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ABSTRACT

This paper explores how monetary policy should be conducted when the definition and measurement of money are time varying. It suggests that the recent debate about the desirability of controlling monetary aggregates or nominal interest rates is not helpful in a regime where financial innovations are occurring. The first section argues that money should be defined as immediately spendable (or collected) funds and provides empirical evidence that both currency and overnight repurchase agreement and Eurodollar borrowing are more closely related to personal income than are different types of bank deposits. The second surveys the adequacy of policy instruments and information available to the Federal Reserve in recent years. The third considers how policy should be conducted in a system that experiences innovations. A filtering approach proposed by Kalchbrenner and Tinsley is recommended. The paper argues that greater and faster data collection are desirable and that even in the best circumstances greater uncertainty about the effects of monetary policy is very likely to obtain. It concludes by recommending that monetary authorities focus on real interest rates, that banks be induced to raise new capital through stock issues, and that the Federal Reserve consider introducing real-time reserve accounting.

On the Adequacy of Policy Instruments and Information when the Meaning of Money is Changing

Donald D. Hester*

During the past twenty years a torrid debate has occurred about the desirability of having the Federal Reserve focus on and peg either some interest rate or some monetary aggregate growth rate. The debaters assumed, explicitly or implicitly, that there was a fixed finite number of financial assets and interest rates in the economies they studied - sometimes only one of each. There was general agreement that in the long run in such economies inflation (deflation) will result if monetary aggregates are allowed to grow too rapidly (slowly) or if nominal interest rates are kept too low (high). Most of the disagreement concerned pegging interest rates and monetary growth rates over a period of a few years.

This paper attempts to expand the scope of the discussion by considering how policy is affected when the set of monetary aggregates and interest rates changes over time. Changes occur because of technical progress in data processing; institutional, legal, and regulatory change; and conditions that have been precipitated by unusually sharp fluctuations in interest rates or aggregate growth rates. It does not propose a solution to the ill-structured problem of designing optimal controls when market innovations are induced by policy. Instead it analyzes how the possibility of unforeseen changes should affect the design of policy and collection of data by a central bank. Underlying the discussion is an assumption that there exists a relation between the volume of transactions media (money) and output and prices, but that linkage is not specified.

I. The Definition of Money

In this paper money is defined to be the amount of instantaneously spendable funds that individuals and firms have at any point in time. A sharp distinction is drawn between the public's deposit claims on banks which conventionally are interpreted as money and "collected funds" which are institutionally defined as being immediately available and therefore instantaneously spendable. Deposit claims are short-term credits that individuals and firms extend to banks. They are a partial payment for services that banks provide, a temporary buffer where imbalances between receipts and expenditures are resolved, and an investment upon which interest is paid. The first and third interpretations do not imply that income and deposits should be closely related, and the second has a strong competitor. Individuals and firms often resolve imbalances by taking installment or commercial bank loans or by using charge accounts, trade credit, or credit cards; such adjustments are at least as plausible temporary buffers as reservoirs of deposits.

Before 1965 little error would have been made by equating collected funds with outside money, the sum of currency outstanding and deposits at reserve banks. Neither of these items are credits extended to banks that could compensate for services rendered and neither earns interest. Currency dominates both checks and short-term loans for a wide variety of small transactions. Balances which banks carry with reserve banks are correspondingly the dominating medium for large transactions, whether they are used to settle check clearing imbalances among banks or effect wire transfers. Because transactions that were financed by credit are eventually extinguished or rolled over with collected funds, there was a strong pre-

sumption that monetary authorities could control the level of economic activity when they controlled the level of outside money. This argument, it should be emphasized, is very different from claiming that monetary policy works by controlling some monetary aggregate which includes deposits at banks, such as M1B. The present argument implies that the relation between M1B and income generally will be loose and that components of M1B will be differently related to income; of its components currency should be most strongly related to income. Modern monetarist models make no such prediction, although an important early contribution by McKean did.

Since 1965 it has become increasingly misleading to equate collected funds with outside money. As explained in Hester (forthcoming), other varieties of collected funds have emerged that are not included in currency and bank reserves. Each day member banks acquire large quantities of collected funds through repurchase agreements that banks arrange with corporations and state and local governments, through overnight Eurodollar deposits that bank customers carry in Grand Cayman Island shell branches and through "daylight overdrafts" that are mechanistically created during the course of a business day. These intraday funds disappear each evening before banks close and are not accurately recorded by the Federal Reserve. Their existence substantially weakens its control over the volume of transactions media. There is no direct connection between the new varieties of collected funds and the monetary base, but demand for them is undoubtedly a function of interest rates which can be affected by open market operations.

Empirical evidence of the indefensibility of summing components of conventional monetary aggregates and of the "moneyness" of overnight repurchase agreements and Eurodollar borrowings, when describing fluctuations

in economic activity, is provided in equations 1) and 2). Regressions of personal income on seasonally unadjusted components of M1B and (new) M2 indicate that different components have very different coefficients.[1] An

1) $Y = -235.71 + 21.024^{*}\ C - 0.092\ DD + 2.836^{*}\ OCD$
$\qquad\qquad\qquad\quad (.610)\qquad (.250)\qquad (.548)$

$R^2 = .996,\ S_u = 19.67$

2) $Y = 101.73 + 11.580^{*}\ C - 0.006\ DD + 0.498\ OCD + 2.892^{*}\ ORE - 0.361\ MMF -$
$\qquad\qquad\quad (1.187)\qquad (.198)\qquad (.671)\qquad (1.415)\qquad (.335)$

$- 0.052\ SD + 1.012^{*}\ STD$
$\quad (.134)\qquad (.169)$

$R^2 = .998,\ S_u = 15.860$

analysis of covariance strongly rejects the hypothesis that all coefficients are equal.[2] As predicted, the coefficients for currency are many times greater than the coefficients on demand and other checkable deposits. After currency, the coefficient on overnight borrowings is largest.

The close relation between currency and income does not imply that restrictive monetary control can succeed unless one is willing to deny currency to individuals who are, for example, queued up in front of a bank, as occurred during the thirties. No doubt high correlations between income and the monetary base are largely attributable to its currency component, and a similar qualification should be appended to claims about the virtues of controlling the base.

II. Instrument and Information Adequacy

The set of policy instruments and regulatory powers available to the Federal Reserve has also been increasing over time as financial innovations occurred. New instruments and powers include marginal reserve requirements on

Eurodollar borrowings, bank related commercial paper, repurchase agreements, and federal funds purchases from nonmember bank intermediaries; surcharges on the discount rate; and powers to disallow new lines of activity and acquisitions by bank holding companies. When the Credit Control Act of 1969 was activated, the set of instruments was virtually unlimited. Legislative initiatives towards improving monetary control are a curious blend of attempts to increase the flexibility of the Fed's powers to deal with new situations and a seemingly contradictory series of resolutions designed to limit its independence. For example, the 1970 amendments to the Bank Holding Company Act, the International Banking Act, the Electronic Funds Transfer Act, and the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) all sought to expand powers of the Board to respond in important respects. On the other hand, parts of DIDMCA and the Humphrey-Hawkins Act reduced Federal Reserve autonomy and forced it to cast policies in a narrowly monetarist framework, which was unsuitable in the light of innovations that were occurring.

In order to control an economy, it is necessary to observe (or monitor) variables that describe it in a timely fashion and to know the structure of a model that formally relates policy instruments to these variables. Apart from the possibly growing extent of the irregular economy (Feige), measures of real economic activity appear to be no less accurate today than they were formerly. The structures of models that might reliably guide policymakers surely have changed because of new policy instruments, because of recent financial market innovations (Hester, 1981), and for reasons that have been identified by advocates of rational expectations. Therefore, knowledge about the relation between

variables that describe an economy and policy instruments is likely to have diminished.

The analysis of forces leading to financial market innovations is in its infancy. While it is surely the expectation that profits can be obtained through development of a new market or service that leads to innovation, there appears to be no basis for presuming that innovations will decrease the probability that an economic system is unstable or the need for discretionary policy. For example, financial instrument futures markets are a successful response to growing interest rate fluctuations in the seventies, because they have been profitable and increased hedging opportunities. Yet speculation is not necessarily stabilizing. Similarly, the existence of rational expectations does not imply that fluctuations in an economy will be small or that discretionary policy cannot reduce the present value of their expected amplitude.

Therefore, it is important that variables in an economy continue to be monitored for evidence of financial distress and for opportunities for constructive discretionary intervention. What criteria should guide data collection in these circumstances? A formal experimental design is not possible because the event space is not defined; therefore, intuitively appealing criteria are required. Three seem paramount: interpretability, timeliness, and sensitivity to change. While no single data source is likely to score highly in every dimension, a judicious analysis of several may allow successful early identification of major changes.

First, it seems desirable to continue to collect data series that appear in well-constructed macromodels. They provide baselines for judging when an innovation has occurred - particularly if "add-factor" and other arbitrary

dummy variable adjustments are foresaken. The failure of an equation such as the demand function for money to track historical time series implies misspecification, which may be a consequence of innovation.

Second, cross-sectional data about financial institutions are regularly collected by the Federal Reserve and the other supervisory agencies. These samples are sufficiently large that probability distributions of balance sheet variables can be constructed. Under relatively weak assumptions of stationarity, it is possible formally to test hypotheses about changes in means or other moments of distributions. Innovations can be expected to cause changes in the distributions of observable variables. Further, because of the high setup costs of financial market innovations, they can be expected to occur first in the portfolios of large financial institutions. A particularly sensitive indicator of innovations is likely to be means of individual bank portfolio ratios for, say, the fifty largest banks.

Third, interest rates are continuously observable. As I have argued elsewhere (1981) very substantial changes in the structure of interest rates tend to accompany financial market innovations.

Fourth, the clearest signal that a change has occurred is the appearance of a new financial instrument or institution. Unfortunately, it is in the nature of change that information about either will not be collected for a considerable period of time. Many changes involve small amounts of funds and individually are of no consequence in a macro model. Collectively, however, they may not be so negligible. They can be roughly monitored by tracking residual or "all other --" entries in balance sheets of financial institutions.

III. Change and Control

Once a change is recognized to have occurred, how should policy be planned? A structural change in a model implies that its multipliers have changed. Typically too few observations will be available to estimate multipliers in an updated model. One could continue to use the old model on the grounds that innovations start small. Alternatively, a competent technician, without benefit of data, could make conjectures about how equations need to be modified in response to an innovation so that the model would yield conditionally unbiased forecasts. Third, following Kalchbrenner and Tinsley one could pool each of the two preceding specifications by taking a weighted average of the multipliers for a policy instrument where weights reflect a user's subjective estimate of their reliability. Their procedure is preferable because it is likely to lead to the lowest mean square forecast error.

Three observations about policy strategy seem generally defensible. First, the debate mentioned at the beginning about whether pegging nominal interest rates or monetary aggregates is an optimal strategy is not illuminating when change is occurring. It is easy to construct examples where either approach will prove disastrous. For example, suppose an innovation creates a nearly perfect substitute for M1 that is unaffected by variations in the monetary base. Movements in M1 would be almost irrelevant for the economy. Pegging nominal interest rates could be very harmful, if an innovation caused the rate of inflation to rise above the peg. Elementary demand theory teaches that linkages between interest rates and real or nominal measures in the economy are conditioned by the set of aggregates and institutions.

Second, discretionary policy can be no better than the information that guides it. In a rapidly changing system decisions by monetary authorities and the private sector will become increasingly anarchic unless the volume of information collected is large and the speed of its processing high. This observation is related to monetary control in two ways. Recent efforts by the government to reduce reporting burdens by financial institutions inevitably weaken the controllability of the system by monetary authorities. On the other hand, increasingly incomplete information in the hands of the private sector is likely to change its behavior when capital markets are imperfect and individuals risk averse. More uncertainty will lead to less risk taking and more pooling of risks through conglomerate organization and mergers. More uncertainty weakens rational expectations arguments against discretionary policy since households and firms will be less able to detect policy initiatives.

Third, the possibility that both the private sector and the government are becoming progressively less informed about the economy raises serious questions about the ability of institutions to withstand unforeseen shocks. While deposits in financial institutions tend to be insured, a substantial volume of large denomination certificates of deposit, jumbo savings certificates, and Eurodollar deposits is uninsured. Continuing losses at thrift institutions suggest that their ability to absorb shocks is weakening, particularly when one takes into account the large undisclosed book losses which many have suffered from recent high interest rates. High nominal interest rates naturally coincide with high rates of inflation and I believe a strong case exists for having real short-term interest rates positive. However, when the real federal funds rate exceeds 8%, as it has for much of 1981, policy makers are engaging in dangerous brinksmanship. Few borrowers can sustain these high real interest rates for

long and many firms may not be able to survive without credit.

To cope with the present threatening situation, the Federal Reserve should encourage short-term rates to fall to a level where the real federal funds rate lies within its historic range, say, between a positive one and two and one-half percent. Further, it and other regulatory agencies should coerce banks and other financial institutions to raise fresh outside capital, even if new issues must be sold at prices that are substantially below book values. Existing stockholders have menaced the stability of the financial system by allowing leverage to rise. They contributed to the existence of a large potential negative externality. Free markets function best when externalities are absent!

Finally, to control the growing volume of intraday immediately available funds the Federal Reserve should consider imposing real-time reserve accounting. Under such a regime the attractiveness of overnight repurchase agreements and Eurodollars to banks would be substantially diminished because reserves would be required against an average of intraday deposits, not simply deposits at the close of a day as presently is the case.

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[1]Data are monthly, January 1976 - February 1981. Sources are the Federal Reserve Bulletin and the Survey of Current Business. Standard errors are in parentheses. The symbols C, DD, OCD, ORE, MMF, SD, and STD refer respectively to currency, demand deposits, other checkable deposits, overnight repurchase agreements and Eurodollars, money market funds, savings deposits, and small time deposits.

[2]Specifically, the F-ratios in these analyses of covariance were 304.91 and 41.41 for 3 and 58 and for 7 and 54 degrees of freedom respectively. Very similar results were reported by Wood who used quarterly data between 1952:2 and 1974:2 in a study of old monetary aggregates.