the exogeneity (or in the strict sense, controllability) of the aggregate (target) variable itself; and the stability of the (multiplier) relation between the aggregate and the money stock.

Once it is resolved that the monetary base is preferable on the exogeneity criterion, the critical issue becomes the comparative stability of the relationships between the money stock and the various proposed aggregate-type policy variables.

Based both on its exogeneity (controllability), and on the demonstrated stability of its relation to the money stock, the monetary base appears to be the optimal target variable.

The optimal indicator variable appears to be changes in money supply relative to money demand. In closing,
it might be noted that the rate of interest seems to be a quite-important explanatory variable in empirical money-demand work; the rate of interest is accorded a role after all in the indicators game.

What is required, obviously, is a stable money-demand function, recalling the incantation that greater knowledge of the structure is to be sought. Empirical work to date indicates that this is a not unreasonable aspiration. Yet, if indicator data are to be of any value, they must become available with minimal information lag. Supposing that money-demand information does not meet this requirement (131), policy-makers might want to opt for some proxy variable chosen on more pragmatic grounds: a possible indicator of the stance of policy in this event could be changes in the money stock relative to some readily observable measure of economic activity, such as changes in the level of aggregate expenditure in the economy.
APPENDIX A:
RECENT POLICY BEHAVIOR OF THE FEDERAL RESERVE

The most comprehensive study that the author is aware of in this area is Wood's ambitious "A Model of Federal Reserve Behavior" (132). Wood finds that for the most part the Fed has concentrated on "smoothing variations in 'other factors' (presumably what we have termed noncontrolled factors) affecting reserves", in agreement with an earlier statement by Dewald (133). A smaller but significant part of its behavior is directed at what we have called ultimate targets, e.g. GNP, price level, employment. Wood adds the caveat that such a model of Federal Reserve behavior, "while necessary, is not a sufficient basis upon which to develop an assessment of the correctness of Federal Reserve policies. This can be accomplished only in connection with a larger model which explains variations in all of the jointly dependent variables contained in our Federal Reserve behavioral equation. That is, what is needed if we are to evaluate the effects of monetary policies is not the Federal Reserve's view of the structure of the economy, but rather the true structure, though the two might be related" (134).

Another recent work in this area is "Monetary Aggre-
gates and Open Market Operations" (135). Meek and Thunberg assert that prior to 1970, actual (proclaimed) policy targets of the Fed were based on so-called "money market conditions". The Fed most often aimed at member bank borrowings, free reserves, and the federal funds rate. The major problem in achieving reserve and borrowings targets seemed to be in predicting variation in noncontrolled factors (136). The authors assert that as of 1970, there has been increased emphasis on aggregates. Just as we are becoming hopeful, we learn that the federal funds rate and something called "adjusted bank credit proxy" (see footnote 4, pg. 81) are the primary (proximate) operating targets, along with money (137). 18

Finally, in 1970 the Fed had trouble attaining the desired growth rate in money, due to (a) informational lags; (b) movements in noncontrolled factors; (c) attention to other sometimes conflicting targets, most notably the federal funds rate (138).

18 But, even more recently (1972), the Fed has come to view RFDs as an important proximate target (see pg. 38-39).
APPENDIX B:
ON THE EXOGENEITY OF "CONTROL" VARIABLES

Most "control" aggregate variables (e.g. the monetary base or various reserve variables) must in the strictest sense be considered endogenous; they contain elements that are not wholly determined by policy actions. It is worth stressing that a variable "in principle subject to control" such as unborrowed reserves or the base is one whose variation emanating from noncontrolled variables can in principle be offset by changes in controlled variables. In an unpublished paper by Dewald and Lindsey, unborrowed reserves are partitioned into controlled (exogenous) and noncontrolled (endogenous) components; \( F_0 \) and \( N \), respectively.

\[ U = F_0 + N \]

Analysis of proximate targets involves explaining variation in the variables "in principle subject to control" and not in assuming that they are controlled (139). In policy making, then, account must be taken of expected changes in noncontrolled factors: \( F_0 = U_t - E(N) \)

where \( U_t \), the unborrowed reserve target, is given by

\[ U_t = q_0D_0 + X(i) - B(i) \]

\( q_0 \) = average reserve requirement.

Thus if one views unborrowed reserves as a target and the
rate of interest as a variable which may respond to (among other things) policy actions aimed at altering the reserve base, one must consider possible responses in free reserves to whatever changes in the interest rate as are likely to result. Specifically, the monetary authorities can, via open market securities transactions, (initially) affect the magnitude of $U_t$ through changes in the control variable $F_0$; this action may alter the short-term rate structure, and ultimately result in an offsetting feed-back effect on $X(i) - B(i)$.

Nor is the monetary base strictly exogenous; several components of the sources of the base are thought to respond to economic activity, notably the items discounts & advances, banking system float, and international gold movements. See also Appendix F.

Thus, if one opts for an unborrowed reserve target, 

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19A brief example is given to clarify the use of the term 'offsetting'. Suppose that the monetary authorities desire an expansionary policy; accordingly, $F_0$ is increased by means of the purchase of securities. Initially, at least, the rate of interest will tend to decline. Assuming that $\frac{\partial (X-B)}{\partial t} < 0$, banks will hold increased free reserves at the lower rates, that is, $(X-B)$ will rise. The increase in $(X-B)$ is a secondary effect which must be regarded as restrictive, and thus is (partly) offsetting to the primary expansionary effect of the open market purchase. It is assumed that $q_0$ and $P_0$, the nominal discount rate, are fixed.
the relevant questions are (1) Do banks, in the absence of any alteration in short-term rates owing to the open market transaction, tend ultimately to readjust their free reserves back to the initial desired level? (2) What is the magnitude of the effect of an open market securities transaction on the interest rate, i.e. what is the elasticity of $i$ with respect to changes in $F_0$? (3) What is the interest elasticity of the $X(i) - B(i)$ schedule? (4) Might $i - P_0$, the differential between the market interest rate and the (nominal) cost of borrowing, be a more appropriate argument? (See Appendix D and Appendix E.)

If one opts for a monetary base target, it is important to know how the noncontrolled items respond to things like seasonal factors, price level, and interest rates. All these issues are empirical; and relevant evidence is cited in the body of the paper where appropriate.
APPENDIX C:

MONEY STOCK \( (M) \), MONETARY BASE \( (B) \), MULTIPLIER \( (m) \), RATE OF INTEREST \( (i) \), AND RESERVE / DEPOSIT RATIO \( (r) \); 1959-1961 AND 1965-1967.

Seasonally unadjusted data.

The rate of interest shown is the Treasury bill rate.
APPENDIX D: THE PROFIT MOTIVE HYPOTHESIS

Undoubtedly, "informal" borrowing pressures ($P_0'$) vary over the cycle, but probably in a way which should reduce the correlation were they somehow included. We would expect such pressures to intensify when the profit incentive to use the discount window is greatest, i.e. when $i$ is high relative to $P_0$. As the free reserve ratio would be falling, and this assumed rise in $P_0'$ would decrease the effective differential, the (negative) correlation would be reduced. It is pertinent to note that $P_0$ has undergone relatively infrequent change in this country.

The second possibility looks more productive. The hypothesized feed-back effect rests on a sophisticated behavior by banks regarding expected changes in rates, specifically $P_0$. Assume that banks are willing to use the window for speculative purposes when the market rate $i$ is sufficiently high; and that when the anticipated differential between $i$ and $P_0$ is great enough they will desire to expand loans and investments, and will reduce their free reserve ratio and be willing to borrow more to this end (140). Now, as the market rate (and the differential) rises, banks come to anticipate that $P_0$ (and/or $P_0'$) will be raised (and that $i$ will remain high). They plan to
acquire a relatively large volume of earning assets by bor-
rowing and by drawing down free reserves; they naturally
prefer to borrow at the lower current rate \( P_0 \), as opposed
to the (expected) higher rate in the near future; they do
so initially, and draw down free reserves as \( P_0 \) (or \( P_0 + P'_0 \))
rises in response to increased activity at the discount
window and monetary expansion in general. Note that free
reserves and \( i - P_0 \) now move in the same direction.
Clearly, whether banks in fact behave in the described
manner is an empirical question, and seemingly a difficult
one to test. In any case, this version of the feed-back
hypothesis depends on a probably unrealistic assumption
regarding speculative behavior on the part of banks with
respect to anticipated movements in \( P_0 \) and \( P'_0 \).

A less elaborate version of the same hypothesis can be
constructed, which posits a rise in the discount rate in
response to high borrowing, producing a positive correla-
tion between the free reserve ratio and the differential,
which obscures the negative correlation postulated by and
seemingly crucial to the "profit" theory (141). This ad-
mittedly ad hoc reformulation might be given more credence
if \( P_0 \) were changed frequently in response to credit condi-
tions, but this hasn't been the case. This shifts much
of the burden of explanation onto the more-or-less phantom
variable $P_0'$, a tenuous position to try to hold.

Observers of financial markets tend to attach much significance to the discount rate; thus its chief importance probably lies in the realm of psychological responses in the financial sector, as changes in the rate are usually interpreted as signals of general policy intentions. But the evidence turned up by Cagan and by Meigs indicates that it is not a terribly important influence on banks' borrowing behavior, popular opinion to the contrary. These observations regarding $P_0$ are obviously damaging to the feed-back versions of the argument.

Cagan is probably correct in interpreting the results as indicative of the importance to banks of accommodating the credit needs of their major customers (142). Thus when demand for funds is great and market rates relatively high, we should expect the free reserve ratio to be quite low, and borrowing to increase; upward pressure on $P_0$ could be expected to result. Yet suppose borrowing did not diminish (or even increased) as $P_0$ (or $P_0'$) rose; due either to the anticipations version of the feed-back hypothesis, or the desire-to-accommodate-important-customers hypothesis. A positive correlation between $\frac{R}{D}$ and $(i-P_0)$ would result. It is curious that this result follows from either of two hypotheses which posit such radically
different behavior on the part of the banking sector.

The relation between the free reserve ratio and borrowing (143) and the pervasive strong relation between $\frac{R}{D}$ and $i$ are consistent with both hypotheses. Further empirical tests would need to be constructed which would render the two observationally distinguishable. However, on the basis of (a) the apparent conservative bias of most banks; (b) avowed statements to the effect that credit accommodation of major customers is important in banks' decision making (144); and (c) historical observation of the infrequency of changes in $p_o$; one should decidedly favor the accommodation interpretation over the anticipations interpretation.

The accommodation interpretation might reasonably be construed as a "long-run profit motive". Cagan's results are probably biased against the "short-run profit motive", as he admits (145). Summarizing, the "short-run profit motive" might do better empirically if one were to (a) include some measure of $p_o$; (b) allow for feedback; (c) use the desired free reserve ratio, $(\frac{FR}{L})^*$, as suggested by Meigs (146). In fact, Cagan finds that for (c) the correlation between $(\frac{FR}{L})^*$ and $(i - p_o)$ generally has the correct sign, and is sometimes even significant.
Conclusions:

(a) The "profit motive" is not so badly damaged as Cagan's results would at first seem to indicate. See also Appendix E.

(b) $p_0$ is a rather unimportant parameter in banks' decision making processes; whether $p_0 + p_0'$ would do better is an empirical issue. The less significant the total effective cost, including an adequate proxy for $p_0'$, in explaining bank borrowing behavior, the more we should be led to prefer the accommodation hypothesis over the anticipations hypothesis.

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20 To the extent that limited evidence of the "short-run profit motive" exists, it shows up most clearly for the 1920s decade. (The implications for banking conservatism growing out of the subsequent experience of the 1930s are too obvious to require comment.)
Appendix E:
The Frost-Sargent Model

Banks hold excess reserves as a buffer against unanticipated outflows since this reduces the adjustment costs of meeting reserve requirements by more than the opportunity cost, i.e. income foregone from earning assets that might have been purchased. Thus banks' levels of excess reserves vary directly with borrowing costs and adjustment costs and variability in reserve flows, and inversely with interest rates on earning assets (147).

Frost-Sargent posit three primary alternative sources of reserves to meet (essentially short-run) needs: borrowing in the federal funds market, borrowing from the Fed, and the sale of short term securities (in this model, treasury bills). The costs, including adjustment cost parameters, are specified for each source (148). F-S define the relevant "cost advantage" variable as

\[ i - \rho_o + \varnothing_T,\text{max} \]

where \( i \) is the treasury bill rate
\( \rho_o \) is the nominal discount rate
\( \varnothing_T,\text{max} \) is the maximum adjustment cost differential between selling bills and borrowing from the Fed.

If \( i - \rho_o + \varnothing_T,\text{max} \leq 0 \), no bank borrows. As the "cost advantage" variable becomes positive, more banks borrow
from the Fed to meet unexpected reserve losses. Thus the expected level of borrowings can be expressed as

\[ E(B) = g(i - \rho_o + \phi_{T,\max}) \]

where \( g' > 0 \) for \( \phi_{T,\max} > (i - \rho_o) > \phi_{T,\min} \)

The regression of borrowing on the "cost advantage" variable is characterized by a break where the "cost advantage" variable is zero. Above this point borrowings respond positively to increases in cost advantage; below it there is no response (149).

**FROST - SARGENT EMPIRICAL RESULTS AND CONCLUSIONS**

For the 1950s, the federal funds market appears to have been the primary alternative to borrowing from the Fed (150).

Lags in banks' borrowing responses are much shorter (.3 months for reserve city banks, 1.4 months for country banks) when the costs are formulated in this manner (151).

Some evidence for the profit motive:

Some New York city banks found it profitable to borrow from the Fed when the difference between the (market) rate and the discount rate was greater than -.25 percent. Beyond this point the number of banks that found it profitable to borrow from the Fed increased monotonically as the difference increased to 1.25 percent; at this point all of the banks found it profitable to borrow from the Fed when faced by the prospect of reserve deficiencies (152).
The evidence indicates that the simple spread between the short-term interest rate and the discount rate is not quite the appropriate cost advantage variable to be used in explaining member banks' borrowing. Instead, the rate spread should be truncated in the fashion suggested by the model presented in section II. This modification of the simple spread variable delivers a sizable improvement in explanatory power. In addition, it reduces the lag which is found in the response of borrowing to cost changes. This suggests that a large part of the lags found in previous studies is attributable to the faulty specification of the cost advantage variable (153).
APPENDIX F:
EXOGENEITY OF THE BASE; "PEELING" THE BASE

Of course, exogeneity of a policy variable is not the primary criterion, a priori; that the policy measure have theoretical significance is a necessary condition, and one too obvious to require elaboration. Still variables have been devised or proposed which achieve greater exogeneity in the statistical sense but are suspect on theoretical grounds. Particularly suspect are those proposed measures resulting from "peeling" of the monetary base.

A typical such construct is proposed by DeLeeuw and Kalchbrenner (154). (Recall that the base, by uses, consists of bank reserves plus currency held by the public (vault cash is omitted to avoid double counting).) Borrowing and currency in circulation are subtracted from the use base; what remains is unborrowed reserves. This "peeled" base is open to criticism on both theoretical and methodological grounds. "On theoretical grounds, unborrowed reserves is not a relevant measure of monetary influence" (155).21 Unborrowed reserves (and other reserve measures) are subject to the criticisms already voiced (see pg. 47-50). Andersen and Jordan also point
out that to "peel" the use base is theoretically meaningless (156). 22

21 This holds true even if the Federal Reserve espouses an unborrowed reserve target; it is the actual structure of the economy, and the actual behavior of the Federal Reserve, and not their motivations or their interpretation of their behavior, that has economic consequence. This important point is emphasized by Brunner (157).

22 The three primary components of the monetary base by sources are Federal Reserve Credit, which is comprised of the Open Market Account (exogenous), discounts & advances (endogenous), and bank float (endogenous); Gold stock (endogenous); and Treasury Currency (exogenous). Note that Treasury Currency is issued currency, a policy variable, and not the same as currency in circulation, the amount of which at any point in time depends on behavior of the non-bank public sector. Thus if one were to "peel" the source base — the proper procedure if one is interested in such things — the resulting construct would consist of the Open Market Account plus Treasury Currency.
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