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## The Contributions and Limitations of "Monetary" Analysis

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*Remarks before the American Economic Association  
and the American Finance Association in  
Atlantic City, New Jersey, on Thursday, September 16, 1976*

The invitation to address this annual joint luncheon of the American Economic and Finance Associations is a special honor. But for one engaged in policymaking it also presents a special challenge. He may like to think of himself as a practical man but certainly not, as Keynes once put it, the "slave of some defunct economist". At the same time, he can hardly regard himself as "quite exempt from intellectual influences".

In that spirit, I would like to take this opportunity to consider some of the approaches and practices of central banking in the light of modern economic analysis.

Now, I fully realize that neither central banks as a genus nor the species Federal Reserve—nor even that special variety known as the Federal Reserve Bank of New York—have had a reputation of moving in the vanguard of professional opinion. Nor would I apologize for a certain intellectual conservatism. What we do must take account of human attitudes and institutional settings that necessarily change slowly. Sorting out what is true and valid from what is fashionable is never easy, and we have no laboratory apart from the American economy itself.

Yet, as one who spent almost twenty years outside the Federal Reserve before returning last year, I can testify directly about how much has changed over that period.

I learned my economics and my central banking in the first full flush of the *General Theory*. Perhaps symbolic of that influence, in the mid-1950's it was still something of a challenge to calculate a meaningful money supply series from the mass of statistics issued by the Federal Reserve, while markets hung on the latest release of data on free reserves or bank loans. Today, the situation is almost reversed. Our computers spew out "M's" in seemingly infinite variety and with great rapidity. Meanwhile,

analysis of the asset side of financial balance sheets seems relegated pretty much to a few specialists—or to bank examiners and the SEC.

We need not look to "defunct economists" to help explain the change, but to a school of thought that is very much alive and well!

I know one always treads on dangerous ground in using a shorthand label to describe any school of economic thought. I will therefore run a risk of oversimplification and even injustice in characterizing some of the views of the monetarists today—assessing the contributions and limitations of that analysis. But I do not think there can be much doubt that that school, for all the differences within it, has helped bring a distinctly different flavor to much macroeconomic policymaking and analysis in recent years.

Certainly, it has helped bring a new focus on the relevance of monetary policy: the proposition that the stock of money does matter. To be sure, relatively few economists—and almost no central bankers—have ever openly argued the opposite proposition. But implicitly or explicitly, there was a rather common assumption two or three decades ago that, while the money supply did have an effect on credit markets and interest rates, the induced effects on the economy were not terribly powerful in most situations. Changes in the supply of money moved us along a rather elastic liquidity preference schedule, and the investment demand function was thought to be relatively insensitive to interest rates. We therefore need to look at fiscal actions and to other exogenous forces as the main determinants of economic activity.

As I shall suggest later, the idea that, at least in the short run, the supply of money and interest rates are

related still seems relevant today. But the monetarists have usefully emphasized the danger of confusion between nominal and real rates and the role of price expectations. They have forcefully made the case for the view that in the long run velocity is not related to the stock of money and that, in the same long run, an excess supply of money contributes not to real income or wealth but simply to inflation.

That latter point is, of course, one of the oldest propositions in the history of economic thought. But there is no doubt that too often we have lost sight of it amid the urgent search for solutions to immediate policy problems.

The further extensions of the idea—that the rate of monetary expansion can have relatively little effect on the real rate of interest over time and hence on the mix of consumption and investment—are controversial in their more extreme form. But certainly there is more awareness today of the real limitations on the possibilities for manipulating the mix of fiscal and monetary policies to achieve our objectives.

More generally, while the insight is hardly confined to monetarists, modern analysis has typically emphasized the length and probable variability in the lags between policy action and the effect on the economy. As a result, there is less faith in our ability to make short-term adjustments—to “fine tune” the economy.

These lessons have not been lost on central banks in the United States or elsewhere. In shaping their policies and policy pronouncements, monetary officials have provided tangible evidence of the new emphasis in the greater prominence given the behavior of broad monetary aggregates.

At the same time, central banks have long shared an understandable human interest in wanting to hedge against an uncertain future. They want to retain the ability to respond flexibly to emerging developments, to probe experimentally with new policy measures, to test market reactions, and to learn from those reactions before fully committing themselves to new directions. Indeed, this flexibility to act and react has long been considered a great strength of monetary policy. Concern that a needed degree of flexibility might be impaired accounted, I believe, for some initial reluctance by the Federal Reserve in adopting the practice of publicly specifying explicit goals or targets for monetary aggregates for any substantial period of time ahead.

More than a year ago, however, responding to Congressional intent, the practice of each quarter announcing such targets a year ahead was adopted, always retaining the right to change the targets in the light of emerging developments.

From my viewpoint, this experiment in “practical monetarism” has proved useful. It has assisted in communicating our intentions both to the political authorities and to the marketplace. I suspect it has provided a focus for more informed and constructive public debate. Indeed, I am hopeful that, by clarifying the nature of the policy choices and dilemmas and by more clearly relating today’s decisions to a longer term horizon, the temptation to engage in more purely political debate about policy choices has been moderated.

But most important, I think, is the discipline it provides for our own debate within the Federal Reserve. In my experience, each of our short-term decisions has needed to be justified and rationalized in our own minds against our earlier and broader judgment about what growth in money seems appropriate over a longer period. The pressure to react, and the temptation to overreact, to each new piece of information must be filtered through that earlier judgment and longer perspective.

The Federal Reserve is not alone among central banks in adopting that sort of approach. In that sense, we have all been influenced by the monetarist debate. But a consensus on the usefulness of that approach does not, of course, imply consensus on the substance of policy: just where the targets should be set, the circumstances under which they might be changed or temporarily set aside, and the degree of importance accorded other variables including interest rates. Moreover, there is no general agreement on which monetary aggregate is most relevant—a matter of some importance since both the trend and short-term fluctuations frequently diverge.

Policy is made up of a succession of short-run decisions. In making those decisions we face the simple fact that, whatever the stability in the relationship between money and nominal income in the longer run, there is considerable instability in the relationship over time horizons relevant to policymakers. Certainly the relationships between money, interest rates, and nominal income have been unusual over the year or so since I rejoined the Federal Reserve. Specifically, over the first year of an economic recovery that has proved very close to the average of postwar recoveries, the velocity of  $M_1$  grew substantially more rapidly than history or most econometric analysis would have suggested, taking account of the stability of interest rates. Indeed, the phenomenon of stable or even declining interest rates alone is highly unusual during the first year of recovery.

Suppose an approach had been followed since the spring of 1975 that sought to set aside judgment in favor of the statistical rule book. Presumably a monetary target would have been set significantly higher than the roughly

5 percent growth that actually occurred in  $M_1$ , assuming of course a desire to achieve a similar pattern of growth. Those who, in contrast to the monetary school, emphasized last year the desirability of roughly stable interest rates to promote vigorous recovery have seen that objective materialize. But members of this group typically grossly overestimated the monetary growth that would prove consistent with that scenario. I can only conclude that, in periods such as that we have just been through, we need to be alert to possible shifts in the demand for money. Movements in interest rates are an essential source of information about those shifts in money demand and other relevant developments. At times, they remain a useful, if not uniquely useful, guide to appropriate policy.

Recognition of the broad relevance and desirability of longer term monetary targets also has left unresolved important tactical issues as to just how these targets should be achieved. This is a matter vigorously debated by monetary economists out of concern that the choice of technique biases the result. I reveal no secret when I say that the subject returns again and again in the discussions of the Federal Open Market Committee (FOMC) and is a major preoccupation of the work of the supporting staffs at the Board and the Reserve Banks.

The Committee's record of policy actions, now released about a month after each FOMC meeting, reflects the results of discussion of the appropriate tactical approach adopted by the Committee at each meeting. (I might note in passing that the amount of information provided in these records probably sets a standard among the major central banks of the world, and represents a degree of openness entirely unknown to a central banker of an earlier generation.)

These policy records show that, while the precise approach varies with circumstances, recent practice typically involves numerical "tolerance" ranges for key monetary aggregates for the period immediately ahead. While influenced by the immediate economic circumstance, these ranges are designed to be generally consistent with the one-year targets, allowing for the short-term volatility of the numbers and expectations about their near-term behavior. A range is also established for the Federal funds rate, taking into account the evidence we have about the interest rate-money supply relationship. Then the Open Market Account Manager has the job of providing reserves on a week-by-week basis at a rate that is expected to produce a Federal funds rate (and related money market conditions) within the given range, typically moving higher or lower within that range as the aggregates appear to be relatively strong or relatively weak in terms of the objectives for those magnitudes.

I have not found anyone in the Federal Reserve who is wholly satisfied with this technique. To me, one problem is that it has encouraged a high degree of sensitivity throughout financial markets to even relatively small and potentially transient movements in the Federal funds rate, because this rate is felt by the market to reflect so heavily official intentions. But the relevant question, as always, is not whether the present technique is problem free, but whether more satisfactory approaches can be devised. No doubt, improvements are possible and will come. But no one should be under the illusion that any tactical change will end controversy that, in the last analysis, stems more from different judgments about relevant policy variables than about operating techniques.

The proposal is frequently made that the Federal Reserve would be more successful in achieving desired aggregates within relatively short periods if it simply adopted a target path for bank reserves, the monetary base, or some variant thereof. These reserve magnitudes (at least those exclusive of member bank borrowings) are more or less directly under our control, and they can be related to the money supply by projections of the "money multiplier". Usually, the concept is that these targets would then be adhered to, almost regardless of short-term money market implications.

One technical question arises immediately. While I do not pretend to econometric expertise, I do know that a massive amount of research has been conducted in this area. The apparent result is that the relationship between money and reserve aggregates, particularly in the short run, appears no more reliable than the relationship between interest rates and money. In either case—whether one uses money market conditions or reserve measures as the immediate tactical targets—one comes up against two hard facts: first, the monetary aggregates are going to be subject to considerable short-run uncertainty and, second, changes in the week-to-week tactical targets will have their impact on monetary aggregates only with a significant (and uncertain) lag.

Let me be more explicit. When short-term tactical objectives are couched in terms of money market conditions, it is necessary to forecast what the demands for the various categories of bank deposits and currency are likely to be under given money market conditions. Alternatively, if the short-term tactical procedures are couched in terms of some reserve aggregate, such as nonborrowed reserves, it is necessary to forecast the reserve-deposit multipliers for the various monetary aggregates—and of course one must also successfully forecast and offset market factors affecting reserves in order to hit the reserve target.

We have techniques to make the needed forecasts with both the interest rate and reserve approaches. The trouble is the forecast errors are large no matter what procedure is used, particularly over periods of one to three months. Indeed, unimpressive as they are, I am told some of the correlations observed in historical data between reserve measures and monetary measures would prove to be spurious under a regime of rigid reserve targeting.

These uncertainties are likely to make precise monetary control elusive under any set of procedures. A common characteristic of the two approaches is that the effect of changes in either operating target—interest rates or reserves—on the various monetary aggregates takes time to have its full impact, and the largest impact is not the closest time horizon.

The relevancy of these twin problems of forecasting errors and lags—whatever the tactical approach—is that we must constantly balance the danger of *underreacting* to deviations of the aggregates from target paths against the danger of *overreacting*. Clearly, there are risks in not responding to bulges or shortfalls in the money supply relative to objectives. For example, if growth in the monetary aggregates falls short of objectives, but the shortfall is treated as a momentary aberration and no action is taken, a cumulative shortfall may develop, making it harder to retrace our steps. At times, the bulges or shortfalls may reflect important underlying developments, such as an unforeseen change in business activity that we would ignore at our peril.

But the danger of overreacting to deviations in the aggregates from targets is just as real. Statistically, there is a high probability that any deviation from target—even of considerable size—will prove temporary. Attempts to respond immediately by shifting reserve availability and allowing the money market abruptly to tighten or ease could therefore easily result in whipsawing of the market. More confusion than light might be thrown on our intentions as short-term gyrations in open market operations obscure any more sustained strategy.

The problem is not a negligible one if one thinks in terms of a really substantial month-to-month smoothing. Since only a relatively small fraction of the impact of a given move in reserve availability or money market conditions is reflected in the behavior of the monetary aggregates in the short run, very large movements in reserves and money market conditions might be needed to correct short-term aberrations. Worse, the lagged effect of these moves might then have to be offset by even larger movements in the opposite direction in the subsequent period—a process that could easily lead to a serious disruption of the whole mechanism.

To take a recent example, it is not easy to contemplate what degree of money market tightness might have been needed to prevent the 15 percent rate of  $M_1$  growth that emerged this past April—or the implication of that degree of tightness for growth in subsequent months as lagged effects continued to be felt. Similarly, one wonders if the outright declines in  $M_1$  that have occurred in some individual months could have been prevented consistent with *any* positive Federal funds rate or, alternatively, through *any* feasible injection of nonborrowed reserves within that month.

I recognize that few, if any, still seriously push the need or practicality of keeping monetary growth rates on track month by month. The significance of these response lags comes in a somewhat longer run context. But the general proposition remains: there are risks in quickly adjusting our tactical sights, and risks in delay, when the aggregates move off course.

I know of no purely mechanical procedure to avoid these risks—to ensure just the right degree of responsiveness to deviations from targets. Whether and how much to respond will, I think, always be a difficult matter of judgment and will not be helped much by choice of tactical approach.

Obviously, the search for improved tactical techniques will and should go on. Perhaps the continuing effort to achieve better econometric models of the markets through which open market policy operates will help, although I must say frankly that the experience we have had does not encourage me to expect any startling breakthroughs. There may be alternative ways of formulating and presenting longer term targets that would improve upon present procedures. Even on the basis of what we know now, we need to consider carefully ways in which reserve targets could be more extensively used as part of our tactical procedures; indeed, the FOMC has done extensive work on this issue in recent years.

As we immerse ourselves in these tactical questions, however, we need to realize the larger question is not tactical but substantive—how much weight to put on the monetary aggregates as opposed to other considerations. Concentration on the problems of chasing aggregate targets should not cause us to neglect their limitations.

I have already suggested that the normal relationships between the aggregates and the economy can break down over time horizons long enough to be highly significant for policy formulation. There are also times when market conditions may deserve attention in their own right. One thinks immediately of those occasions when markets are unusually disturbed to the point that a potential impact on business sentiment and financial availabilities cannot

be ignored. At other times, relatively small changes in the apparent posture of the Federal Reserve may trigger undesired expectations in the market out of proportion to any presumed gain in tracking monetary targets. I think, too, we have seen plenty of evidence of the potential sensitivity of international financial markets to interest rate differentials—that floating exchange rates cannot by themselves eliminate that dimension of policy concern.

More broadly, I think the intellectual emphasis on monetary aggregates that developed through the 1960's threatened and, on some occasions, did go too far in implying that credit markets, broadly defined, "don't count"—that they are never or seldom a source of disturbance in the economy or a legitimate concern of policy. Indeed, I suspect the relatively little attention directed toward serious and systematic analysis of the role of credit markets, toward the financial complexities of the economy generally, and toward their disruptive potential is a common failing of most modern theorizing, regardless of the intellectual starting point.

We have had many occasions in the 1970's to pay the closest possible attention to particular financial problems and to the potential vulnerability of various credit markets. I would remind you of the recurrent concerns about thrift institutions and the mortgage market, Penn Central and commercial paper, Herstatt and the Euro-dollar market, New York City and the municipal bond market, and the rising level of commercial bank loan losses a year ago. Some of these situations had in them the potential for grave problems. Happily, they have been contained and dealt with through a variety of techniques, more or less of an *ad hoc* nature.

But is it sheer coincidence that so many of these problems have arisen in so short a period? And what is the present significance of such phenomena as the shifting proportions of debt and equity for the nature and strength of our recovery, for the vulnerability of the economy to inflation or to new shocks at home or abroad, and therefore for monetary and fiscal policy?

Perhaps answers to questions like these can be traced back in some ultimate sense to the behavior of money. But I doubt it. The explanation is much more likely to be found in other phenomena, including changes in social and economic attitudes stimulated by the earlier period of relatively stable prosperity.

I would go further and raise a question about the practical policy implications of the central policy theme of monetarism: that "inflation is always and everywhere a purely monetary phenomena".

I do not want to be misunderstood. Central bankers, as custodians of a nation's money, commonly share the

observation and intuition that pressures to increase the money supply to serve some presumed short-term objective are a basic source of inflationary pressure. Certainly, excessive monetary expansion is a sufficient condition for inflation and, in the longer run, it is equally clear that no important inflation can be sustained without money rising substantially faster than real income (taking into account trend velocity). There is always some rate of monetary growth (perhaps zero) that will in principle achieve price stability. But, in the world in which we live, I do not think we can draw much comfort from those principles as a full explanation of where we are and a guide as to how to proceed.

Take, for instance, the period since inflation began to accelerate after the mid-1960's, with the rate reaching a peak during 1974 unprecedented for peacetime. Do we really have an adequate explanation of this development in terms of an acceleration in the rate of monetary expansion alone?

To be sure, there was in that period a faster rate of money growth. The two events were not unrelated. But, as a technical matter, it is also true that as we got into the 1970's the money relationships were not stable, so that monetarists did not succeed better than others in anticipating the full force of double-digit inflation.

Plainly, even over a period of years, the relationship between money and inflation is complex and the statistical association rather loose. We do not need to look far to find other, and supplementary, explanations of price developments in the 1970's—the oil situation, some crop failures, the spread of unions into some new areas, and shortages in particular industries that ran up against capacity pressures before the economy as a whole reached full employment.

We can theorize that such developments affect only relative prices and need have no effect on the general price level if monetary growth is held steady. But the argument rests on the assumption of a highly flexible and quickly reacting price system. If, to the contrary, relative price adjustments in circumstances like these are typically slow in coming and resisted, economists would agree that monetary growth at a noninflationary rate would depress the level of real activity. The question is which view better fits observations of reality, and there seems to me a lot of evidence that it is the latter.

More generally, we cannot avoid asking ourselves about the nature of the economic, social, and political forces and attitudes that seem to have aggravated the difficulties of reconciling full employment with price stability.

It is hardly a satisfactory answer to say that central banks in principle can always resist inflationary pressures

by simply refusing to provide enough money to finance them. Set against persistent expansionary pressures, aggressive wage demands, monopolistic or regulatory patterns that resist downward price adjustments, and other factors affecting cost levels, such an approach would threaten chronic conflict with goals of growth and employment that must rank among the most important national objectives. In a democracy, the risk would not be just to the political life of a particular government, but to our way of government itself.

In this larger social and political setting, we should perhaps think of central banks themselves as "endogenous" to the system. A theory of chronic inflation that points only to the money supply is not going to prove adequate to understand—or deal with—inflation in today's world. The danger is that it may discourage the search for particular remedies for particular problems.

There is no doubt in my mind that we must persist in finding an answer to our inflationary problems. We can take satisfaction in the progress of the past year. The current underlying rate of 6 percent or so is half that of 1974, and it has been maintained in a period of rather vigorous recovery. It feels better, and it is better.

But perhaps the greater test lies ahead. I hear from many directions the argument that individuals and institutions have pretty well adjusted to the current rate of inflation. Further progress, it is said, may be difficult without an unduly depressed economy. Perhaps, the argument goes, the better part of wisdom would be to live with the current rate rather than to try to reduce it further, aiming ultimately at the restoration of price stability.

Now, I recognize that it is possible to conceptualize about fully anticipated inflation being equivalent in its real effects to confidence in price stability. But I also question whether our institutions or individuals are in fact fully adjusted, or really can be expected to adjust, to the current rate of price increases or to any sizable rate of inflation. In any case, such an adjustment, once initially made, would not help us to deal with those forces that upset price equilibrium in the past. Indeed, I suspect the job of dealing with these forces would be much more

difficult. The difference between a goal of, say, living with 6 percent or a goal of evolving toward stability seems to me profound from a psychological point of view. Willingness to settle for just so much inflation, but no more, would simply lack creditability with the public at large, or indeed, with policymakers themselves. Resistance to increases in the name of short-term advantages could only be weakened, and we would be off again. And I think we have learned enough to see that, in those circumstances, even our employment goals will fall by the wayside.

My theme today is simple. As we look back over the evolution of thinking about monetary policy and macroeconomic policy generally over the postwar years, we can see the dangers of overly simple and overly confident views of the way the economic world works. Eventually, simple doctrine comes up against complex and harsh reality.

Back in the days when I was learning economics and central banking, the *General Theory* had cast fresh light on old problems. The intellectual contributions were immense. But popularized, bowdlerized, and pressed to extremes, it lost fashion for good reason.

The monetarists, emphasizing old truths in modern clothing, have provided a large service in redressing the balance. It is in pressing the point to an extreme that the danger lies—the impression that only money matters and that a fixed rate of reserve expansion can answer most of the complicated problems of economic policy.

In a way, I suppose full confidence in a simple, unified view of economic policy is a comforting thing, a kind of security blanket in an uncertain world. But Alfred North Whitehead, in a different context, once pointed to the danger: "There are no whole truths; all truths are half truths. It is trying to treat them as whole truths that plays the devil."

He overstated the case. The practical man cut adrift from any sense of what is the greater truth—distinguishing, if you will, the one-eighth truth from the seven-eighth truth—will soon lose his way. But, in assessing those truths, he can never afford to lose sight of the messy reality of the world in which we live.

## The Business Situation

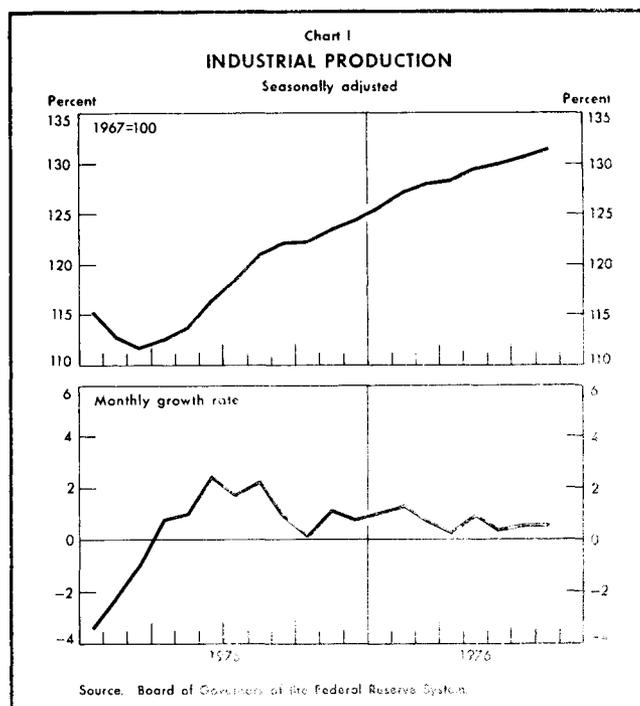
Recent business statistics suggest that the economy is continuing to move up, although it is still too early to tell whether the pattern of slower growth evident since last spring has ended. Consumer spending showed renewed strength in August, as retail sales posted a sharp and broadly based advance. At the same time, housing starts and newly issued building permits increased substantially, providing signs of prospective strengthening in residential construction. Distinctly less encouraging, however, were the August declines in durable goods orders and in the index of leading indicators. Overall, while business activity continues to exhibit upward momentum, the extent of the strengthening, if any, is difficult to assess. Capital spending is likely to play a key role in the months ahead, but the outlook for such expenditures is unclear. On a more positive note, while the nationwide automobile strike has entered into the fourth week, a tentative contract agreement has been reached.

The latest price data have been mixed. At the consumer level, overall price increases have been running at around a 6 percent annual rate for the past several months, but wholesale price increases accelerated in September. Some other developments have been more favorable for the price outlook. Most notable are recent price developments in major metals industries. Steel producers rescinded some previously announced price hikes, and aluminum firms postponed price increases. In addition, spot prices of raw industrial commodities, which are generally regarded as particularly responsive to demand pressures, registered outright declines in September for the second successive month.

### INDUSTRIAL PRODUCTION AND CAPACITY

Industrial production rose in August for the seventeenth consecutive month, according to the Federal Reserve Board's index. Preliminary estimates show that output of the nation's mines, utilities, and manufacturing establishments rose 0.5 percent in that month, the same as the increase recorded in July (see Chart I). Following the

sharp cyclical expansion in the early months of the recovery, the rate of growth in production has slowed noticeably in recent months. Nevertheless, output in August was about 18 percent above its trough level reached in March 1975. In large measure, some moderation in production gains was to be expected as the recovery matured. In fact, at this point in the recovery, the growth of production is comparable to that in most previous post-war recoveries. Nonetheless, the recent data have been distorted by strikes in the rubber and coal industries, and production in September was affected by the strike of the United Auto Workers' union against the Ford Motor Company, which began on September 15. Recent gains in industrial output have been concentrated largely in durable



goods materials, business equipment, and construction supplies. Production of consumer goods has been relatively unchanged in recent months, no doubt reflecting a response to the midsummer lull in consumer buying.

While the continued growth of industrial production has raised the level of output close to its pre-recession mark, concerns over the reemergence of widespread capacity problems appear to have diminished. Virtually all measures of capacity utilization indicate that the economy is operating well below its productive limits. The McGraw-Hill measure of manufacturing utilization stood at 77 percent in August, well below the 88 percent peak recorded in 1973. The Federal Reserve Board's index of capacity utilization in materials-producing industries, which is generally regarded as a sensitive indicator of possible production bottlenecks, also is far below its peak. The level of plant and equipment utilized in the materials-producing sector stood at 81.5 percent in August, some 11.5 percentage points below the peak rate attained in August 1973. Thus, the latest readings suggest that there is ample capacity available to accommodate continued growth of the economy. Moreover, the likelihood of constraints being reached in the near term has been further reduced, of course, by the more moderate rate of growth of real output experienced in the spring and summer.

#### **MANUFACTURERS' ORDERS AND INVENTORIES**

Durable goods manufacturers' new orders fell 1.5 percent in August. The decline resulted mainly from a substantial drop in new orders for nondefense capital goods, which, in contrast, had posted an unusually large increase in the previous month. Because month-to-month changes in any economic series can be erratic, such large offsetting movements are not particularly meaningful. Because of concern over the behavior of capital spending thus far in the recovery, however, the decline in capital goods orders has raised, to some extent, renewed anxiety over the outlook for this sector. While there can be little doubt that this sharp decline diminishes somewhat the otherwise generally brightening picture for business fixed investment, its importance should not be exaggerated. Aside from the August drop, nondefense capital goods orders have increased continually this year. Bookings for defense goods recovered in August, after dropping sharply in July. The recent erratic movements in defense orders might be related to the changeover by the Federal Government to a new fiscal year.

Inventories in manufacturing and trade continued to rise, by \$1.6 billion in July, with nondurables manufacturing and durables retail trade accounting for most of

the increase. The accumulation began in January in response to a strong pickup in sales and continued into the summer, partly as a result of the recent sluggish growth in final sales. Hence, the inventory-sales ratio has rebounded recently, although it has remained well below the level of a year ago. As in July, manufacturers' inventories rose by more than \$900 million in August, owing mainly to the buildup in the nondurables sector.

The index of leading indicators fell 1.5 percent in August, with the decline related to the recent sluggishness in consumer spending and some areas of capital investment. Contributing heavily to the drop were the rise in the manufacturing layoff rate, the decrease in contracts and orders for new plant and equipment, and the shortening of the average workweek in manufacturing. While the August decline—the first in eighteen months—may contribute to anxiety over the future course of the economy, a one-month decrease is not sufficient to signal a stalling of the recovery. Historically, the index has turned down, sometimes for several months, even though the economy subsequently continued to expand.

#### **RETAIL SALES AND PERSONAL INCOME**

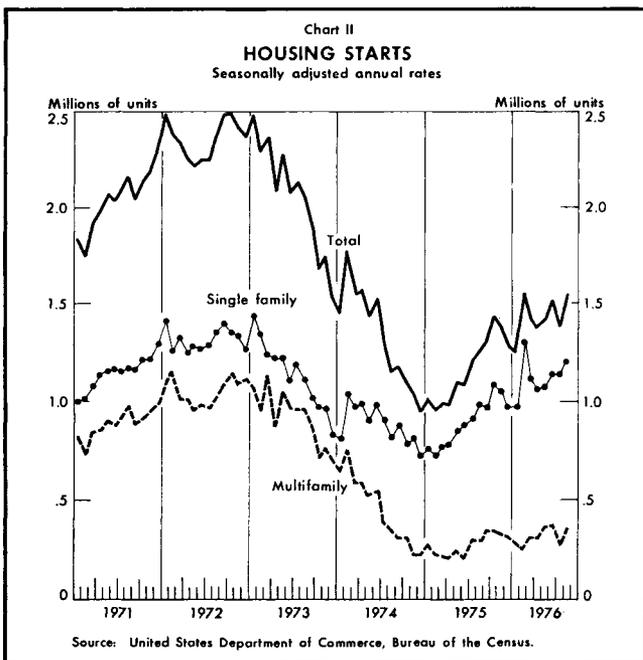
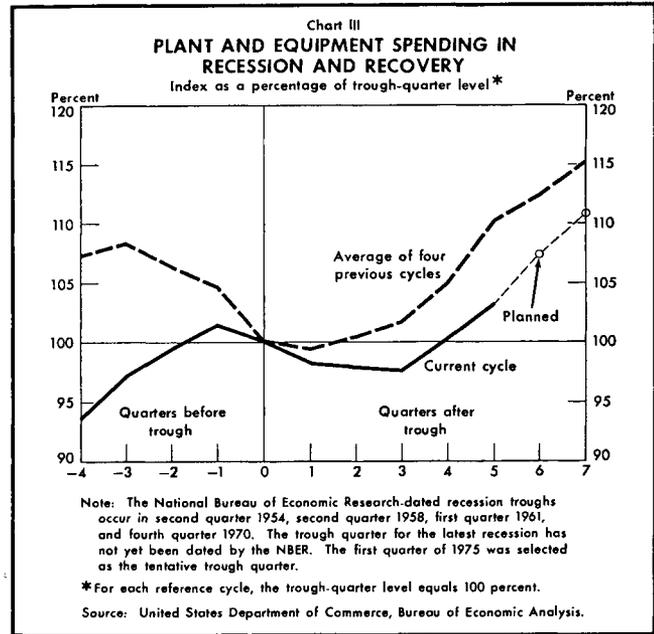
Following several months of lackluster performance, retail sales rebounded strongly in August, rising 2.3 percent on a seasonally adjusted basis. After adjustment for higher prices, this represented an increase of 1.9 percent, pushing sales in constant-dollar terms slightly above the previous peak registered in April. The August sales gain was broadly based, with all major categories of retailers—particularly auto dealers and department stores—posting substantial gains. Some analysts have contended that auto sales would have been even stronger except for shortages of some popular models. It may also be, however, that in efforts to reduce stocks of existing models dealers have offered generous price concessions and consumers have responded by snapping up the available models.

Since last April, retail sales have fluctuated irregularly, with an increase in one month followed by a decrease in the next. The failure of retail sales to break out of this pattern is generally considered a major factor in the overall slowing in the nation's economic advance. A prolonged pickup in sales depends on consumers' willingness to spend as well as on the growth of income and employment. In this regard, the latest surveys of consumers' attitudes suggest no change in their assessment of the economy or in their interest in buying big-ticket items. On the other hand, the prospects for continued gains in personal income appear good. After a strong surge in July due

mainly to the midyear cost-of-living increase in social security benefits, personal income posted a more modest increase in August. Part of the slowdown was attributable to the small advance in that month of average hourly earnings in the private nonfarm economy. A decline in farm income, as a result of a sharp drop in wholesale prices of farm products during the month, also was important in moderating the personal income gain. From a longer term perspective, personal income has grown at better than a 9 percent annual rate over the first eight months of the year, well above the experience of earlier recovery periods.

**RESIDENTIAL CONSTRUCTION AND CAPITAL SPENDING**

Housing activity showed some encouraging signs in August, with housing starts rising to a seasonally adjusted annual rate of 1.54 million units (see Chart II). This was the highest level of activity since April 1974 and put the level of building activity some 22 percent above a year earlier. Much of the August increase was in the multifamily sector, where starts rose from about 260,000 to nearly 350,000 units. Since one of the major factors restraining the recovery in residential construction activity



has been weakness in the multifamily sector, the pickup in starts in this sector was particularly encouraging. Further bolstering near-term prospects was a jump in permits to build apartment complexes of five or more units. Despite this tentative evidence of a pickup in the multifamily sector, the level of activity remains well below that of the peak years of 1972 and 1973. The single-family sector, which has staged a stronger recovery, exhibited renewed strength in August. Single-family starts rose to 1.2 million units, and newly issued permits increased to their highest level since early 1974.

According to the Commerce Department survey taken in July and August, business spending on plant and equipment is expected to rise 7.4 percent in 1976, little changed from the 7.3 percent increase indicated in the previous Commerce Department survey. However, while the year-over-year growth has changed only slightly, there has been a substantial redistribution of the pattern of spending. As a result, spending in the final quarter of this year is expected to be substantially above that planned earlier. While capital spending typically lags the general recovery, thus far in the current business expansion capital spending has been trailing unusually far behind (see Chart III). Plant and equipment spending currently is only 3 percent above the trough-quarter level. In contrast, at comparable

points in previous postwar recoveries, capital spending had typically registered better than a 10 percent gain. Since this comparison is in nominal terms, allowing for the faster rate of inflation in the current recovery would further underscore the recent sluggishness of capital spending. Provided that the revised expenditure plans are realized, the gap between the current experience and earlier recoveries will be reduced. Even more importantly, the prospective revival in capital outlays could go a long way toward quickening the overall pace of activity.

#### RECENT PRICE DEVELOPMENTS

There has been little indication of a fundamental change in the price situation. Consumer prices rose at a 6.3 percent annual rate in August, only slightly higher than the increase posted over the preceding three months. Retail food prices rose at a 4 percent rate, a somewhat more rapid increase than the very modest advances of the two prior months. With a large harvest in prospect, the

outlook for food prices in coming months continues to be favorable, although the weather always adds an important element of uncertainty. Consumer power and fuel prices continued to increase at a rapid rate in August; on the other hand, price increases for consumer services moderated somewhat to a 6.6 percent annual rate.

Fragmentary information about prices of goods at the initial stage of the production process suggests that some further diminution in inflation may be forthcoming. There have been reports of price concessions and increased discounting on a number of basic raw materials. Additional evidence on this was provided by the September survey of the National Association of Purchasing Management, which reported a continued decline in the proportion of respondents facing higher prices. Moreover, steel manufacturers rescinded a previously announced price hike, while aluminum producers postponed planned price increases. In addition, spot commodity prices dropped considerably in August and September, according to the Bureau of Labor Statistics index.

## The Money and Bond Markets in September

Interest rates fluctuated in a narrow range during September following rather steady declines over the summer months. After edging slightly lower in the three previous statement weeks, rates adjusted upward subsequent to the announcement on September 23 of a massive increase in the money stock during the week ended September 15. The one-week increase more than offset declines in earlier weeks, and it dampened previous speculation among market participants that the Federal Reserve System would encourage slightly lower short-term interest rates. During the statement week ended September 22, however, the increase in the money supply for the previous week was substantially reversed by a large decline. Rates on new corporate bond issues dipped below the year's previous lows in April, and this development apparently prompted a number of corporate borrowers to schedule new financings. As a result, the calendar of forthcoming issues grew as the month progressed, further tempering market sentiment. The Treasury continued with its program of fairly regular coupon offerings, and the two new issues were sold during the month. The sluggish state of business loan demand and the low rates available to borrowers in the commercial paper market induced a number of major banks to reduce the prime lending rate by  $\frac{1}{4}$  percentage point to  $6\frac{3}{4}$  percent. Early in October the  $6\frac{3}{4}$  percent rate became widespread, as most major banks joined in the reduction.

Preliminary estimates indicate that in September the narrowly defined money stock ( $M_1$ ) showed a modest rise, on balance, after substantial week-to-week fluctuation. The broadly defined money stock ( $M_2$ ) continued to reflect rapid growth in consumer-type time deposits and rose at a relatively strong rate. Further declines in the volume of large negotiable certificates of deposit (CDs) outstanding held the bank credit proxy to a small increase.

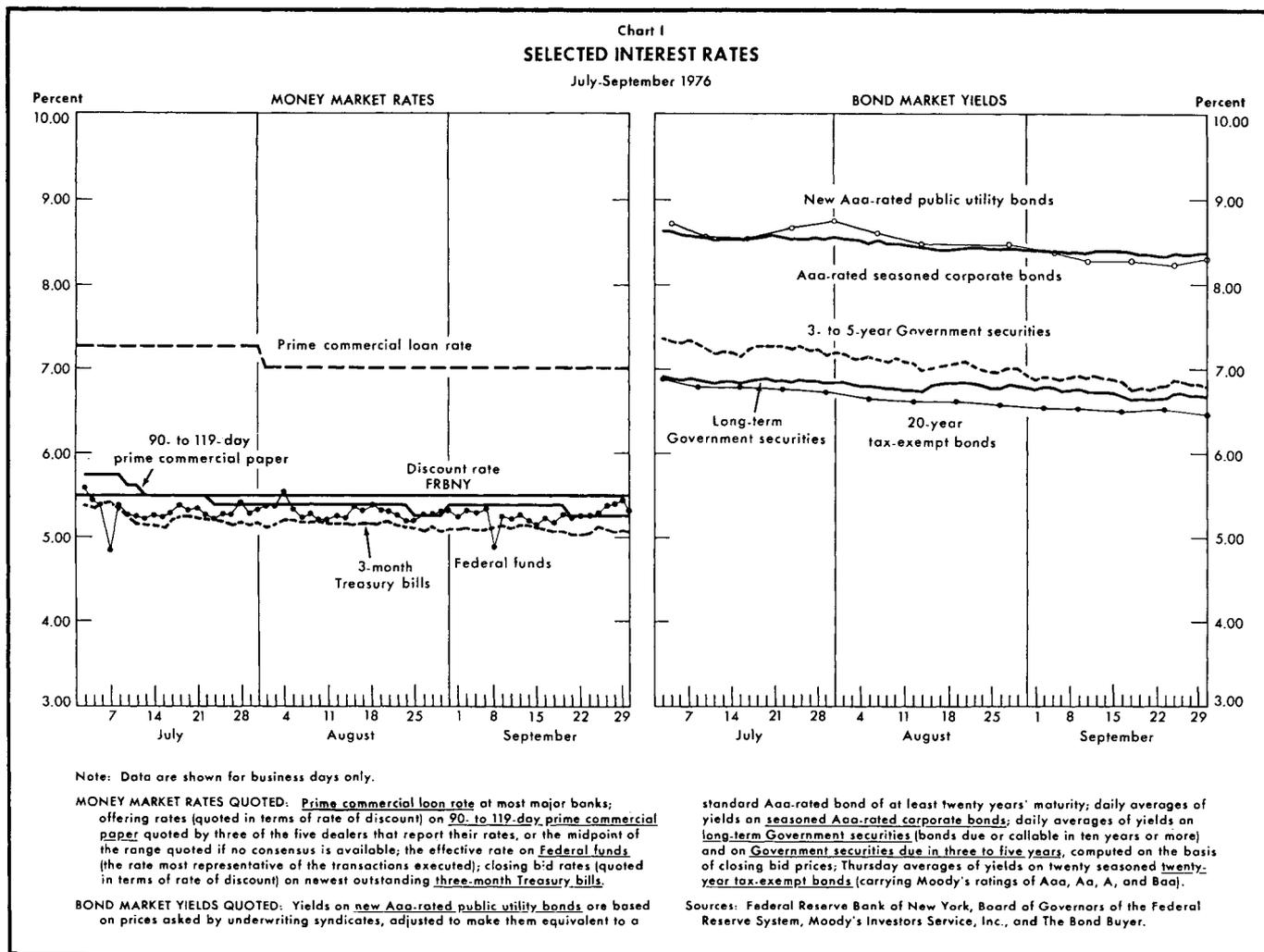
### THE MONEY MARKET AND THE MONETARY AGGREGATES

Interest rates on most money market instruments were little changed on balance in September. At its meeting on August 17, the Federal Open Market Committee

(FOMC) specified that the Federal funds rate should be held within a 5 to  $5\frac{1}{2}$  percent range during the period until the next meeting on September 21. During that interval, the funds rate remained around the  $5\frac{1}{4}$  percent level that has prevailed since early in the summer (see Chart I). During September as a whole, the effective rate on Federal funds averaged 5.25 percent, down 4 basis points from its average in August. At the end of September, the rate on 90- to 119-day commercial paper was  $5\frac{1}{4}$  percent,  $\frac{1}{8}$  percentage point below the end-of-August level. Rates on bankers' acceptances also changed little and closed the month at  $5\frac{1}{4}$  percent. Similarly, CDs maturing in 90 days traded in the secondary market at 5.28 percent at the end of the period, a decline of 5 basis points over the month. In view of the continued sluggishness in business loan demand and the downward drift of commercial paper rates in recent months, a number of large banks lowered their prime lending rate by  $\frac{1}{4}$  percentage point to  $6\frac{3}{4}$  percent, with most others joining in this action in early October.

Federal Reserve open market operations in September were, in part, concerned with offsetting the impact on bank reserves of the September 15 tax date for corporate and individual income taxes. As tax payments accumulate in the Treasury Tax and Loan Accounts at commercial banks, the Treasury typically transfers such receipts to its accounts at Federal Reserve Banks. These transfers—Treasury calls—drained reserves from the banking system in the last two statement weeks of September. Federal Reserve open market operations supplied reserves and offset these drains (see Table I).

The Federal Reserve adds reserves to the banking system either through outright purchase of securities or through repurchase agreements, under which it buys securities from dealers who enter into agreements to buy the same securities back at a later date. These agreements have short-term maturities, usually from one to seven days. In the past, dealers had the option of withdrawing early from all repurchase agreements that had an initial maturity of more than one business day. When a contract was terminated prior to maturity, it drained reserves from the banking system and thus offset part of the reserve



injection made by the Federal Reserve. Early terminations of outstanding agreements were often large, and their volume was not readily predictable. At the end of September, the Trading Desk of the Federal Reserve informed dealers it would enter into four- and seven-day repurchase agreements at the start of the October 6 statement week and, in this operation, the seven-day contracts would not include the right of early withdrawal. Similar fixed-term contracts with a six-day maturity were made on October 1.

Preliminary estimates indicate that  $M_1$ —private demand deposits adjusted plus currency outside commercial banks—grew in September at a somewhat slower pace than in the previous two months. The average level for the four weeks ended September 22 stood at 3.0 percent

(seasonally adjusted annual rate) above its average level in the four statement weeks ended eight weeks earlier. At its August meeting, the FOMC established a tolerance range of 4 to 8 percent for growth of  $M_1$  over the two months ended with September. As a consequence of somewhat more rapid expansion of time and savings deposits in September, the spread between the growth of  $M_2$ — $M_1$  plus these deposits other than large negotiable CDs—and  $M_1$  widened. A wider spread between growth of  $M_2$  and  $M_1$  is often associated with a decline in money market yields relative to yields prevailing on time and savings deposits, such as occurred during the June-August period. Over the four statement weeks ended September 22, the average for  $M_2$  was 9.9 percent at an annual rate above

its average during the four statement weeks ended eight weeks earlier. The FOMC tolerance range for  $M_2$  growth over the two months ended in September was 7.5 to 11.5 percent. Comparing the averages for the four weeks ended September 22 with similar averages fifty-two weeks earlier,  $M_1$  and  $M_2$  have expanded 4.3 percent and 10.1 percent, respectively (see Chart II). After posting a modest decline in August, the bank credit proxy—total member bank deposits subject to reserve requirements plus certain nondeposit sources of funds—was little changed in September, as large negotiable CDs outstanding continued to slide in response to weak demand for business loans.

### THE GOVERNMENT SECURITIES MARKETS

Yields on United States Treasury securities declined during most of September before partially retracing these steps late in the month. Participants initially believed that the pause in the economic recovery and the slow growth of  $M_1$  would lead the monetary authorities to encourage interest rates to edge lower. However, the sharp increase in  $M_1$  announced after midmonth prompted some revisions in this outlook, and thereafter money market interest rates were generally anticipated to remain stable in the near term.

In the Treasury bill market, the extension of earlier declines in bill rates was reflected in the auction of 52-week bills on September 15. The average yield in this auction was 5.56 percent, 7 basis points below the auction four weeks earlier (see Table II) and the lowest average rate since February 1975. The apparent tempering of market sentiment after midmonth, however, resulted in a reversal of generally declining rates at the auctions of three- and six-month bills. At the last regular auction in September, the average issuing rates on these bills were 5.07 percent and 5.33 percent, respectively, up 4 and 9 basis points from the previous week. No new cash was raised in September by the Treasury on these short-term issues. Rates on most bills ended September unchanged to 9 basis points below levels at the end of the previous month.

The Treasury continued during September to raise cash by auctioning coupon issues. On September 22, \$2.5 billion of two-year notes was sold at an average yield of 6.30 percent, 37 basis points below the return on a similar offering of two-year notes in the previous month. The issue, which raised \$819 million in new cash, attracted broad-based bidding interest. On September 28, \$2.5 billion of five-year notes was auctioned, all for new cash. The average issuing rate at this auction was 7.08 percent, down from 7.63 percent for a similar offering on June 29.

**Table I**  
**FACTORS TENDING TO INCREASE OR DECREASE**  
**MEMBER BANK RESERVES, SEPTEMBER 1976**

In millions of dollars; (+) denotes increase  
and (–) decrease in excess reserves

Factors	Changes in daily averages—week ended					Net changes
	Sept. 1	Sept. 8	Sept. 15	Sept. 22	Sept. 29	
<b>"Market" factors</b>						
Member bank required reserves ..	– 67	+ 465	– 263	+ 121	– 925	– 669
Operating transactions						
(subtotal) .....	+ 419	+3,471	+3,493	–6,296	–2,421	–1,334
Federal Reserve float .....	+ 208	– 138	+1,017	– 360	– 698	+ 29
Treasury operations* .....	+ 23	+3,399	+3,007	–5,542	–2,975	–2,088
Gold and foreign account .....	– 19	– 8	+ 5	+ 33	+ 9	+ 20
Currency outside banks .....	+ 653	– 408	– 297	– 504	+1,361	+ 805
Other Federal Reserve liabilities and capital .....	– 446	+ 626	– 240	+ 79	– 119	– 100
Total "market" factors .....	+ 352	+3,936	+3,230	–6,175	–3,346	–2,003
<b>Direct Federal Reserve credit transactions</b>						
Open market operations						
(subtotal) .....	– 591	–3,771	–3,466	+5,991	+3,493	+1,656
Outright holdings:						
Treasury securities .....	+ 230	+ 74	–3,324	+3,154	+1,166	+1,300
Bankers' acceptances .....	– 14	– 8	– 4	– 21	– 17	– 64
Federal agency obligations .....	– 23	–	– 18	– 3	–	– 44
Repurchase agreements:						
Treasury securities .....	– 839	–3,226	– 107	+2,479	+2,192	+ 499
Bankers' acceptances .....	+ 80	– 496	– 9	+ 318	+ 70	– 37
Federal agency obligations .....	– 25	– 115	– 4	+ 64	+ 82	+ 2
Member bank borrowings .....	+ 26	– 47	+ 15	– 17	+ 44	+ 21
Seasonal borrowings† .....	+ 2	– 2	– 2	+ 1	+ 5	+ 4
Other Federal Reserve assets‡ ..	+ 271	– 152	+ 211	– 16	– 19	+ 295
Total .....	– 294	–3,970	–3,240	+5,958	+3,520	+1,974
Excess reserves‡§ .....	+ 58	– 34	– 10	– 217	+ 174	– 29
<b>Member bank:</b>						
<b>Daily average levels</b>						
Total reserves, including vault cash‡§ .....	34,078	33,579	33,839	33,501	34,600	33,919
Required reserves .....	33,772	33,307	33,570	33,449	34,374	33,694
Excess reserves§ .....	306	272	269	52	226	225
Total borrowings .....	93	46	61	44	88	66
Seasonal borrowings† .....	32	30	28	29	34	54
Nonborrowed reserves .....	33,985	33,533	33,778	33,457	34,512	33,853
Net carry-over, excess or deficit (–)¶ .....	123	154	159	135	62	127

Note: Because of rounding, figures do not necessarily add to totals.

\* Includes changes in Treasury currency and cash.

† Included in total member bank borrowings.

‡ Includes assets denominated in foreign currencies.

§ Adjusted to include waivers or penalties for reserve deficiencies in accordance with the Regulation D change effective November 19, 1975.

¶ Average for five weeks ended September 29, 1976.

‡ Not included in data above.

Trading in seasoned coupon issues followed the general market pattern, and the index of three- to five-year bonds closed the month 10 basis points lower than its level at the end of August. Similarly, the index of long-term bonds fell 9 basis points over the month.

Yields on Federal agency issues moved modestly lower in September. The Government National Mortgage Association raised \$264.6 million through the auction of 7½ percent modified pass-through securities on September 14. These securities, which have an average life of about twelve years, were well received when reoffered to yield 8.25 percent on a corporate bond equivalent basis. The Farm Credit Banks redeemed \$82 million of maturing securities and refunded the remainder with \$1,419.3 million of new issues, consisting of \$569.6 million of six-month Banks for Cooperatives bonds yielding 5.60 percent and \$849.7 million of nine-month Federal Intermediate Credit Bank bonds yielding 5.80 percent. On September 22, the Federal National Mortgage Association raised \$400 million of new cash through the sale of fifteen-year debentures at 7.80 percent. At the

**Table II**  
**AVERAGE ISSUING RATES**  
**AT REGULAR TREASURY BILL AUCTIONS\***  
In percent

Maturity	Weekly auction dates—September 1976			
	Sept. 3	Sept. 13	Sept. 20	Sept. 27
Three-month .....	5.087	5.099	5.028	5.072
Six-month .....	5.333	5.309	5.236	5.325
Fifty-two weeks .....	Monthly auction dates—July-September 1976			
	July 21	Aug. 18	Sept. 15	
	5.887	5.633	5.561	

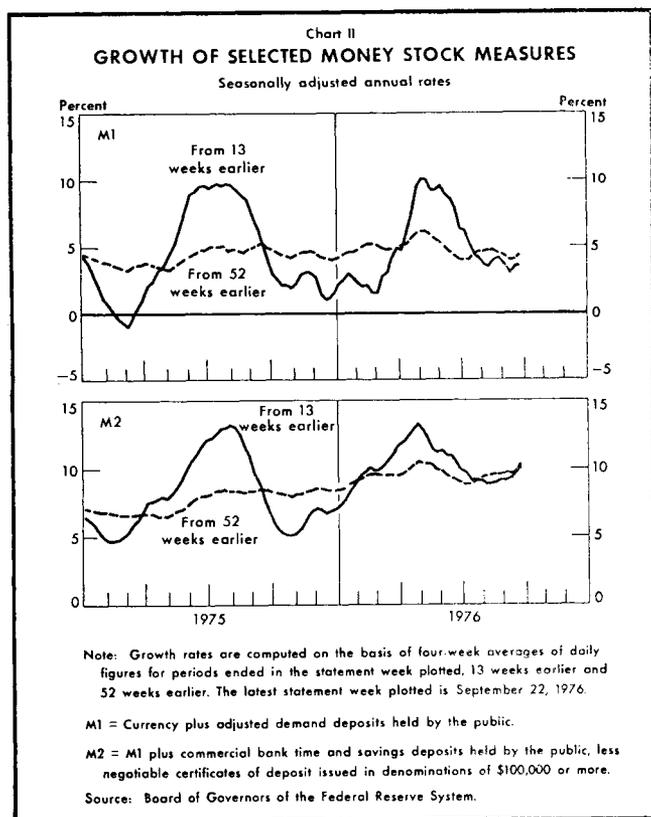
\* Interest rates on bills are quoted in terms of a 360-day year, with discounts from par as the return on the face amount of the bills payable at maturity. Bond yield equivalents, related to the amount actually invested, would be slightly higher.

end of the month, the Federal Land Banks offered \$1.66 billion of bonds consisting of \$450 million of fifteen-month bonds priced to yield 6.10 percent, \$858.2 million of 4¼-year bonds yielding 7.10 percent, and \$350 million of twenty-year securities with a return of 7.95 percent. These issues generally encountered a good reception by investors.

#### OTHER SECURITIES MARKETS

Yields on corporate and high-grade municipal bonds extended the declines of the previous three months during most of September. Increased supplies of new issues, together with uncertainty over the future course of monetary policy, however, put upward pressure on yields late in the month. The number of new corporate offerings was slim early in the period, but the calendar expanded steadily as corporations were attracted by the lowest interest costs in three years. Heavy new issue activity in the tax-exempt market throughout the period generally encountered good investor demand.

The decline in yields in the corporate sector was exemplified by the successful sale early in the month of a \$60 million offering of Aa-rated electric utility bonds priced to yield 8.45 percent in thirty years. This return was 22 basis points below that of a comparable issue, which sold slowly when offered in July, and was the lowest yield on an Aa-rated electric utility since March 1974. The attractiveness of prevailing yields to corporate borrowers brought forth a \$100 million offering of Aaa-rated



telephone debentures which had been postponed earlier in the year. The bonds were priced to yield 8.00 percent, 25 basis points below a comparably rated telephone issue offered the previous month. This was, moreover, the lowest return on such an issue in nearly three years. The yield was set in anticipation of further interest rate declines and did not initially prove attractive to investors. At the end of the month, the bonds were released from syndicate price restrictions and subsequently traded in the market at yield increases in excess of 10 basis points. Underwriters priced \$250 million of Aa-rated debentures of Hydro-Quebec to yield 8.60 percent in thirty years. This was 70 basis points below the yield on a similar offering last June. It proved insufficient to attract investors, and a large volume remained in dealer hands at the month end.

Lower interest rates established this past summer in the tax-exempt sector were little changed over the month of September. For example, good receptions were afforded both South Carolina's \$70 million of Aaa-rated bonds scaled to yield from 3.0 percent in 1977 to 5.05 percent in 1991 and Ohio's \$70 million of Aa-rated bonds with yields ranging from 3.5 percent in 1978 to 6.2 percent in 2002. The return in 1977 on the South Carolina issue was 20 basis points below a comparably rated offering marketed in June. However, New Jersey's \$75 million

offering, rated Aa/AAA (Moody's/Standard & Poor's), sold slowly when priced to yield from 3.5 percent in 1978 to 5.8 percent in 1996. These yields were as much as 30 basis points below those on the state's previous offering in January. In one of the largest of such offerings, \$700 million of Pennsylvania 8½-month notes sold quickly at a yield of 3.2 percent. Late in the month Texas issued \$40 million of Aaa-rated bonds, with yields ranging from 4.50 percent in 1985 to 5.30 percent in 1993.

The New York State Housing Finance Agency (HFA) passed a key test in September, marking a milestone on the road to renewed access for New York State to the capital markets. The issue was a \$149 million package of State University of New York A/AA-rated construction bonds, consisting of \$18 million of serial bonds priced to yield from 5.50 percent in 1977 to 7.50 percent in 1986 and \$131 million of term bonds priced to return 8.50 percent in thirty years. The offering provided for the retirement of some bonds issued earlier in the year as part of a plan by New York State to keep the HFA and several other state agencies out of default. The size of the issue was originally \$50 million but was raised to \$97 million subsequently. Demand for the new bonds was so strong by the time it came to market that the HFA increased the amount of the offering to \$149 million.

## Alternative Definitions of the Money Stock and the Demand for Money

By LAURENCE H. MEYER\*

In the last five years, the monetary aggregates have played an important role in the formulation and execution of monetary policy. At the same time, there has been growing concern that developments in financial practices over the postwar period and innovations in financial instruments and technology over the last few years have reduced the importance of the narrowly defined money stock ( $M_1$ ) in the financial system and have blurred the distinction between  $M_1$  and savings and time deposits at both commercial banks and thrift institutions. The ratio of  $M_1$  to total liquid assets has declined steadily over the postwar period. More recently, the introduction of negotiable order of withdrawal (NOW) accounts, checking accounts at thrift institutions, expanded third-party payment privileges from savings accounts, telephone transfers between savings and demand deposit accounts, and electronic funds transfer systems have made the association of  $M_1$  with the means of payment increasingly less compelling.

This paper is concerned with the problem of defining the money stock in this changing financial environment. In Part I, the five official measures of the money stock are presented, the savings instruments included in the broader money stock measures are briefly defined, and the developments that may have altered the role of  $M_1$  in the financial system are discussed. Empirical evidence on the definition of money is reported in Part II. The empirical analysis is confined to  $M_1$ ,  $M_2$ , and  $M_3$ , the three money stock measures for which the Federal Reserve System currently sets growth ranges.

In determining the ranges for growth in the monetary

aggregates, the Federal Reserve System uses econometric models, among other tools, to predict the paths of income, prices, and employment associated with alternative rates of monetary expansion. The precision with which the System can predict the economy's response to alternative monetary growth rates depends, in some of these models at least, on the precision with which it can estimate the demand for money. And precision in estimating the demand for money can be maximized by selecting the definition of money with respect to which wealth owners exhibit the most stable and systematic behavior. Hence, the focus of Part II of this paper is on the relative predictive performance of demand functions for alternative definitions of the money stock. The empirical results reported in this section suggest that there has been a perceptible deterioration in the predictive performance of the  $M_1$  demand function relative to the  $M_2$  and  $M_3$  demand functions in the 1970's. While the  $M_1$  definition permitted the most accurate prediction of money demand over the full sample period including both the 1960's and 1970-75, the  $M_2$  and  $M_3$  equations yield more accurate predictions when the analysis is confined to the 1970's alone.

### DEFINITIONS OF THE MONEY STOCK

There recently has been a proliferation in the number of official definitions of the money stock.<sup>1</sup> Until April 1971, the *Federal Reserve Bulletin* recognized only the  $M_1$  definition of money in reporting financial data. At that time, it began to report regularly three measures:  $M_1$ ,  $M_2$ , and  $M_3$  (the sum of  $M_2$  and deposits at mutual sav-

\* The author wishes to thank Martin Mauro for excellent research assistance, and Michael Hamburger, Arline Hoel, Kevin Hurley, Fred Levin, and Gary Stern for valuable comments and suggestions.

<sup>1</sup> For the purposes of this study, measures of money regularly reported in the *Federal Reserve Bulletin* are considered official.

**Table I**  
**MEASURES OF THE MONETARY AGGREGATES**

In billions of dollars, June 1976

Money stock measures	Totals
M <sub>1</sub> (Private demand deposits adjusted + currency outside commercial banks) .....	303.1
M <sub>2</sub> (M <sub>1</sub> + savings and time deposits at commercial banks other than large negotiable certificates of deposit) .....	700.3*
M <sub>3</sub> (M <sub>2</sub> + deposits at mutual savings banks, savings and loan association shares, and credit union shares) .....	1,159.2†
M <sub>4</sub> (M <sub>2</sub> + large negotiable CDs) .....	770.9‡
M <sub>5</sub> (M <sub>3</sub> + large negotiable CDs) .....	1,229.8‡

\* Time and savings deposits at commercial banks other than large negotiable CDs (T) were \$397.3 billion.

† Savings deposits at thrift institutions (S) were \$458.9 billion.

‡ Large negotiable CDs were \$70.6 billion.

ings banks and savings and loan association shares). Beginning in April 1975, M<sub>3</sub> was redefined to include credit union shares and two additional measures of the money stock were introduced: M<sub>4</sub> (the sum of M<sub>2</sub> and large negotiable CDs) and M<sub>5</sub> (the sum of M<sub>3</sub> and large negotiable CDs). Table I reports the magnitudes of the five official measures and the savings components of the broader measures as of June 1976.

**SAVINGS AND TIME DEPOSIT COMPONENTS.** As previously noted, the broader money stock measures include, in addition to M<sub>1</sub>, one or more of the three time deposit totals mentioned above. In this section the savings instruments included in the broader definitions are described. Commercial banks and thrift institutions issue a wide assortment of savings instruments, differing in the maximum interest rate that can be paid, in the term over which the account must be held, and in the minimum denomination of the account.

*Savings deposits* or shares are mostly passbook accounts. Although commercial banks and thrift institutions must reserve the right to require at least thirty days' written notice before withdrawal, in practice withdrawals are honored on demand. In effect, therefore, any amount may be added to or withdrawn from a savings deposit account at any time, making it particularly well suited for savers whose deposits are in small amounts or whose needs for withdrawals may be irregular or unpredictable. *Time deposits*, unlike savings deposits, explicitly specify a maturity but may be redeemable prior to maturity with some sacrifice of interest. In addition, time deposits may require some minimum denomination and are generally issued in

certificate rather than in passbook form.

During the 1950's and much of the 1960's, the savings account was the major savings instrument issued by both commercial banks and thrift institutions. However, changes in regulations and competition for savings deposits have resulted in the development of a wider assortment of instruments. By the end of 1974, the value of time accounts had increased to more than one third of the total value of accounts in mutual savings banks, almost half of the savings and time accounts (excluding large CDs) at commercial banks, and more than half of the savings and time accounts at savings and loan associations.

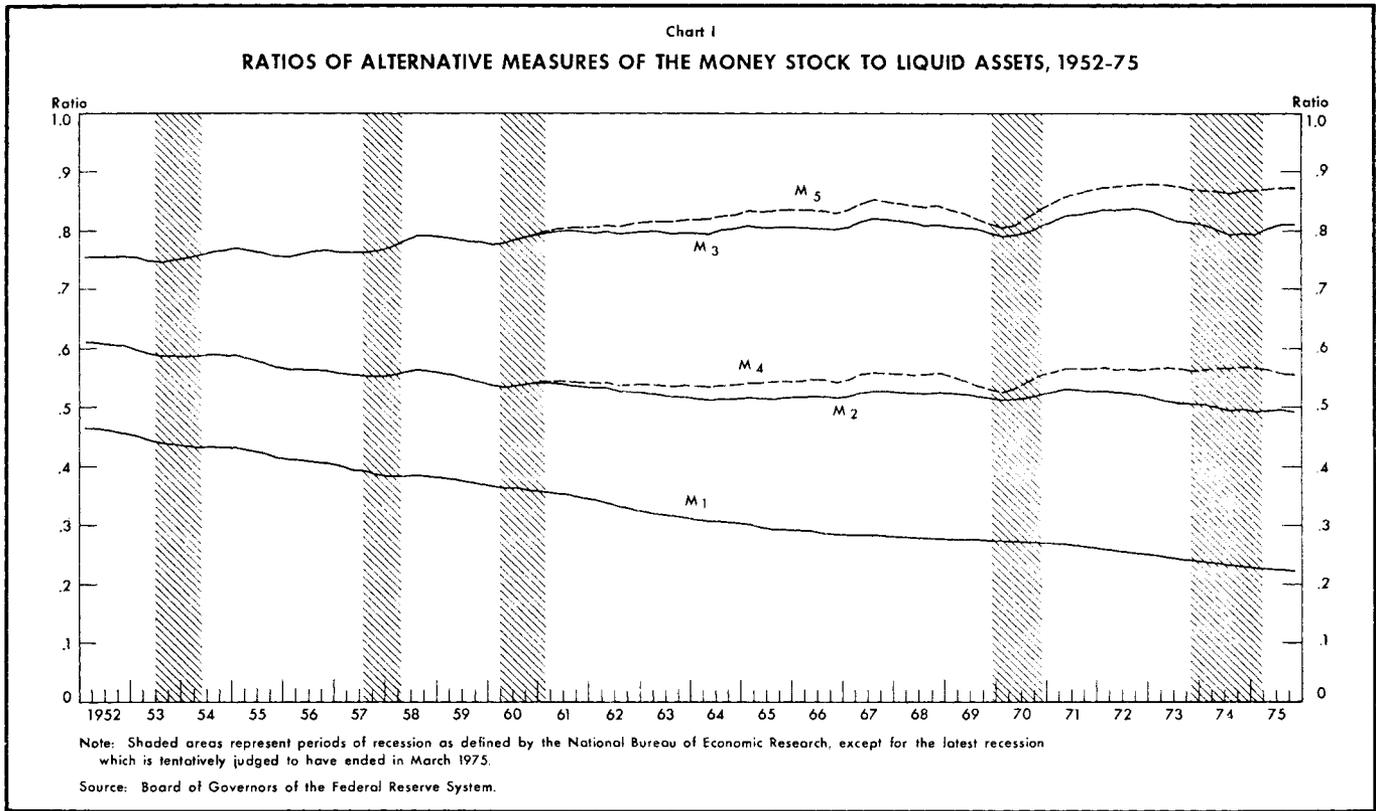
Several important regulatory changes affecting savings deposits at commercial banks were initiated in 1975 to permit commercial banks to compete more efficiently with thrift institutions. Effective April 7, 1975, the Board of Governors of the Federal Reserve System authorized member banks to permit the use of the telephone to withdraw funds from savings accounts or to transfer funds from savings accounts. As of September 2, 1975, the Board permitted member banks to offer a bill-paying service through preauthorized transfers of funds from customers' savings accounts to pay their debts. Previously only mortgage-related payments were permitted. These two changes may have enhanced the substitutability of savings deposits for demand deposits and, at the same time, may have increased the distinction between savings and time accounts. Effective November 10, 1975, the

**Table II**  
**CORPORATE SAVINGS DEPOSITS**  
**AT COMMERCIAL BANKS\***

In billions of dollars

Period	Total
1975: October .....	0
November .....	0.6
December .....	1.5
1976: January .....	2.6
February .....	3.9
March .....	4.8
April .....	5.3
May .....	5.9
June .....	6.0

\*These figures were derived by "blowing up" the data from weekly reporting banks and using the ratio of corporate savings deposits at all commercial banks to those at weekly reporting banks based on a one-time survey taken on January 7, 1976.



Board amended the definition of savings deposits in Regulations Q and D to permit corporations, partnerships, and other profit-making organizations to maintain savings deposits of up to \$150,000 per depositor at member banks. Estimates of the growth of corporate savings deposits through June 1976 are reported in Table II. These deposits increased to \$6 billion dollars in seven and one-half months. During late 1975 and early 1976, this growth in corporate savings deposits may have contributed to the sluggish growth in  $M_1$ .

A *negotiable time certificate of deposit (CD)* commits the issuing bank to pay the amount deposited plus specified interest on a date specified. Because the instrument is negotiable, it can be traded in the secondary market prior to its stated maturity. Negotiable CDs typically are issued in minimum denominations of \$100,000 and are the most volatile of the deposit measures. Negotiable CDs were first introduced in 1961; prior to this date,  $M_2$  and  $M_4$  were identical as were  $M_3$  and  $M_5$ .

**RATIOS TO TOTAL LIQUID ASSETS.** Chart I depicts move-

ments in the ratio of each money stock measure to total liquid assets over the period 1952-I to 1975-IV. Total liquid assets are defined here as  $M_5$  plus short-term Government securities, United States savings bonds, and commercial paper. The secular trend in the money stock measures points up a concern among those who favor the broader money stock definitions. As a ratio of total liquid assets,  $M_1$  has steadily declined over the period—from almost half in 1952 to less than one quarter in 1975.

$M_2$  has also declined as a percentage of total liquid assets, although to a substantially smaller degree. The  $M_2$  ratio has declined from just over 60 percent in 1952 to 50 percent in 1975. The greater stability of the  $M_2$  ratio reflects offsetting influences stemming from the declining proportion of  $M_1$  in total liquid assets counterbalanced by an increase in the proportion of savings and time deposits at commercial banks. The share of the latter in total liquid assets rose from 15 percent in 1952 to about 27 percent in 1975. The proportion of total liquid assets held as savings and time deposits at thrift institutions underwent a similar increase, climbing from about 15 percent in

1952 to about 30 percent in 1975. As a result of the growth of savings and time deposits at commercial banks and thrift institutions, the share of  $M_3$  in total liquid assets increased from 75 percent in 1952 to 80 percent in 1975.

The behavior of  $M_4$  and  $M_5$  relative to total liquid assets is also evident in Chart I. Over the period of its independent existence, the ratio of  $M_4$  to total liquid assets has changed little, with growth of CDs offsetting the reduction of the  $M_2$  share. The ratio of  $M_5$  to total liquid assets has increased from 80 percent in 1961 to 87 percent in 1975, reflecting the proportionate run-up in both  $M_3$  and CDs.

Overall,  $M_1$  and  $M_2$  have declined as proportions of total liquid assets, with the decline in the  $M_2$  ratio far less dramatic than the halving of the  $M_1$  ratio over the period. On the other hand, the shares of  $M_3$  and  $M_5$  in liquid assets have risen, while the  $M_4$  proportion has changed very little. The pronounced decline in the ratio of  $M_1$  to total liquid assets, however, is not necessarily evidence that the usefulness of the  $M_1$  definition of money has deteriorated.  $M_1$  could still be the aggregate with respect to which wealth owners behave most systematically, and the decrease in the ratio of  $M_1$  to total liquid assets simply could reflect lower income and/or wealth elasticities of demand for  $M_1$  compared with the savings components included in the broader measures.

**FINANCIAL DEVELOPMENTS.** Nevertheless, the financial innovations of the last several years seemingly have blurred the distinction between savings and demand deposits and may have weakened the close link between  $M_1$  and the means of payment. Two important innovations were the introduction of checking privileges on interest-bearing savings accounts in New England and the spread of noninterest-bearing checking facilities at thrift institutions in states where checking privileges for savings accounts are prohibited.

In January 1974, Congressional legislation became effective authorizing all depository institutions in Massachusetts and New Hampshire to issue NOW accounts but prohibiting their introduction in other states. Depository institutions are permitted to pay a maximum interest rate of 5 percent on NOW accounts; these accounts can be issued only to individuals and nonprofit organizations. In March 1976, Federal legislation which sanctioned NOW accounts in the four other New England states (Connecticut, Maine, Rhode Island, and Vermont) became effective. The growth of NOW accounts is reported in Table III.

Noninterest-bearing accounts with negotiable order of withdrawal provisions, called payment order accounts,

were introduced by savings banks in New York in 1974. In May 1976, New York State legislation which permitted state-chartered thrift institutions to offer checking accounts to individuals and nonprofit institutions became effective. Of the eighteen states and territories (including Puerto Rico) with mutual savings banks, ten currently permit savings banks to offer checking accounts (Indiana, Delaware, New York, New Jersey, Connecticut, Maine, Maryland, Oregon, Rhode Island, and Vermont). Federal regulations prohibit Federally chartered savings and loan associations from issuing checking-type deposits, but some states have permitted state-chartered savings and loan associations to offer either third-party payment orders (Illinois) or demand deposit accounts (Connecticut, Maine, Vermont, Rhode Island, and New York). Interest-bearing check-like instruments, called "share drafts", were introduced by credit unions in October 1974.

Interest-bearing NOW accounts at commercial banks are included in their savings deposit totals and therefore are included in  $M_2$  but not in  $M_1$ . Interest-bearing NOW accounts and noninterest-bearing checking accounts at savings and loan associations are included in  $M_3$  but not in  $M_1$  or  $M_2$ , and NOW accounts at mutual savings banks are included in  $M_3$  but not in  $M_1$  or  $M_2$ .

**Table III**  
**NEGOTIABLE ORDER OF WITHDRAWAL (NOW) ACCOUNTS**  
**IN NEW ENGLAND**  
In thousands of dollars

Month ended	Total of all offering institutions in New England	Commercial banks	Mutual savings banks	Savings and loan associations
1972: December .....	45,272		45,272	
1973: December .....	143,254		143,254	
1974: December* .....	312,576	65,249	213,661	33,666
1975: December .....	839,256	358,940	386,560	93,756
1976: January .....	880,357	394,239	389,589	96,529
February .....	942,779	435,080	406,217	101,482
March† .....	1,091,004	543,456	435,352	112,196
April .....	1,206,880	627,525	456,166	123,189
May .....	1,324,030	738,586	458,288	127,156
June .....	1,415,712	804,328	476,112	135,272

\* Congressional legislation enacted by the Congress which authorized all depository institutions in Massachusetts and New Hampshire to issue NOW accounts became effective on January 1, 1974.

† Federal legislation which sanctioned NOW accounts in all depository institutions in Connecticut, Maine, Rhode Island, and Vermont became effective on March 1, 1976.

Source: *Monthly Statistical Release on Now Accounts* (Research Department, Federal Reserve Bank of Boston), June 30, 1976.

Checking accounts at mutual savings banks which do not earn interest are not included in any of the monetary aggregates. Accounts at credit unions against which share drafts can be written are included in  $M_3$  but not in  $M_1$  or  $M_2$ . If NOW accounts and thrift checking accounts become increasingly important,  $M_1$  may well include a declining proportion of the stock of assets used as a means of payment.

Overdraft banking also may have reduced the role of  $M_1$  in the payments process. Overdraft banking permits the user to secure a loan simply by writing a check in excess of the current balance in his checking account. If the overdraft is used to make a purchase and is subsequently offset by the transfer of funds from the purchaser's savings account, in effect final payment is made from the savings account and  $M_1$  has played no role at all in carrying out the exchange.<sup>2</sup>

**VELOCITY.** In addition to these changes in financial practices, concern over the appropriate definition of money has been heightened as a result of the behavior of  $M_1$  velocity relative to that of the other monetary aggregates. Velocity measures the relationship between the stock of money and the flow of income or payments; more precisely, the income velocity of money is the ratio of income to money, or the rate at which the money stock "turns over" in income transactions during a period. Velocity can be viewed as the link between the money stock and spending. This can be seen by writing current-dollar income ( $Y$ ) as the product of velocity ( $V$ ) and money ( $M$ ):

$$Y = VM$$

In Chart II, movements in the velocity measures corresponding to the five monetary aggregates discussed in this paper are depicted for the period 1952-I to 1975-IV. The only velocity measure with a pronounced trend over the entire period is  $V_1$ . During the period,  $V_1$  grew at a 2.9 percent compound annual rate. The trend rate was 3.2 percent over the period 1952-66, but then it slowed to 2.4 percent per year over the 1967-75 period.<sup>3</sup> The velocity measure corresponding to  $M_2$  exhibits a more moderate upward trend prior to 1962 and no significant trend thereafter. Over the period 1962 to 1975-IV,  $V_2$  remained in the narrow range of 2.30 to 2.45. The  $V_3$ ,  $V_4$ , and  $V_5$

series (corresponding to  $M_3$ ,  $M_4$ , and  $M_5$ , respectively) also displayed less trend than the  $V_1$  series.

These differences in observed velocity do not necessarily indicate that  $M_1$  velocity is more difficult to predict. Predictability and stability are not the same thing.<sup>4</sup> The determinants of velocity are precisely the forces that determine the demand for money; i.e., the value of  $V$  is the outcome of portfolio decisions about how much money wealth owners want to hold relative to income. Hence, concern with velocity suggests the importance of focusing on the relative performance of money demand functions that employ alternative definitions of money.

#### EMPIRICAL EVIDENCE ON THE DEFINITION OF MONEY

The declining share of  $M_1$  in liquid assets, the marked upward trend in its velocity, and recent innovations in financial practices all raise questions about continued emphasis of this aggregate. However, as noted above, the issue hinges on the relative predictive performance of demand functions for money using alternative definitions of the money stock. From the perspective of stabilization policy, accurate prediction of the demand for money is important in part because it can affect the precision with which the consequences of alternative monetary growth rates can be forecasted. More specifically, in many models one element in assessing accurately the implications of alternative money growth targets for real income, employment, and prices is a reasonably stable money demand function.

Reliance on the predictive performance of the money demand function under alternative definitions of money has been urged as a criterion for determining the definition of money by Friedman and Meiselman [4] and Friedman and Schwartz [5].<sup>5</sup> The preferred measure of money is the one exhibiting the smallest prediction error. The

<sup>4</sup> Friedman [3] suggests that the best definition of money is the one that yields the most easily predictable velocity. However, in comparing  $M_1$  and  $M_2$ , Friedman identifies *stability* of the velocity series with its *predictability* and concludes that  $M_2$  should be preferred to  $M_1$ , because  $M_2$  velocity ( $V_2$ ) is relatively constant while  $M_1$  velocity ( $V_1$ ) exhibits a pronounced upward trend.

<sup>5</sup> Friedman and Schwartz suggest that "the desideratum is a monetary total whose real value bears a relatively stable relation to a small number of variables that theoretical considerations lead us to believe affect the real quantity of money demanded. . . ." [5, pp. 139-40]. In their empirical work on the definition of money, however, Friedman *et. al.* employed money income correlations rather than explicit money demand functions.

<sup>2</sup> Proposals to cover automatically overdrafts at commercial banks with funds from savings accounts are pending.

<sup>3</sup> However, the growth of  $V_1$  over the 1970-75 years alone was roughly equal to that in the 1952-66 interval.

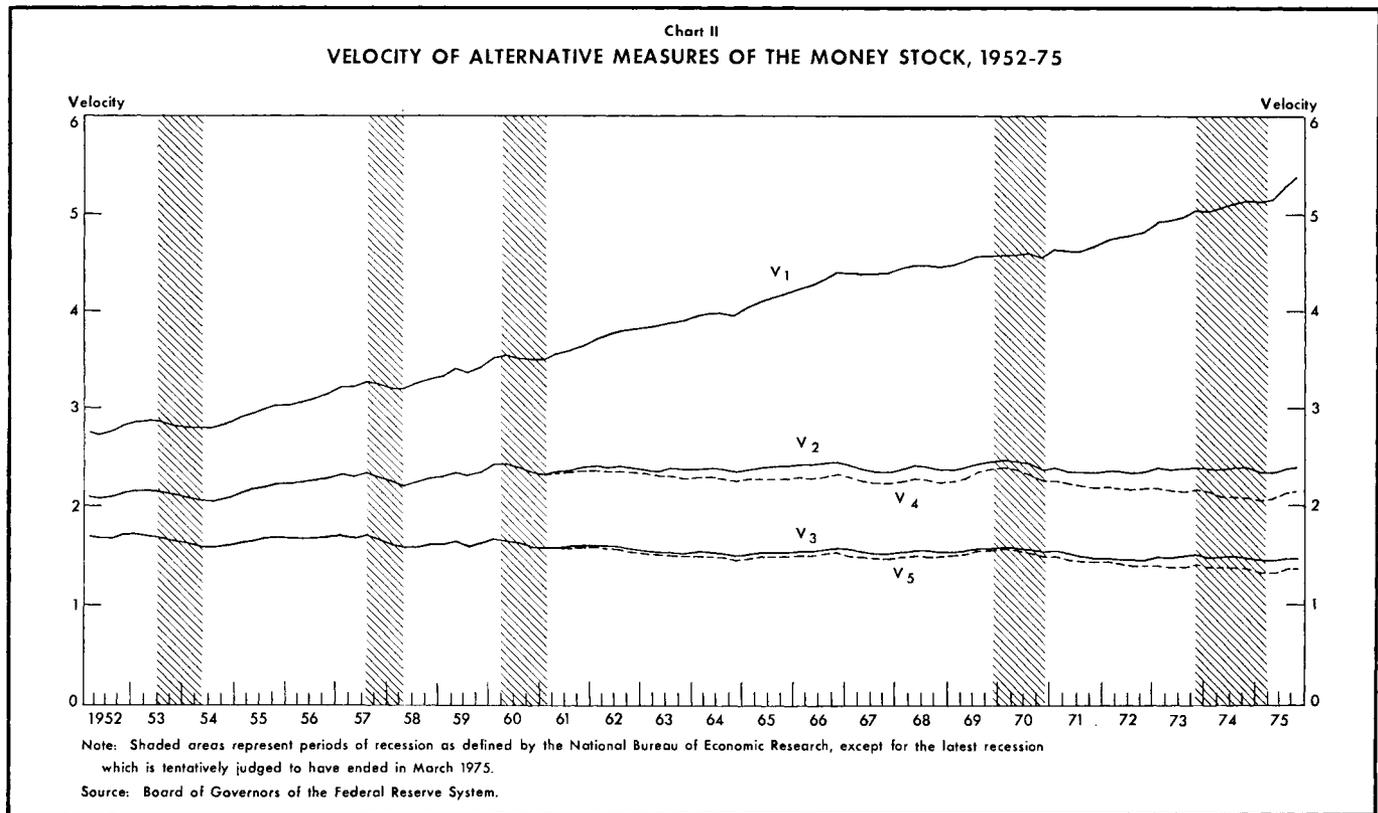
empirical analysis in this paper is confined to  $M_1$ ,  $M_2$ , and  $M_3$ , the three money measures for which the Federal Reserve System currently sets growth ranges.<sup>6</sup> The empirical approach employed below uses two separate objective criteria—the first previously employed by Brunner and Meltzer [1] and the second introduced by Goldfeld [6]—to assess the relative predictive performance of alternative money demand functions and therefore to shed light on the appropriate definition of money:

(1) Comparison of percentage prediction errors for  $M_1$ ,  $M_2$ , and  $M_3$  demand equations (Brunner and Meltzer [1]).

(2) Comparison of aggregate and disaggregated predictions of  $M_2$  and  $M_3$  (Goldfeld [6]). For example, assume the choice is between  $M_1$  and  $M_2$ .  $M_2$  predictions can be made directly from an  $M_2$  equation (referred to as an aggregate prediction) or by summing the predicted values of separate  $M_1$  and time deposit equations (referred to as a disaggregated prediction). If the disaggregated prediction is superior to the aggregate prediction, this suggests that “aggregation is inflicting some positive harm” [p. 594] and  $M_1$  is preferred to  $M_2$ . On the other hand, if the aggregate prediction outperforms the disaggregated,  $M_2$  would be preferred to  $M_1$ . This second approach is applied below to  $M_2$ ,  $M_3$ , and the sum of savings and time deposits at commercial banks and thrift institutions.

<sup>6</sup> For previous empirical research on the stability and predictive performance of the money demand function, see Brunner and Meltzer [1], Laidler [8], Hamburger [7], and Goldfeld [6]. Laidler concluded that the  $M_2$  function was more stable than the  $M_1$  function, but the other studies favored the  $M_1$  definition.

**SPECIFICATION OF THE DEMAND FUNCTION.** Demand functions for  $M_1$ ,  $M_2$ , and  $M_3$ , time and savings deposits at commercial banks other than large negotiable CDs (T), savings deposits at thrift institutions (S), and the sum of T and S (TS) were estimated over the period 1952-II



to 1974-II.<sup>7</sup> As in most standard formulations, the demand for money is assumed to depend on income and/or wealth and interest rates. The income version reflects the transactions view of the demand for money.<sup>8</sup> The transactions view immediately suggests the  $M_1$  definition, given that  $M_1$  appears to be the empirical counterpart to the theoretical construct of the medium of exchange. However, the increasing use of third-party payment privileges from savings accounts, NOW accounts, and checking accounts at thrift institutions suggests that the empirical counterpart to the means of payment is no longer as clear-cut as it once was.

The wealth version of the demand for money emphasizes the nonpecuniary return associated with holding money. Money is viewed as a temporary abode of purchasing power which bridges the gap between sales and purchases of goods and services. Viewed in this fashion, money includes the medium of exchange but may be broader. The empirical counterpart is not so clearly defined as for the means of payment, and the choice of assets to include is, of necessity, an empirical issue.

Based on the general considerations just discussed, to derive the money demand equation estimated in this paper the long-run desired level of real money holdings ( $m^*$ ) is first specified as a function of real income ( $y$ ), interest rates ( $r$ ), and real net wealth ( $a$ ):

$$m^* = L(r, y, a)$$

Portfolio adjustment costs are assumed to induce wealth owners to adjust actual money holdings ( $m$ ) to the long-run desired level of money balances ( $m^*$ ) with a lag. Using a stock-adjustment approach, the change in real money balances between periods  $t$  and  $t-1$  is related to the discrepancy between desired money balances in  $t$  and actual holdings in  $t-1$ , or

$$m_t - m_{t-1} = \alpha (m^*_t - m_{t-1})$$

where  $\alpha$  is the speed of adjustment. Following Goldfeld, the basic form of the equations is logarithms in the levels

of the variables. Measures of money and time and savings deposits, income, and wealth are deflated by the gross national product (GNP) implicit price deflator. The commercial paper rate and one rate on savings deposits are used in each regression, except with  $M_2$  where only the commercial paper rate is employed.<sup>9</sup> The wealth variable is net worth of households, constructed for use in the MPS econometric model of the United States economy.

The basic form of the money demand equation tested is as follows:

$$\ln m_t = a + b \ln y_t + c \ln a_t + d \ln RCP_t + e \ln RS_t + f \ln m_{t-1}$$

where  $m$  is one of the various measures of the money supply or a component thereof deflated by the GNP price deflator,  $y$  is real GNP,  $a$  is the real value of net worth of households,  $RCP$  is the commercial paper rate, and  $RS$  is one of the savings account rates.<sup>10</sup> Three versions were estimated for each aggregate depending on whether income only, wealth only, or both income and wealth were included as independent variables in the regression. Below the results for the income versions of the  $M_1$ ,  $M_2$ ,  $M_3$ ,  $T$ , and  $TS$  equations are reported, along with the wealth version of the  $S$  equation. More complete results can be found in Meyer [9].

**PERCENTAGE RMSE IN AND OUT OF SAMPLE.** The most widely used criterion for comparing money demand functions under alternative definitions of money involves comparison of in-sample and out-of-sample predictive performance. The in-sample results are based on the

<sup>9</sup> The savings deposit rate was not statistically significant in the  $M_2$  equation. The savings rate used in each equation is reported in the following table. RSAV is a weighted average of rates on savings and time deposits at commercial banks (RTD), at savings and loan associations, and at mutual savings banks; RTHR is a weighted average of rates at savings and loan associations and mutual savings banks. In both cases, the weights are the proportions of the total stock of assets in the previous quarter:

Equation	Saving rate
$M_1$	RSV
$T$	RTD
$S$	RTHR
$TS$	RSV
$M_3$	RSV

<sup>10</sup> While this is a conventional specification of the money demand function (see, for example, Goldfeld [6]), it is by no means the only possibility. One characteristic of this equation which should be pointed out is that it implies that nominal money holdings adjust to price disturbances within a quarter, while adjustment to changes in all other independent variables occurs with a lag.

<sup>7</sup> The end point of 1974-II was selected because of indications that all equations exhibited structural shifts at or after this date.

<sup>8</sup> According to this view, the essential property of money is that of a medium of exchange, facilitating purchases and sales of goods and services. Money is held in portfolios between receipt from sales and expenditures on goods and services because of the transactions costs of moving between money and interest-earning assets. Income is included in the money demand function as a measure of the volume of transactions, and interest rates reflect the opportunity cost associated with holding money.

**Table IV**  
**PREDICTIVE PERFORMANCE OF  $M_1$ ,  $M_2$ , AND  $M_3$  EQUATIONS**

Definition	RMSE as a percentage of the mean	
	In sample	Out of sample
	1952 to 1974-II	1962-75
$M_1$ .....	0.42	0.96
$M_2$ .....	0.47	0.96
$M_3$ .....	0.44	1.23

RMSE = Root mean squared error.

percentage root mean squared errors (RMSEs)<sup>11</sup> over the period 1952-II to 1974-II; the out-of-sample results are based on four-quarter dynamic simulations over the period 1962-I to 1975-IV.<sup>12</sup>

Table IV reports the RMSE as a percentage of the mean for the  $M_1$ ,  $M_2$ , and  $M_3$  equations for both in-sample and out-of-sample predictions. The results of this comparison favor the  $M_1$  definition in that the  $M_1$  equation yields the best predictive performance both in and out of sample. The prediction error for  $M_1$  is 0.42 percent in the in-sample results, compared with 0.47 percent for  $M_2$  and 0.44 percent for  $M_3$ . In the out-of-sample results, the percentage prediction error is 0.96 percent for both  $M_1$  and  $M_2$  and 1.23 percent for  $M_3$ .<sup>13</sup>

<sup>11</sup> The RMSE is defined as the square root of the sum of squared errors divided by the number of forecasts. The percentage RMSE is computed by deflating the RMSE by the mean of the actual values of the variable being predicted. Again, while comparison of RMSEs is a conventional procedure, it is not the only way to distinguish between these aggregates. Use of the RMSE means that large errors are given a great deal of weight.

<sup>12</sup> In a dynamic simulation, the predicted value of the money supply is used in the following period as the value of the lagged dependent variable. A regression is initially estimated over the period 1952-II to 1961-IV. To determine the predicted value of money in 1962-I, actual values are substituted for income, wealth, and interest rates in 1962-I and for the value of money in 1961-IV. To determine the predicted value of money in the next quarter, actual values of income, wealth, and interest rates in 1962-II and the predicted value of money in 1962-I are substituted in the equation. The same procedure is followed to yield predicted values in 1962-III and 1962-IV. At this point, four quarters are added to the sample period, the regression is rerun through 1962-IV, and predicted values are determined for 1963. The procedure is continued through 1975.

<sup>13</sup> The four-quarter out-of-sample dynamic predictions are extended through 1975 to increase the number of observations available to discriminate between aggregates.

**Table V**  
**OUT-OF-SAMPLE PREDICTIONS OF  $M_1$ ,  $M_2$ , AND  $M_3$**

Definition	RMSE as a percentage of the mean	
	1962-69	1970-75
$M_1$ .....	0.77	1.20
$M_2$ .....	1.27	0.65
$M_3$ .....	1.45	1.01

RMSE = Root mean squared error.

These results appear to provide support for the  $M_1$  definition. To determine whether or not there has been any deterioration in the relative predictive performance of  $M_1$ , compared with  $M_2$  and  $M_3$ , the period used for out-of-sample tests was broken into two subperiods: 1962-69 and 1970-75. The basic equation described above, using alternative definitions of money, was simulated dynamically for these periods. The results are reported in Table V.

During the earlier 1962-69 subperiod, the  $M_1$  definition yields the smallest percentage prediction error (column 2 of Table V). During the 1970's, however, the  $M_2$  definition yields the smallest prediction error and  $M_1$  yields the largest error (column 3 of Table V).<sup>14</sup> The subperiod results suggest, therefore, that the performance of the  $M_1$  equation relative to the  $M_2$  and  $M_3$  equations has deteriorated in the last several years.

**AGGREGATE VS. DISAGGREGATED PREDICTIONS OF  $M_2$  AND  $M_3$ .** The second empirical criterion for the definition of money, discussed above, involves a comparison of aggregate and disaggregated predictions of the broader measures of the money stock. For example, if  $M_2$  is the appropriate definition of money, it should be possible to predict movements in  $M_2$  more accurately using an explicit demand function for  $M_2$  rather than making predictions from separate demand functions for its components,  $M_1$  and  $T$ . Similarly, predictions of  $M_3$  based on an aggregate  $M_3$  function should be compared with predictions derived from separate equations for its components.

This criterion is applied to the results of dynamic out-of-sample simulations over the 1962-75 period. For the

<sup>14</sup> This result could depend heavily on the deterioration in the  $M_1$  demand function evident since mid-1974. On this subject, see Enzler, Johnson, and Paulus [2].

**Table VI**  
**AGGREGATE VS. DISAGGREGATED PREDICTIONS**

Four-quarter post-sample predictions  
Root mean squared errors

Definition	1962-69		1970-75	
	Aggregate	Disaggregated	Aggregate	Disaggregated
M <sub>2</sub> .....	5.02	4.98	3.14	3.66
M <sub>3</sub> .....	8.87	7.06	7.93	8.27
TS .....	7.63	6.84	7.75	8.20

entire period, the out-of-sample results provide some superficial support for M<sub>2</sub> over M<sub>1</sub> in that the disaggregated M<sub>2</sub> prediction error exceeds the aggregate prediction error. However, there is also evidence suggesting that T and S should be treated as a single aggregate and, if this is the case, the appropriate comparison is between M<sub>1</sub> and M<sub>3</sub> and not between M<sub>1</sub> and M<sub>2</sub>. The disaggregated prediction of M<sub>3</sub> dominates the aggregate prediction, suggesting a preference for M<sub>1</sub> over M<sub>3</sub>.

Subperiod results for the post-sample prediction period are reported in Table VI. The disaggregated predictions are consistently superior in the 1960's, although the difference with regard to M<sub>2</sub> is small.<sup>15</sup> The results for the subperiod of the 1970's, however, are just the reverse. The aggregate equations consistently yield the better predictions. Taken together, these results seem to support the deterioration in the relative performance of the M<sub>1</sub> demand function in the 1970's that was evident in the results based on percentage prediction errors for M<sub>1</sub>, M<sub>2</sub>, and M<sub>3</sub>. And, since these results also suggest that T and S should be treated as an aggregate, M<sub>3</sub> rather than M<sub>2</sub> may be the preferred definition.

### CONCLUSION

The ability of the Federal Reserve System to predict the response of the economy to monetary policy may depend, in part, on the precision with which it can predict the portfolio behavior of the private sector. In turn, the precision with which private portfolio behavior can be

<sup>15</sup> Similarly, for the period 1961-71, Goldfeld found that disaggregated predictions of M<sub>2</sub> outperformed the aggregate results (see [6, pp. 592-95]).

predicted depends on identifying those asset categories with respect to which the private sector exhibits systematic behavior and, in part, it depends on estimating demand functions for those categories.

A number of recent financial developments have raised concern about the continued usefulness of the narrow definition of the money stock. The secular decline in the ratio of M<sub>1</sub> to total liquid assets may suggest a diminished role for M<sub>1</sub> in the financial system. The greater stability of the velocity measures corresponding to the broader money stock measures has been cited in support of broadening the definition of money. Yet neither of these secular trends represents direct evidence about the appropriate definition of money.

To provide direct evidence, this paper compared the predictive performance of demand functions for the M<sub>1</sub>, M<sub>2</sub>, and M<sub>3</sub> definitions of money. The evidence based on the full sample and full post-sample periods indicated that the private sector behaved in a more systematic fashion with respect to the M<sub>1</sub> variable than with respect to the broader measures. When the period was broken into the 1960's and the 1970's, however, evidence of deterioration in the predictive performance of the M<sub>1</sub> equation relative to the M<sub>2</sub> and M<sub>3</sub> equations was uncovered. While the M<sub>1</sub> definition yielded the best results during the 1960's, the broader money stock measures were generally superior in the 1970's. Consistent with this, moreover, was the superiority in the 1970's of the aggregate predictions of M<sub>2</sub> and M<sub>3</sub> in comparison with the disaggregated predictions.

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