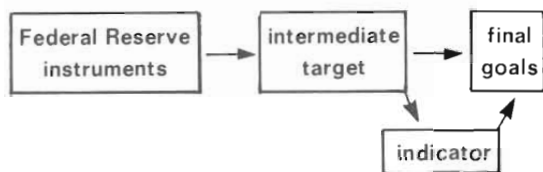# The right rabbit: Which intermediate target should the Fed pursue?

Gillian Garcia

The importance of monetary policy to economic well-being is widely acknowledged. Given the recurring problems of recession and inflation that have plagued the U.S. and the world economies for the past two decades, there is general interest in attempts to improve the conduct of monetary policy. During the 1970s and the early 1980s monetary policy has been conducted using an intermediate targeting approach. This paper discusses the relative merits and demerits of the several alternative candidate intermediate targets.

The Federal Reserve uses one or more intermediate targets when it conducts monetary policy because it believes that it operates more effectively this way than if it directed its tools immediately at its ultimate objectives. Under intermediate-targeting, the Fed first sets goals for the final economy in terms of the rate of growth of final output and the rate of inflation. It then estimates the level or the growth rate for its intermediate target or targets that are most consistent with achieving these ultimate goals. Finally it sets its policy instruments at levels commensurate with hitting the intermediate target. That is, policy is conducted according to the schema

```
┌─────────────┐    ┌─────────────┐    ┌────────┐
│  Federal Reserve │──▶│ intermediate │──▶│ final  │
│  instruments     │   │   target     │   │ goals  │
└─────────────┘    └─────────────┘    └────────┘
                          │              ▲
                          ▼              │
                      ┌───────────┐
                      │ indicator │
                      └───────────┘
```

Note the use of an indicator in the conduct of monetary policy. This is some variable (not one of the final objectives) which is influenced by monetary policy and which gives early informa-

Gillian G. Garcia is a senior economist at the Federal Reserve Bank of Chicago. The author thanks Thomas A. Gittings, Anne Marie Gonczy, and Harvey Rosenblum for comments on an earlier draft of this paper and Gus Backer for competent research assistance.

tion on the likely outcomes for the final goals. For example, data on retail sales (available more quickly and more frequently than GNP figures) provide one of many possible indicators.

Recent experience

In the years immediately before October 1979, the Fed used an interest rate as its main intermediate target, but it was felt that this procedure encouraged inflation. Consequently, in October 1979, the Fed increased its emphasis on the M1 targets and switched to using nonborrowed reserves as the instrument to hit those targets. However, even after the change, inflation initially continued to be a severe problem; interest rates rose to high levels and became more volatile. The economy experienced two recessions within a short period. Many observers argued that the change in operating procedures had exacerbated the economy's ills and a lively debate developed both within and outside the Fed on the relative merits of various potential intermediate targets.

During fall 1982, the Federal Reserve announced that it would pay less attention to movements in M1 in the near term. It pointed out that the relationship between M1's behavior and the final economy was being obscured by several developments in the financial markets. In particular, the phaseout of All Savers Certificates and introduction of the money market deposit accounts (MMDAs) and Super NOW accounts were expected to obscure M1's underlying movements. In the short run, the portfolio shifts resulting from these developments would most likely be effected via M1, the medium of exchange. Consequently, observed changes in M1 growth might reflect merely a reshuffling of funds between accounts with similar purposes, but which happened to be in different money classifications (M1, M2, etc.), rather than a sig-

Glossary

Goals. The features of the economy which the Fed wishes ultimately to influence, such as the growth of real GNP, the inflation rate, or the unemployment rate.

Indicators. Variables that are not final goals but which provide advance information on the economy's likely performance in achieving its goals.

Instruments. Variables which the Fed most closely controls such as the federal funds rate, the discount rate, the level of depository institution reserves, and the reserve requirement ratios.

Intermediate targets. Variables between the instruments and goals over which the Fed has some leverage, such as a monetary aggregate, a credit aggregate, an interest rate, or a money index.

Instruments

Reserve requirements. The amount of funds (held either as vault cash or, directly or indirectly, as deposits at Federal Reserve Banks) that depository institutions must hold in support of their transactions (and some other) accounts.

Federal funds rate. The interest rate at which depository institutions trade reserves and other immediately available funds overnight.

Discount rate. The rate the Federal Reserve Banks charge depository institutions to borrow reserves to meet any deficiencies.

Intermediate targets

M1. Currency in circulation, demand deposits, other checkable deposits, and travelers checks.

M2. M1 plus overnight repurchase agreements (RPs) and overnight Eurodollars (issued to U.S. residents by foreign branches of U.S. banks worldwide), most money market mutual funds (general purpose and broker-dealer), money market deposit accounts, small time and savings deposits.

M3. M2 plus term RPs and term Eurodollars, institution-only money market mutual funds, large time deposits.

L. M3 plus nonbank public holdings of U.S. savings bonds, short-term Treasury securities, commercial paper, and bankers acceptances.

K. Total domestic nonfinancial debt.

Monetary base. Currency in circulation and depository institution reserves.

Divisia indices. Quantity index numbers corresponding to M1, M2, M3, and L that weight the components of each aggregate by their user (or opportunity) cost.

Debit-weighted index. A quantity index of available media of exchange that are weighted to reflect their respective turnover rates.

Nominal interest rate. The annual rate of interest received on a given investment, particularly risk-free Treasury bills.

Real rate of interest (before taxes). The nominal annual rate received or expected over a time interval, less the inflation rate experienced or expected over the same interval. No allowance is made for taxes.

Real after-tax rate of return. The real rate adjusted for the taxes incurred by the particular investor on the interest earned.

Technical terms

Velocity. The speed with which money (particularly M1) changes hands during any year—calculated usually as the ratio of GNP to M1.

Reserve multiplier. The relationship between the stock of depository institution reserves and the quantity of money (usually M1).

Repurchase agreement (RP). A bookkeeping transaction that temporarily converts a (demand) deposit into a deposit backed, typically, by a Treasury security. RPs allow an institution to reduce the level of its required reserves and the customer to earn (higher) interest rates on his funds.

Turnover. The rate at which any aggregate (or its components) changes hands per year.

Debits. The volume of funds deducted from the different kinds of bank account, i.e., a measure of the work being performed by the account in effecting transactions.

nificant shift in either monetary policy or the public's demand for transactions balances. This possibility was regarded as even more likely because velocity, the ratio of nominal GNP to M1, was behaving more oddly than usual during the 1981-1982 recession. Since the end of World War II, the trend in velocity has been upwards. In recessions this growth typically decelerates, but in 1981-82 velocity actually *declined sharply,* as shown in Figure 1.

Figure 1
The velocity of money declined sharply in 1981-82
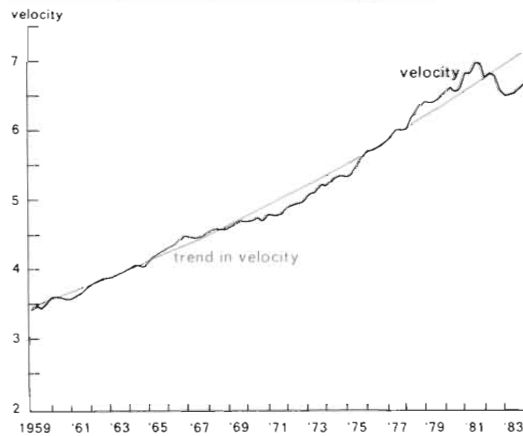
Thus, in fall 1982, the question of what alternative intermediate target to use became more urgent. That an answer had to be found was clear — for the Humphrey Hawkins Act mandates that the Fed report its intentions for money and credit growth to Congress semi-annually. And, in fact, it does so each February and July. Moreover, several bills had been introduced into the Congress to direct the Federal Reserve to adopt one of several alternative targets.

Public opinion on the issue

While Congress and the financial press were debating the relative merits of the alternatives—M1, M2, M3, L (the Federal Reserve's measure of liquid assets), a broad credit aggregate, a real or a nominal interest rate, nominal GNP or

even no intermediate target at all—the public had several opportunities to express its views. Two surveys of professional opinion were conducted. One surveyed academic economists and the second reported the views of financial market participants.

The results of these two surveys are reported in Table 1. Academic economists surveyed by the House Banking Committee in April 1983 showed a 2:1 preference for switching away from a monetary aggregate to some other intermediate target. Favored alternatives were, in order of preference: a mix of economic indicators, the monetary base, nominal GNP, and interest rates. Financial market participants, surveyed by Money Market Services Inc. in July 1983, favored retaining a monetary aggregate target, particularly M1. Alternatives favored by this group were, in order: nominal GNP, a credit aggregate, a mix of indicators, and the monetary base.

Table 1
Results from two surveys of public preference regarding intermediate targeting

Target	Percentage of academic economists who prefer[1]	Percentage of financial analysts who prefer[2]
Monetary aggregate:	30.8	56.6
M1		(37.7)
M2/M3		(18.9)
Other:	62.6	39.5
Monetary base	(15.5)	(5.6)
Credit aggregate	(3.3)	(9.4)
Interest rate	(7.7)	(1.9)
Mix of indicators	(24.3)	(7.5)
International variables	(1.1)	(0.0)
Other	(1.9)	(0.0)
Nominal GNP	(8.8)	(13.2)
Reserves	(0.0)	(1.9)
Final goals directly	2.2	3.7
Real GNP	(1.1)	(0.0)
Inflation	(1.1)	(3.7)
Don't know/Unclear	4.4	0.0
	100.0	98.8

[1]90 academic economists were surveyed.
[2]53 financial economists were surveyed.
SOURCE: Academic economists were surveyed by Congressman Fernand St Germain for the Domestic Monetary Policy Subcommittee of the House Banking, Finance and Urban Affairs Committee in April 1983. The bankers and dealers were surveyed by Money Market Services Inc., in July 1983.

These surveys indicate a substantial divergence of opinion. Three possible reasons come to mind to account for this divergence. First, there is a difference in the timing of the reports. Academic economists were surveyed by letter by Congressional chairman Fernand St Germain in April 1983. Money Market Services surveyed dealers and brokers by telephone three months later. However, it seems unlikely that such a small lapse in time could have been responsible for such a large divergence of opinion.

Second, it is possible that different segments of the population hold different opinions. It is often argued that those more concerned about unemployment than about inflation prefer nonmonetary indicators. Many academic economists fall into this category. Those who worry about inflation more than unemployment, choose a narrow money aggregate. Market participants, concerned about the adverse effects of inflation on the money and capital markets, may belong to this group.

Third, and this is the position taken in this paper, it may be that there are genuine uncertainties about the relative merits and demerits of the various alternatives. Therefore, these advantages and disadvantages are explored further here.

The pros and the cons

The intermediate target question is not new, but the events described above prompted a surge of research into the topic. This article summarizes some of the recent research and discusses the pros and cons of the several proposed targets: the monetary base, M1, M2 and/or M3, a credit aggregate, an interest rate (either real or nominal), nominal GNP, or one of the two new money index numbers.

Four criteria are used to evaluate the alternative targets. First, the chosen intermediate target should be closely and causally related to the final targets set for monetary policy. Second, it should be an accurate leading indicator of those final targets. Third, it should be closely and reliably connected to the instruments over which the central bank has direct control. Fourth, its

data should be available on an accurate and timely basis.[1]

M1

M1 consists of currency in circulation, demand deposits, other checkable deposits, and travelers checks. That is, it measures transactions balances.[2] Despite the Federal Reserve Board's expressed concern about M1's usefulness in the recent environment, four strands of current research support its continued use in the long run. First, Batten and Stone (1983) show that M1 continues to meet the first criterion listed above. That is, it explains real GNP and inflation well. The relatioship can be summarized in a "St Louis equation" for the period 1960.II to 1982.IV. The St. Louis equation relates the annualized quarterly growth rate of GNP (Y) to the similar growth rates for M1 and high employment government expenditures (E) for the current and previous four quarters. That is,

$$Y_t = a + \sum_{i=0}^{4} m_i \, M_{t-i} + \sum_{i=0}^{4} e_i \, E_{t-i} + u_t.$$

Batten and Stone show that, despite changes in operating procedures, M1 continues to explain GNP. It explains GNP before October 1979, when the Fed was using a nominal interest rate as its intermediate target. It explains GNP when the Fed was using M1 as its intermediate target and it explains GNP during late 1982 when the Fed changed its intermediate target emphasis once again—this time to the broader aggregates, M2 and M3. For example, Batten and Stone find that M1 explains 31 percent of the quarter-to-quarter variation in nominal GNP and over 80 percent of the short-term variation in the inflation rate. Moreover, despite an estimation bias

---

[1]The Federal Reserve, itself, has some ability to influence the performance of any intermediate target when judged by the third and fourth criteria. An important issue is whether the Fed could, if it wished to, change its procedures to allow it to directly control, via its instruments (existing or new), an important economic variable. An ancillary issue is whether it could then arrange to have the necessary data available on an accurate and timely basis.

[2]It does not, however, include money market mutual funds or money market deposit accounts, which have limited transactions features.

against the monetarist model, it is found to be as successful as are the well-known large econometric models in forecasting nominal and real GNP and the inflation rate.

Second, research by Thomas Gittings (1983) at this bank demonstrates the usefulness of M1 as an intermediate target. Gittings has built a small macro model in the St. Louis tradition, but with the long-run neutrality of money assumption formally imposed. The neutrality assumption means that a change in the growth rate of money or credit, when this is used as the intermediate target, eventually causes an equal change in the rate of inflation and does not have a permanent effect on the level of real output. The model's specification contrasts with the St. Louis models, which do not impose this assumption, and with the several large macro models, which are so constituted that neutrality is achieved only after very long lags.[3] The model works well until the last quarter of 1982. At that time, many macro models experienced difficulty—a difficulty reflecting the unusual behavior of velocity, which will be discussed further below.

Gittings' model can be used to ask which of several money and credit aggregates best explains GNP and inflation. The answer is M1. The superiority of M1 over this period is demonstrated in Figures 2-7.

The Gittings model of real GNP and inflation was built on data that ended with 1976. Consequently, four tests are available for judging the performance of the three intermediate targets examined in these charts (M1, M2, and the Federal Reserve's credit aggregate, K). These are the ability of each aggregate to track real GNP both "in-sample" (through 1976) and "out-of-sample" (after 1977) and to track inflation over both intervals, as well.

M1, in sample, tracks the extent and the timing of the upward and downward spurts in both real GNP and inflation reasonably well. While M2 and K track real GNP well, they do not so accurately portray in-sample the inflation rate. Out-of-sample, none of the three variables suc-

cessfully tracked the range of post-1976 variation in real GNP or inflation. But then it is (deliberately) asking a lot (much more than is asked of the large commercial econometric models) to forecast seven years out of sample. In short, these simulations show that M1 predicts real GNP and the inflation rate better than does the monetary base or M2 and as well as any credit aggregate. That is, M1 meets the first and second criteria for an intermediate target better than do most alternatives and at least as well as credit.

Third, research by William Barnett (1982) and Paul Spindt (1983) shows that M1 continues to explain the economy well in normal times. However, in abnormal times, such as 1974-76 and 1982-83, the policymaker may find supplementary information provided by one of the two new monetary indices useful. These are discussed further below.
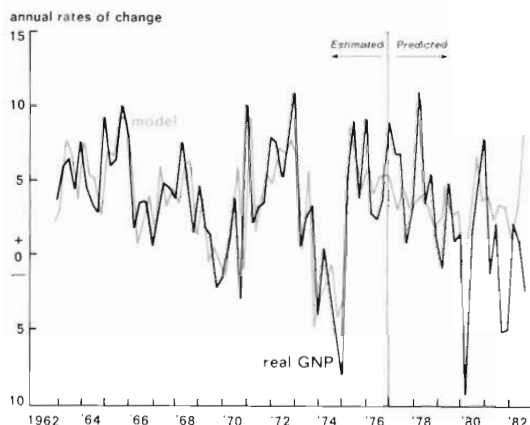
Fourth, several economists have advocated using a credit target as a supplement or replacement for M1. In justifying this position, Benjamin Friedman (1982) has conducted a large number of empirical tests on time series data. These tests, together with those by Edward K. Offenbacher and Richard D. Porter (1983) at the Federal Reserve Board, show that while some credit measures perform as well as M1 in explaining economic events, none does better than M1 alone.

No intermediate target is perfect; there are three main disadvantages to using M1 in this way. First, the continuing process of financial innovation—such as the growing use of credit cards and repurchase agreements, has served to increase the (velocity) relationship between M1 and GNP. Second, this regular upward trend was sharply reversed (see Figure 1) during the 1981-2 recession. The reasons for velocity's decline were not (and still are not) well understood. Third, the gradual extension of reserve requirements to nonbank depository institutions and the downward adjustment of requirements for many banks has distorted the multiplier relationship between reserves and M1. These problems, particularly the first two, caused the Fed to de-emphasize the use of M1 during Fall 1982. Thereafter M2 and M3 were given greater attention than before.

[3]Some economists feel that the lags observed in the large macro models are artificially long because of econometric estimation problems.

Figure 2
The M1 version of Gittings Model predicts real
GNP reasonably well until 1982 . . . .

annual rates of change

Figure 3
. . . And does almost as well with the implicit
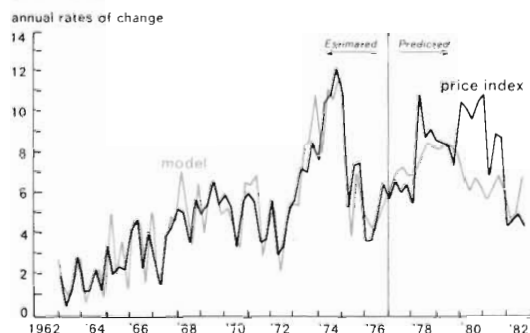GNP deflator (price index)

annual rates of change

Nevertheless, the four strands of research support M1's usefulness in explaining movements in the economy. While it failed during the last quarter of 1982, during the first half of 1983, and also in 1974-76, M1 has otherwise been a good predictor of the economy. M1 also meets the last two criteria for an intermediate target. That is, it is closely related to the Fed's instruments such as the federal funds rate, and the supply of nonborrowed reserves (Bryant, 1983). Further, the Fed has experience in its use and this experience has provided detailed, accurate, and timely data on the movements of M1 and its components.[4]

The monetary base

The monetary base consists of currency in circulation and depository institution reserves. Such bank and thrift reserves are comprised of currency on hand and deposits held at the Federal Reserve. Some economists are currently advocating use of the monetary base as a surrogate for M1 in the present environment. Advo-
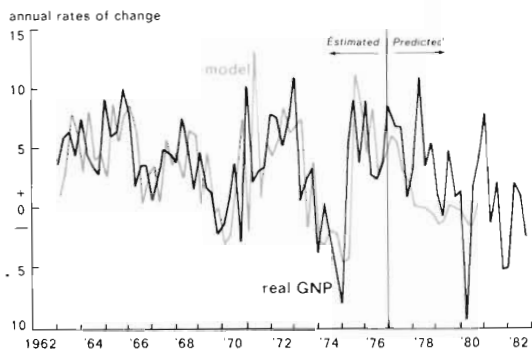
cates of the base argue that the Fed is better able to control the base than M1, while the base governs the growth of M1 and should, therefore, also be closely related to the final economy. According to these economists, the base meets criteria (3) and (1) above. There is, however, debate on these issues.

For example, currency is supplied according to the public's needs, so that the Fed does not control this component of the base. Further, there is debate as to what extent the Fed controlled the supply of reserves to depository institutions under a system of lagged reserve accounting, (LRA), which was in effect in the period from September 1968 through January 1984. Under lagged reserve accounting, depository institutions held reserves in one week against the deposits they had held two weeks earlier. Then, if the institutions were to meet their legal obligations, the Fed had to supply the necessary quantity of reserves, which had already been determined. Thus, while the Fed could control the quantity of unborrowed reserves, it was forced to supply any deficiency in the form of borrowed reserves. In short, critics question whether the Fed under LRA actually had any better control over the base than it had over M1.

In February 1984, the Fed moved to a system of almost contemporaneous reserve accounting. It is too early to say what are the implications of this change for the choice of an intermediate target. Students of reserve accounting predict some small improvement in monetary control (Laurent 1984).
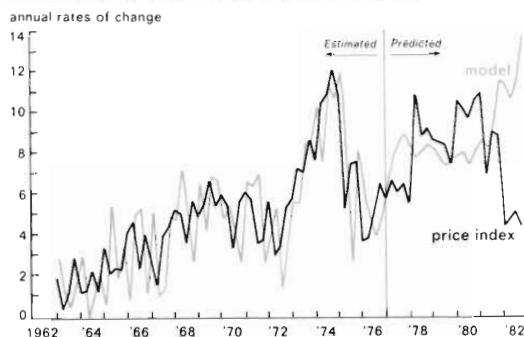
---

[4]The Fed does acknowledge problems in obtaining accurate seasonal adjustments for its M1 data. These problems hamper the use of daily and weekly, rather than longer period data, and they make the "fine tuning" of monetary policy more difficult. Consequently work is currently underway to improve the Fed's seasonal adjustment procedures (Pierce, Grupe, and Cleveland).

Figure 4
In its M2 version, the Gittings Model does not predict real GNP as well . . .

annual rates of change

Figure 5
. . . and does even worse with the price index

annual rates of change

The question of control over the monetary base has been tackled by Balbach (1981), who argues that while the Fed does not control all items of its balance sheet at all times, it does have sufficient control for enough of the time to counteract any currency or reserve accretion that exceeds the target. Moreover, base data are accurate and are available on a very timely basis, so they satisfy the fourth criterion.

Other critics have disputed whether the relationship of the base to the level of GNP is either stable or predictable—properties necessary if the Fed is to be able to use the base to adequately control the economy. This question was answered earlier in the affirmative by Balbach and also by Johannes and Rasche (1982). With both of these relationships taken care of, the Fed should be able to use the base as its intermediate target. However, Hafer and Hein (1983) admit that the base has recently failed the third criterion test. That is, the base multiplier, which measures the relationship between the quantity of the monetary base and the stock of money, became erratic in 1982. In fact, Hafer and Hein argue that much of the well-known and oft-criticized volatility in money growth during 1982 was attributable to shifts in the base multiplier and was not due to erratic base growth. In such a case, the Fed would need to react quickly and to anticipate accurately changes in the multiplier if it were to precisely control M1. Consequently, economists who essentially want to control the M1 money supply, and who are willing to do so by monitoring the monetary base

when they are prevented from using M1 itself, would have had difficulty in successfully pursuing this alternative during the last two years or more.

M2 and M3

These are the two aggregates which the Fed has said it is, at the time of writing, following most closely, together with M1. M2 consists of M1 plus money market deposit accounts, small time and savings deposits, most money market mutual funds (general purpose and broker-dealer), overnight repurchase agreements (RPs), and Eurodollars. M3 adds term RPs and Eurodollar deposits, large CDs and other large time deposits, and the remaining money market mutual funds (institution-only MMMFs).
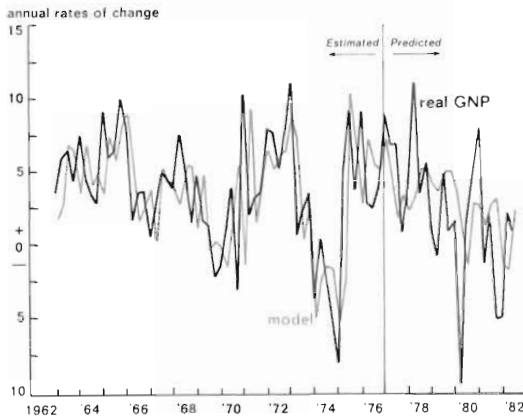
The switch from M1 to the broader aggregates involved the least dramatic revision of intermediate targeting procedures and so would allow an easy return to M1 targeting. There are some problems in adopting this approach however.

First, the introduction and rapid growth of the MMDA during the first quarter of 1983 made it difficult to interpret M2 movements.[5] This presented a practical problem for the Federal Reserve in deciding upon the target range of growth rates to set for the broader aggregates at the beginning of 1983 and specifically what rates

---

[5]The effect of the new accounts on the money aggregates is discussed further in Garcia and McMahon (1984).

Figure 6
The K (debt) version of Gittings Model predicts real GNP better than the M2 version, but not as well as M1
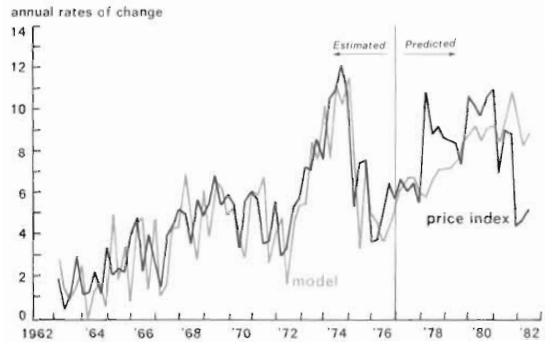
annual rates of change

Figure 7
K predictions of the implicit GNP deflator are better than the M2 predictions

annual rates of change

to report to Congress in February 1983. During this espisode, the problem was overcome by shifting the period used for base comparison from fourth quarter 1982 (the calendar quarter typically used as a base for comparison) to the middle of the first quarter of 1983—after the major part of the disruption had passed.

However, other problems are more difficult to cope with. For example, M2 (and *a fortiori* M3) is a conceptual mish-mash. Unlike M1, which measures transactions balances, M2 has no particular distinguishing features, such as operationalizing the concepts of transaction balances (or credit supply in the case of K). Consequently, the transactions demand approach to monetary theory and policy, which is applicable to M1, does not relate readily to M2, M3, or L. Some economists use an alternative theory, that of portfolio balance, to rationalize the use of M2 as an intermediate target. In this case, M2 would represent transactions balances plus their very close substitutes. But the composition of M2, which includes some illiquid, long-term time deposits, and other shorter-term time deposits which carry withdrawal penalties, call into question M2's ability to represent this concept.

Moreover, the increasing ability under deregulation to pay market interest rates on components of M2 has confused the relationship of M2 to output, employment, and inflation. This problem is so serious that it is not even clear what is

the direction of the effect of an increase in interest rates on the level of M2, which perversely could *rise*. For example, this happened in the case of money market mutual funds, a component of M2. MMMFs rose sharply with market interest rates during the late 1970s and early 1980s.

In this situation, reliance has to be placed on empirical relationships—estimates of the multiplier and of velocity—in setting policy. But in times of change, past empirical relationships may be unreliable. For example, empirical relationships are now being disrupted by the changing financial structure. Financial innovation and financial deregulation have increased the percentage of M2 and, to a lesser extent, M1 components that pay market interest rates. Ten years ago this percentage was very small. In December 1978 it was 6.3 percent. By December 1983 it had risen to 63 percent.[6]

This makes an important difference to the way M2 responds to policy stimuli. Ten years ago if the Fed considered that the economy was growing too rapidly, it would tighten policy. When the Fed tightened (i.e., slowed down the rate of growth of reserves), market interest rates rose. Then, money's opportunity cost rose because it did not earn interest. Consequently, its growth decreased. When the money stock growth decreased, the stimulus to the economy sub-

[6]Moreover, since the introduction of the money market certificate in June 1978, most of the growth in the nontransactions components of M2 has occurred among those components that pay market-related rates. This fact serves to strengthen the arguments made in the text.

Table 2
Correlations between M2 and RGNP growth rates

M2 Growth	1968.1—1978.2	1978.3—1984.1
Contemporary	0.520	0.017
Lagged one quarter	0.584	0.384
Lagged two quarters	0.533	0.341
Lagged three quarters	0.394	0.041
Lagged four quarters	0.217	0.227

sided. By fall 1982 the scenario had changed. If the Fed were to tighten, interest rates would rise, money market mutual funds (a component of M2) and M2 itself might also rise, instead of declining. Consequently, if the Fed were to tighten some more, the growth of economic activity would slow because of interest rate pressures. However, M2 might continue to rise because it contains components that pay market interest rates, whose volume rises as rates rise.

This change has served to weaken the relationship between M2 and real GNP. In the prederegulation era, real GNP (RGNP) rose with (and also one or two quarters after) M2. This association is demonstrated in Table 2. However, since the second quarter of 1978, the association has become weaker. The deterioration is also demonstrated in the table.

In fact, recently M2 has been behaving countercyclically to the business cycle, instead of procyclically. This change is demonstrated as occuring during 1980 in Figure 8. Research by Ross Starr (1982) also makes this point well. Such behavior makes M2 (or M3) a potentially misleading intermediate target: it thus fails the first two tests.[7]

However, recent research by Thomas D. Simpson at the Federal Reserve Board demonstrates how M2's changed relationship to the business cycle can be utilized in policy setting. This research is based on a portfolio allocation

---

[7]More work is needed to clarify this phenomenon. For example, the question arises whether the same phenomenon will carry over to M1 with the advent of Super NOW accounts and the likely introduction of business transaction accounts paying market rates.

theory of M2 demand. As M2 components have increasingly come to pay market rates, the interest sensitivity of M2 has declined. In a portfolio demand model, money holders allocate their wealth among alternative assets. Consequently household net worth replaces GNP as the principal explanatory argument of the M2 demand function. This relationship can be used for policy purposes, if a stable and predictable relationship can be demonstrated between household net worth and GNP. Simpson's work provides evidence that household net worth can be used as a leading indicator of GNP.

Nevertheless, neither M2 nor M3 perform well on the remaining two criteria. Under current operating procedures, the Fed controls the quantity of its chosen aggregate through the supply of depository institution reserves. The configuration of reserve requirements is important here. Some components of M2 (and M3) carry reserve requirements and some do not. Consequently, any Fed attempt to limit the growth of M2 or M3 aggregates can be thwarted by portfolio shifts out of components that carry reserves to those that do not. Control via a reserve instrument, therefore, may be difficult.

Further, data on M2 and M3 are not so readily available as those for M1. While M1 data are available weekly, some M2 and M3 components are available only monthly. In short, M2 and M3 are generally agreed to be impractical interme-

Figure 8
Quarterly growth in real GNP and M2
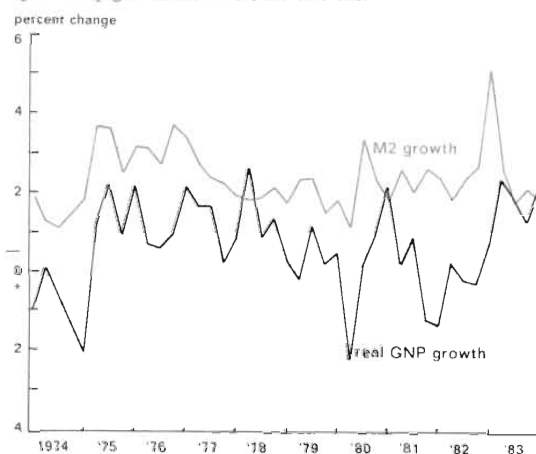
diate targets for sole use on a long term basis; they do, however, provide valuable supplementary information.

Credit

During the past two years there have been several recommendations that the Federal Reserve use a credit aggregate instead of, or in addition to, a monetary target. Attention within the Federal Reserve System was drawn to this matter when Frank E. Morris (1982), President of the Federal Reserve Bank of Boston said, "I have concluded, most reluctantly, that we can no longer measure the money supply with any kind of precision." And, "the time has come to design a new control mechanism for monetary policy, one which targets neither on interest rates nor on the monetary aggregates."

At the same time, several analysts advocated using a debt or credit variable instead of a monetary aggregate as the intermediate target. The research work to support these claims derived from two sources.

First, Modigliani and Papademos (1980) showed how commercial bank credit could be integrated into a traditional, pre-DIDMCA (Depository Institutions Deregulation and Monetary Control Act) model of the monetary sector. The research demonstrated that to operationalize a bank-credit-alternative intermediate target, the system of reserve requirements would need to be redrawn to control credit rather than money. This work provides the theoretical framework for meeting criteria (1) and (3) above.

Changes in the technology of financial intermediation and in the laws governing it, have reduced the disparities between banks and thrifts. Now both groups supply transactions balances. In recognition of this fact, transactions account balances provided by both industry groups are included in M1. By analogous argument, the supplies of credit issued by both groups must be recognized as influencing the level and growth of real GNP and the inflation rate. However, the fundamental theoretical work has not (yet) been extended to describing the transmission of both bank and thrift credit to the final economy. Such an extension is necessary if depository institutions credit is to become the principal intermediate target.

Second, empirical work by Benjamin Friedman, using vector autoregression techniques, has demonstrated that a different credit variable (total domestic nonfinancial credit) has been as closely associated to GNP as M1. Moreover, it has been more closely associated than other potential intermediate targets in the recent past. Friedman argues [1982, pp. 4-5] that,

> The evidence indicates that, in each of the four criteria considered, total net credit is just as suitable as any of the monetary aggregates to serve as an intermediate target for monetary policy in the United States. As long as the Federal Reserve System continues to use an intermediate target procedure, this evidence is consistent with adopting a two-target framework based on both money and credit, thereby drawing on information from both sides of the public's balance sheet for the set of signals that govern the systematic response of monetary policy to economic events.

This advocacy caught the attention of Congress, particularly when the economy was enduring the worst recession since the 1930s. Several bills were introduced into Congress to compel the Federal Reserve to adopt some alternative to monetary targeting.

There are, however, several problems with the credit alternative. On the one hand, the absence of a currently relevant theoretical model for either depository institution credit or for the Fed's debt variable, K, (and Friedman's domestic nonfinancial credit variable) leaves the possibility that the observed empiricial relationships might be accidental. This position is supported by empirical research by Offenbacher and Porter (1983) of the Federal Reserve Board staff. Their research shows that the performance ranking of the various intermediate targets as obtained by Friedman is peculiar to the particular set of tests he conducted. The same tests conducted in a different order yield different results, ones more favorable to M1.

It may also happen (particularly in the absence of the necessary theoretical model) that on accomplishing the revision of reserve require-

ments needed to provide "credit control," the observed empirical relationships would change. Credit could then even cease to be closely associated with GNP.[8] More likely is the case that the observed size of the response would change, as lenders sought ways to avoid the tax imposed by reserve requirements. This would leave the Fed in a quandary as to the level of stimulus necessary to achieve any desired objective.

The absence of experience in operating in this way naturally gives rise to caution. Caution is especially appropriate where carefully constructed and timely data are lacking. While the data situation is improving, credit and debt data are not available in such rich detail, or on such a timely and accurate basis, as are those for M1.[9]

Interest rates

The large macro models of Keynesian descent use interest rates as the transmitter of monetary policy to the final economic goals. The modus operandi of monetary policy during much of the early and mid 1970s was also expressed in terms of interest rates. That is, the theoretical and empirical relationships necessary to meet criteria (1), (2), and (3) have been met and have been acted upon in the past. Moreover, accurate data are available on a timely basis, so that interest rates evidently present a viable alternative target.

As the 1970s progressed, however, a fundamental problem was perceived in applying these theoretical and empirical relationships. The interest rate which the Fed influences most directly—the federal funds rate—is a *nominal* interest rate, unadjusted for inflation, past, present, or anticipated. But the rate which influences spending plans and ultimately the production of goods and services, is a *real* rate (or numerous real rates). The problem in using a nominal interest rate target is that the relationship be-

tween the nominal rate and the final goals can be subject to great uncertainty. This occurs when the policy maker is unable to distinguish between the real and the inflationary components of the nominal rate.

Conceptually, the real rate adjusts for inflation (and sometimes also for taxes), which overstates the true return on investments. That is, the real (before-tax) rate that will be earned on a pending investment of say, one year's maturity, is the interest rate to be earned less the inflation rate that will hold over the year.

A different question then arises as to whether the Fed can hit a real interest rate target. Several practical problems exist, concerning the translation from nominal to real rates and conversely. Should the Fed want to use a real rate as its intermediate target (as proposed, for example, in two 1982 Congressional bills), these difficulties must be resolved. Examples of the practical problems are given and pursued in research by C. Cumming and C. Miners (1982) of the Federal Reserve Bank of New York. For example, the authors ask whether in choosing, say, a nominal rate, it should be one important to households in their spending/saving decisions, or to businesses in making their capital investment plans. Both rates are relevant to determining the economy's direction. But pairs of interest rates influencing these plans have not followed the same path in the past and cannot be expected to do so in the future. They can give conflicting signals, therefore. The authors also ask whether the targeted rate should be adjusted for taxes—and if so, whose? In both cases, the authors argue that a market rate available to households and adjusted for their taxes, is relevant.

If a real rate is to be used, should it be ex post or ex ante? That is, should it be the real rate that held in the recent past, or the one anticipated for the near future? Economists respond that the expected real rate is the variable relevant to decision-making. But a proxy for expected inflation may not be readily available. Instead, therefore, past or present data are often used. Moreover, the question then arises, which deflator—there are several to choose from—should be adopted? If ex ante, over what horizon should the interest rate expectations be formed?

---

[8]Charles Goodhart (1984) of the Bank of England has made this point so forcefully that it has become known as "Goodhart's law."

[9]If the Federal Reserve decided to make credit its principal intermediate target, it could require institutions to provide the data it needed. However, this adjustment would take time to be made satisfactorily.

The authors debate these questions in their paper, then they construct several after-tax and/or real rates, which implement the different alternatives. The behavior of the several resulting measures clearly illustrates the difficulties and potentially serious ambiguities that beset interest-rate targeting. For example, the different interest rate series have behaved differently over times past. They yield different turning points, have different growth rates, and have different cyclical patterns. As a result of their different responses, the different series would give rise to very different policy prescriptions with regard to the policy necessary to achieve any given Fed objective.

Public and Congressional pressure to re-adopt nominal interest rate targeting or to switch to real interest-rate targeting now appears to be over. Whether this change should be attributed to the practical problems illustrated in the research or to the end of the recession is debatable. Ironically, at the same time that Congressional pressure has receded, many Fed watchers claim that since fall 1982 the central bank has once again, de facto, been targeting interest rates (specifically the federal funds rate) rather than M2, M3, or M1. This interpretation is denied by the Federal Reserve.[10]

Nominal GNP

Several eminent economists, Robert Gordon (1983), Robert Hall (1983), John Taylor (1984), James Tobin (1980), and James Meade (1978) have recently spoken favorably of targeting nominal GNP. First, the argument needs to be made that the growth of nominal GNP (NGNP) should be considered a potential intermediate target, rather than one of the Federal Reserve's ultimate goals. (However, as the discussion below reveals, NGNP would be an intermediate target of a different color.) The growth of nominal GNP ($\dot{Y}$) equals the growth of real GNP ($\dot{Q}$) plus the inflation rate ($\dot{P}$).

$$\dot{Y} = \dot{Q} + \dot{P}$$

While both of the right hand variables are final goals, one is a good and the other is a bad. Setting targets for the growth of nominal GNP does not directly imply a growth rate for either goal so NGNP would be an intermediate target. However, proponents argue that NGNP targeting would work to produce a favorable outcome in the resulting division of NGNP growth between inflation and growth in real output. This argument—one about stabilizing the business cycle—will be discussed further below.

Pros

Proponents argue that NGNP targeting would improve the economy's performance with respect to the first criterion, the relationship between the target and the goals. That is, targeting NGNP would tend to stabilize real GNP when velocity goes off track (as it did seriously, from 1981 to 1983). The reason is that in order to keep NGNP (which is the product of the money stock and velocity) growing at a fixed rate, the money supply must be increased when velocity declines or velocity growth slows. The depressing effects of a decline in velocity, or the inflationary effects of its rise, are thus countered.

Targeting NGNP, it is argued, would also combat inflationary shocks. Because nominal GNP is the product of real GNP and the price level, an upward shock to the price level would be countered by a decrease in output. The resulting excess capacity in the economy puts downward pressure on the price level, which allows real GNP to recover.

Similarly, an upward stimulus to output growth arising from an improvement in productivity would produce a decrease in the inflation rate where NGNP growth was being held constant.

Thus, the important arguments in favor of NGNP targeting concern its power to stabilize the economy. However, a recent paper by Pro-

---

[10]Governor Henry C. Wallich (1984) explains how this misperception can arise. The Federal Reserve states that it is using the level of depository institution reserves as its principal instrument to influence the growth of the money aggregates. To do so the system needs accurate projections of reserve availability.

"In the absence of trustworthy projections, the funds rate at times may be a more accurate indicator of reserve availability than the (Staff's) reserves projections. If the manager decides to act on the signal from the funds rate in assessing the volume of reserves needed, he may create the appearance that he is working to influence the rate. . . ." (Wallich 1984, p. 14).

fessor John Taylor (1984) points out that the answer is not so clearly in favor of NGNP targeting as the proponents claim. The issue is more complex.

Cons

Professor Taylor argues that the stabilization advantages of NGNP targeting are more apparent than real. The arguments presented above say only that the direction of the initial response to new shocks to velocity or prices is correct. Beyond the initial response, however, Taylor argues that NGNP targeting leads to overshooting and the propagation of cycles.

With regard to the second criterion for an intermediate target—that of being a leading indicator—the principal argument in favor of M1 as an intermediate target is that it leads GNP. If this is so, to target on NGNP instead of M1 would delay the policymaker's response, a response which is often already criticised for being too slow.

This issue has been ignored in the recent academic discussions. These discussions typically begin: "if NGNP and M1 were contemporaneous then . . . ." But if M1 does indeed lead NGNP, as is almost universally claimed, the issue would be clear cut in favor of M1.

In response to this criticism, Robert Gordon (1983) suggests that the Fed target forecasts of NGNP to reestablish the leading indicator property of the intermediate target. But to make this proposal more convincing Gordon would need to show that an average of consensus forecasts of GNP is a better indicator of GNP than current M1. And this has not yet been demonstrated.

With regard to the third criterion for evaluating an intermediate target, the verdict is not favorable to NGNP. That is, the relationship of the policy instruments (open market operations, etc.) to NGNP are not well understood. Chairman Volcker in his July 20, 1983 testimony to Congress expressed this most forthrightly by denying that the Fed can control NGNP. "The Federal Reserve alone cannot achieve within close limits a particular GNP objective—real or nominal—it or anyone else would choose. The fact of the matter is monetary policy is not the only force determining aggregate production and income" (Volcker 1983, p. 14). Finally, with respect to the fourth criterion, the NGNP data are available only quarterly and after a delay.

In short, NGNP would *not* be a useful intermediate target for fine-tuning monetary policy on a weekly basis. Its forecasts do, however, have value as an indicator. When accurate, they give advance notice of the likely successes (or failures) of a monetary policy that is formulated in terms of one or more monetary targets. Such an NGNP indicator would be particularly useful in keeping policy on track. And, to some extent, NGNP may already be used by some FOMC members in this manner, for the Federal Reserve Board staff regularly prepares forecasts of GNP behavior for use by FOMC members. But that is *not* using NGNP as a intermediate target, in the usual sense of that term.

Index numbers

Some of the most interesting work on the definition of money has been conducted at the Federal Reserve Board by William Barnett, Edward Offenbacher, and Paul Spindt (1981). For many years the definition of money was straightforward: it consisted of currency in circulation and demand deposits. Both were the principal accepted means of payment. On a variety of rationales, the public's holdings of these means of payment reflected its spending intentions. Increases in the stock of money foretold increased spending plans and conversely. But more recently, financial innovations (spurred by advances in communications technology, and previously by incentives provided when high market interest rates were confronted by regulatory restrictions on the payment of interest on many depository institution accounts) have made it increasingly difficult to distinguish transactions from savings balances.

The growth of multi-purpose financial assets made controversial the old all-or-nothing approach to defining money. Under the old approach, a decision had to be made at what level of aggregation (M1, M2, or some broader aggregate) a financial instrument should enter the money aggregate hierarchy. As an alternative, or

The Divisia Indices

Divisia Indices are quantity index numbers that are measured relative to the money stock available in some arbitrarily chosen base year whose stock is set at 100. Thus, they have *no* physical dimension; that is, they are not expressed as dollars. The research is this area has been done principally by Barnett (1982), but also in co-operation with Offenbacher and Spindt (1981) at the Federal Reserve Board.

Divisia numbers are constructed to correspond to the current aggregates, so there are Divisia M1, M2, M3, and L. The Divisia numbers differ from the traditional monetary aggregate numbers in that the components are weighted. A distinguishing feature of the weighting scheme used is a price, called a "user cost" in the technical literature. The user cost is measured by the spread between the rate of return earned by the component (zero on demand deposits and currency and during 1983 near 7% on Super NOW accounts) and that earned on some benchmark financial asset. The benchmark asset is one supposed to serve only as a store of value, and one which does not cater to money's other functions—as a medium of exchange, a unit of account, or a standard of deferred payment.

The idea here is that people reveal the moneyness of any asset by the amount of interest they are willing to forego in payment for the monetary services it provides. In practice then, demand deposits get large weights in the index, because demand deposits are many and they have a large interest rate spread. On the other hand, money market mutual funds' weights are reduced because they receive near benchmark interest rates and, therefore, have a low spread. The weight given to Super NOWs is small for two reasons. First, there are few Super NOWs relative to demand deposits. Second, they have smaller interest rate spreads than demand deposits.

The debit-weighted index numbers (M_Q)

These quantity index numbers ignore the current monetary aggregate definitions in an attempt to construct a measure of money as a medium of exchange. Any asset so usable is to be included in the index, where it is given a weight which reflects its turnover rate during the same time interval. The intuition behind the weights used here is that people reveal the "moneyness" of a third-party transferable asset through its turnover rate.

A complex modern economy has several different transactions media (such as currency, demand deposits, NOW and Super NOW accounts, money market deposit accounts, and money market mutual funds). These different transactions media are weighted by their share in the total value of debits (transactions) that is encompassed by the aggregate. Consequently, the M_Q data constitute a "debit-weighted" index. Thus, the different weighting scheme makes this index different in purpose and behavior from the Divisia numbers.

The total value of debits achieved by a component is equal to the number of its dollars available for use times their turnover rate. Here then, the weight given to a component depends on both its relative size and its turnover rate. Consequently, demand deposits are again doubly important compared to Super NOW accounts, because not only are demand deposits bigger in value but they also turn over much more rapidly. Some relevant data in turnover rates are given in the table.

Turnover rates of some M_Q components
December 1983
Data at annual rates

Demand Deposits	453.0
ATS - NOW Accounts	16.4
MMD Accounts	3.6

SOURCE: Board of Governors of the Federal Reserve, *Federal Reserve Bulletin*, February 1984, Table A14.

The M_Q numbers are potentially useful when M1 velocity (as recently) is changing in an unusual way and when new financial assets are being introduced into the financial system.

supplement, an index number approach is now being recommended. In it, money data would be constituted by weighting financial asset components according to their "moneyness." That suggestion has now been twice implemented—in the Divisia and debit-weighted quantity index numbers.

With respect to the four criteria listed for an intermediate target, Divisia aggregates, described in the box, do not appear at present to be viable alternatives or supplements to the regular money stock data. The theory underlying the transmission mechanism is not readily available, new techniques for Fed control would need to be put into place, the data are not well developed, and the empirical relationships of Divisia aggregates to the final economy show similar problems to those of the aggregates themselves. In short, Divisia aggregates do not offer a practicable alternative intermediate target, at this time.

The more recent debt-weighted index numbers, M_Q, appear more promising, however. These index numbers, the work of Paul Spindt (1983), are also pure quantity index numbers measured relative to some arbitrary base year. They differ from the Divisia numbers in not beginning from the existing M1, M2, M3, and L definitions. Rather, as described in the box, they seek to approximate the medium of exchange function of money. That is, they weight the transactions components of the monetary aggregates by their usage rates, measured by the value of debits accomplished.

Implications of M_Q for policy

During the first half of 1983, data for M1 levels and growth rates were substantially above target, which suggested that monetary policy should be tightened. The problem was less serious for the broader aggregates, however; this suggested that tightening might have been inappropriate. In this type of situation where regulatory innovations are causing portfolio shifts, the debit-weighted index can be helpful. It makes allowance for the fact that the turnover rates on the new money market deposit and Super NOW accounts are low. Consequently, a dollar housed in a Super NOW may not carry the same implica-

tions for consumer spending and GNP as would a dollar of demand deposits. It also recognizes that relocating savings from demand deposits to market-rate-paying assets will *raise* the turnover of remaining demand deposit funds.

The bottom line is that in the years 1973-1975 the debit-weighted index grew somewhat faster than M1, reinforcing the belief that monetary growth was very expansive at that time. On the other hand, from 1979 through 1983, the debit-weighted numbers have grown more slowly than M1, suggesting that money growth has been less expansive than some people fear.

With regard to the four intermediate target criteria, the debit-weighted index numbers promise to provide useful supplementary material. (Spindt does not propose that M_Q be used as an alternative target.) The debit-weighted numbers meet the first two criteria well. Being derived theoretically from the quantity equation that relates the money stock to GNP, these index numbers are closely related to GNP and (given that GNP behavior tends to lag behind any monetary stimulus or decline) they are good predictors of future GNP behavior.[11] With regard to the third criterion, Fed policy procedures are not currently designed to control such an index number. Further, they are not likely to be redesigned to this end, because the numbers are being recommended as indicators, not targets.

The main argument against their use lies in data problems. Not all the necessary data are currently available. For example, no data exist on the turnover rate of currency. The scarcity of information about currency use should be remedied when the results of a survey of household usage of currency and transaction accounts—a survey designed by the Federal Reserve Board and executed by the Survey Research Center in Michigan—become available. There remain, however, problems in separating solely financial transactions from those directly concerned with the creation of GNP. Consequently, it appears

---

[11]The quantity equation in its income version, defines the nominal value of GNP—real GNP (Q) times the price level (P)—to the stock of money (M) times the velocity of circulations; this is

$$MV = PQ.$$

that these index numbers provide potentially valuable supplementary information, but that they need further development before they will reach their full potential.

Conclusion

This article has discussed the pros and cons of several currently favored intermediate targets. The evidence presented suggests that no alternative improves on M1 in meeting the four criteria, although each of those suggested provides valuable supplementary information. While further research on the subject is under way, the passing of two problems—the disruptive effects of financial innovations on the growth of M1 and puzzling steepness of the 1982-83 fall in velocity—suggests that the case for using M1 as the preeminent intermediate target is strengthening. Even so, a reinstatement should not be etched in stone. Interest rate deregulation is now spreading to transactions deposits and the implications for M1 are not yet well understood. Consequently, any reemphasis on M1, may last only until some better approach to policymaking can be devised.

References

Balbach, Anatol B., "How Controllable is Money Growth?" Federal Reserve Bank of St. Louis, *Review* Volume 63, No. 3, April 1981, pp. 3-12.

Barnett, William A., "The Optimal Level of Monetary Aggregation," *Journal of Money, Credit and Banking* Vol. 14, No. 4 Part 2, November 1982, pp. 687-710.

_____, Edward K. Offenbacher and Paul A. Spindt, "New Concepts of Aggregated Money," *Journal of Finance* Vol. 36, May 1981, pp. 497-505.

Batten, Dallas S. and Courtenay C. Stone, "Are Monetarists an Endangered Species?" Federal Reserve Bank of St. Louis, *Review* Vol. 65, No. 5, May 1983, pp. 5-16.

Board of Governors of the Federal Reserve, *Federal Reserve Bulletin*, February and April 1984.

Bryant, Ralph C., *Controlling Money: The Federal Reserve and Its Critics*, The Brookings Institution, Washington, D.C., 1983.

Cumming, C., and C. Miners, "Targeting the Real Rate: Does the Measure Matter?" Federal Reserve Bank of New York, Research Paper, No. 8234, October 1982.

Friedman, Benjamin M. "Monetary Policy with a Credit Aggregate Target," National Bureau of Economic Research, Working Paper No. 980, September 1982.

Garcia, Gillian and Annie McMahon "Regulatory Innovation: The New Bank Accounts," Federal Reserve Bank of Chicago, *Economic Perspectives*, March/April 1984, pp. 12-23.

Gittings, Thomas A., "Models of the Long-Run Neutrality of Money," Federal Reserve Bank of Chicago, internal memorandum 1983.

Goodhart, Charles, *Monetary Theory and Practice: The U.K. Experience*, Macmillan, London 1984.

Gordon, Robert J., "The Conduct of Domestic Monetary Policy," National Bureau of Economic Research, Working Paper No. 1221, October 1983.

Hafer, R. W. and Scott E. Hein, "The Wayward Money Supply: A Post-Mortem of 1982," Federal Reserve Bank of St. Louis, *Review*, Vol. 65, No. 3, March 1983, pp. 17-25.

Hall, Robert E., "Macroeconomic Policy Under Structural Change," in *Industrial Change and Public Policy*, Federal Reserve Bank of Kansas City, 1983.

Johannes, James M. and Robert H. Rasche, "Can the Reserves Approach to Monetary Control Really Work?" *Journal of Money, Credit and Banking*, Vol. 13, August 1981, pp. 298-313.

Modigliani, Franco and Lucas D. Papademos, "The Structure of Financial Markets and the Monetary Mechanism," Federal Reserve Bank of Boston, *Controlling the Monetary Aggregates III*, Conference Series No. 23, October 1980, pp. 111-155.

Morris, Frank E., "Do the Monetary Aggregates Have a Future as Targets of Federal Reserve Policy?" Federal Reserve Bank of Boston, *New England Economic Review*, March/April 1982, pp. 5-14.

Offenbacher, Edward K., and Richard D. Porter, "Empirical Comparisons of Credit and Monetary Aggregates Using Vector Autoregression Methods," Board of Governors of the Federal Reserve Special Studies Paper No. 181, August 1983.

Pierce, David A., Michael R. Grupe, and William P. Cleveland, "Seasonal Adjustment of the Weekly Monetary Aggregates: A Model-Based Approach." Board of Governors of the Federal Reserve, Staff Study No. 125, August 1983.

Simpson Thomas D., "Implications for Monetary Policy of Changes in the Financial System." *Brookings Papers on Economic Activity*, forthcoming.

Spindt, Paul A., "Money is What Money Does: A Revealed Production Approach to Monetary Aggregation," Board of Governors of the Federal Reserve, Special Studies Paper No. 177, June 1983.

Starr, Ross, "Variation in The Maturity Composition of Debt and Behavior of the Monetary Aggregates: The Maturity Shift Hypothesis," Federal Reserve Bank of San Francisco *Economic Review*, (Conference Supplement), Fall 1982.

Taylor, John B., "What Would Nominal GNP Targeting do to the Business Cycle?" Paper presented at the Carnegie - Rochester Conference on Public Policy, April 13-14, 1984.

Tobin, James., "Stabilization Policy after Ten Years," *Brookings Papers on Economic Activity*, 1 1980, pp. 19-72.

_____., "Commentary," in *Industrial Change and Public Policy*, Federal Reserve Bank of Kansas City, 1983.

Volcker, Paul A., "Monetary Policy Objectives for 1983," Testimony of Paul A. Volcker to Congress July 20, 1983.

Wallich, Henry C., "Recent Techniques of Monetary Policy," Remarks to the Midwest Finance Association, Chicago, Illinois, April 5, 1984.