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CONTROLLING MONETARY AGGREGATES

Remarks of

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I am often appalled, amazed, amused, or horrified at what broad conclusions can be constructed upon narrow foundations, when I read news accounts interpreting the monetary statistics that the Federal Reserve publishes each week. Many stories present divinations that seem somewhat akin to the oracular portents produced by prior civilizations after a careful analysis of entrails, auspices, or other odd indices. This is not because the data are unimportant, but because figures are used to carry a superstructure of analysis and prediction that goes far beyond any relationship to their worth or meaning.

Let me today speak to three misunderstandings which seem to underlie numerous stories and which I believe lead to many errors, unwarranted statements, and faulty analyses.

*** The first is a failure to recognize large random forces and estimating errors present in most weekly adjusted data. There are very few weeks--frequently even months--in which much of the reported movement in monetary aggregates is not primarily the result of statistical "noise," by which I mean something in the nature of static that I'll try to identify more precisely later on.

*** The second, and more significant, are errors which attribute the exact amount of the weeks' or months' movements in the monetary aggregates to a specific plan or action of the Federal Reserve. Too many statements seem derived from an incorrect interpretation of what the Federal Reserve does based upon the highly oversimplified elementary textbook explanations of the procedure by which banking systems create money and credit. Too few statements recognize that in any period the amount of money or bank credit created is the joint result of a complex interaction among households, commercial and industrial corporations, financial institutions, the Treasury, and the Federal Reserve. When I point out that in any one-month period, the Treasury, the ten largest banks, and in a similar manner the ten largest corporations are likely to have a greater impact on the narrowly defined money supply

than the Federal Reserve System, most people seem indignant that their carefully learned lesson from Economics I is not a true statement of the operational facts.

*** Finally, the terms, "money supply," or "money stock," are used very loosely in much of both academic and popular discussions. There is often a failure to specify which monetary aggregates are being discussed; which are considered significant; or the advantages of one or another "money supply" concept as a basis of policy. This failure is important. The differently constituted aggregates have significantly different movements over short periods up to and including a year, and the costs of influencing each may differ widely.

The problem of cost-benefit analysis is a major one. To control a part of a whole may be expensive. Such costs should be engendered only if the policy cannot be achieved in more efficient ways.

"Noise" in the Monetary Aggregates

Tables 1 and 2 show how widely reported changes in the money supply can vary from the basic underlying trend of monetary policy. As one would expect they show that the longer the period under consideration the smaller the impact of the non-policy-determined movements. Still, even over a quarter these other movements are large.

The non-policy-determined movements are actually of two very different types. The first, which I have labeled "noise," consists of: operating misses; errors in estimating the actual data at the time that operations for a period end; shifting seasonals; and irregular movements which are temporary and the product of special factors.

The operating misses arise either because of errors in reporting, errors in sampling, or information not available when operations must be ended. For some time, the size of misses has been decreasing steadily. The misses are small compared to the totals, but large compared to weekly or monthly changes.

Table 1

MEASURES OF CHANGE AND DEVIATIONS OF THOSE CHANGES
FOR MAJOR MONETARY AGGREGATES AT MEMBER BANKS IN 1966-68
(In billions of dollars; not seasonally adjusted)

	Money Supply	Operating Misses*	Excess Reserves*	Time Deposits*	Government Deposits	Total Reserves*	Seasonal Reserves*	Total Deposits Subject to Reserves**
1 Week:								
Average change per period	.15	0	0	.08	0	.16	0	.39
Range	-4.4 to 5.2	-1.4 to .7	-3.6 to 2.6	- .2 to .3	-2.5 to 4.3	-5.3 to 5.0	-7.8 to 3.7	-1.9 to 3.2
Mean deviation	1.6	.3	1.1	.1	1.1	1.6	.9	.6
Standard "	1.9	---	1.3	.1	1.4	2.0	1.2	.8
4 Weeks:								
Average change per period	.64	0	0	.31	0	.66	0	1.53
Range	-6.3 to 4.6	-1.4 to .7	- .7 to .7	- .3 to .9	-2.6 to 2.5	-2.1 to 5.6	-5.9 to 5.7	-1.0 to 4.1
Mean deviation	2.0	.3	.3	.2	1.0	2.0	1.9	1.1
Standard "	2.5	---	.4	.3	1.2	2.3	2.2	1.3
13 Weeks:								
Average change per period	2.17	0	0	.91	0	2.6	0	4.9
Range	- .8 to 6.5	-1.4 to .7	- .3 to .3	- .3 to 1.7	- .3 to 1.7	-2.6 to 5.9	-1.3 to 2.6	-1.4 to 8.9
Mean deviation	2.3	.3	.2	.5	.6	2.0	.9	2.5
Standard "	2.5	---	.2	.6	.7	2.5	1.0	3.0

* In order to make the orders of magnitude roughly comparable to demand deposits in terms of their reserve impacts the reserve changes for operating misses, excess reserves, and total reserves have been multiplied by 6.6 while time deposits have been multiplied by .28. Seasonal reserves are based on the credit proxy seasonal and automatically carry the reserve ratio for the entire proxy.

** Seasonally adjusted.

Table 2

MEAN DEVIATIONS OF VARIOUS FACTORS AS PERCENTAGE
OF AVERAGE CHANGE IN MONEY SUPPLY PER PERIOD
1966-68

(In per cent; not seasonally adjusted)

	Money Supply	Operating Misses	Excess Reserves	Time Deposits	Government Deposits	Total Reserves	Seasonal Reserves Supplied	Total Deposits Subject to Reserves*
1 Week	1,030	200	700	48	740	1,030	610	400
4 Weeks	310	40	46	32	150	320	300	170
13 Weeks	105	10	9	21	27	93	42	115

Source: Table 1.

* Seasonally adjusted.

The seasonal factors are large. In addition, they are dominated by irregular factors, particularly over short periods. In many cases, it is hard to determine by analysis of historical data what is a seasonal and what is an irregular factor. The demand for money will vary greatly depending on the day of the week in which a month, quarter, or year ends. The same is true of the day on which traditional dividend and tax dates fall. The change in tax collection dates and percentages has been important in most recent years. The day on which the Treasury borrows and the form of its borrowings are critical. Problems with the debt ceiling and attempts to stay under it loom large. While estimates are made currently as to the impacts of these factors, they still confuse the judgment of seasonal variation, particularly as observed at the time operations take place.

The irregular elements include seemingly minor factors such as the financing of a corporate take-over bid, a breakdown of a bank computer, or a snow storm. Each of these may cause even weekly average changes to vary by over 100 per cent or more. As an example of such movements, examine pages 29 and 30 of the February 1969 Economic Indicators and pages A17 and A18 of the January 1969 Federal Reserve Bulletin. Each carries an estimate for the December 1968 change in the narrowly defined money supply. In one case the increase is reported as $1.2 billion which translates to an annual rate of growth of 7.5 per cent. In the second case the increase is estimated at $8.4 billion, or at an annual rate of 53 per cent. Neither figure is in error. The first weights the extremely unusual end-of-year changes in one way, the second

in a different way. Neither gives a very good sense of the underlying trend because of the dominant influence of very special factors that were rapidly reversed. These irregular forces were large enough, however, to bias strongly analysis of the two adjacent quarters in which they occurred and for many purposes even the annual data for the two years.

Data calculated at the time operations end are the significant data for operational purposes, but theoretically not for any policy impact. These estimates are subject to revisions as more information becomes available, as full universe data replace samples, and as seasonal forces are re-estimated. These revisions between the money supply as first reported and as currently reported are not shown on the table. However, they averaged $152 million per week over the past three years. They had a range of from $-1.4 billion to $1.0 billion. Their mean deviation was over $490 million. Clearly, they make a significant amount of noise which must be taken into consideration when one looks at the reported weekly changes. In a somewhat similar manner, we might note that one part of the money supply, namely, non-member bank demand deposits, is not subject to reserve requirements of the Federal Reserve nor is information on these movements readily available. Their variance is rather great. Their share of total demand deposits has been growing. The weekly and monthly data for this component are estimates from other types of data. Specific information on how this component has changed is available only semi-annually with a lag of four to eight months.

The tables call attention also to the second and third types of problems I noted in my introduction. Many unsophisticated comments and theories speak as if the Federal Reserve purchases a given quantity of securities, thereby creating a fixed amount of reserves, which through a multiplier determines a particular expansion in the money supply.

Much of modern monetary literature is actually spent trying to dispel this naive elementary textbook view which leads people to talk as if (and perhaps to believe) that the central bank determines the money supply exactly or even closely--in the short run--through its open market operations or reserve ratio. This incorrect view, however, seems hard to dislodge. Almost daily I read that last week or last month the Fed increased the money supply by 5 per cent.

Such statements are simply inaccurate. The growth of the money supply in any period is the result of actions taken by the Federal Reserve, the Treasury, the commercial banks, and the public. Over a long period, the Fed may play a paramount role, but this is definitely not the case in the short run. To the best of my knowledge, the Fed has not and probably would have great difficulties controlling within rather wide limits the growth of the narrowly defined money supply in any week or month. I think control over a period such as a quarter might be possible, but I know no estimates of what the cost of obtaining a tight control would be in terms of destruction of our financial structure, output, or employment.

Tables 1 and 2 show movements in reserves absorbing or realizing demands. The first column shows changes in the narrowly defined money supply. The seventh column shows changes in the total reserves furnished by the Fed. The lines between indicate some of the factors which can absorb or inject reserves to cause variations from the simplified text-book case.

To place the relationship between these two columns in a better perspective, we can note that over the past 10 years the rate of growth of the money supply has averaged about 80 per cent of the rate of growth in total reserves. On the other hand, the coefficient of determination (r^2) for quarterly changes in this period is only .27; or, on the average, nearly three-fourths of the quarter-to-quarter movements in the two totals are not statistically related. For year-to-year changes the r^2 is .73.

The tables serve only as general indicators of rough orders of magnitudes. They give no indication of causal relationships. As discussed later, required reserves of member banks are based on the deposits created two weeks earlier. Increased reserves equal to the requirements added by the deposit creation are, with the exception of important marginal differences, normally made available by the Federal Reserve through purchases or sales of securities. In addition, securities are also purchased or sold to offset seasonal or other changes in the so-called technical factors which add or subtract from member bank reserves. These are mainly float, gold, currency, and Treasury balances, and other accounts at the Federal Reserve.

In effect, the Federal Reserve creates or depletes reserves to offset technical and seasonal changes in supplies or requirements. However, as indicated by the second column of the table, in many weeks shifts in reserves do take place simply as a result of misses in estimating what technical as well as seasonal movements are occurring. This column is an indication of the difference between the final reported net movements in reserves and those expected when open market operations ended for the week. The figure for all three periods is the same on the assumption that only the increases in the final week of a period will influence that period's results.

Most of the changes in the technical factors and for the Treasury's balances at the Federal Reserve can be considered as exogenous, i.e., determined outside the system. While some movements might be controlled, it is normally considered more efficient to offset them. As an example, and as noted, the size of Treasury balances at member banks varies widely from week to week. While efforts are made to minimize certain types of reserve impacts of these movements, the totals still remain large. They are a major cause of week-to-week variations in the money supply as funds move back and forth from private deposits to the Treasury.

The utilization of the remaining reserves to meet the requirements for newly expanded time deposits, against currency, against demand deposits, or held as excesses depends primarily upon portfolio balancing decisions of the banks and the public. The equilibrium from these decisions is clearly influenced by the Federal Reserve. Equilibrium,

however, may never be exactly reached and it may take a considerable time before changes in demand schedules work themselves out.

On any given day, banks stay almost completely loaned up. The individual bank, particularly the large money market banks, can vary their loans and investments rapidly, with small costs and within wide limits. Thus, day-to-day changes in bank reserves tend to show up almost immediately as changes in demand deposits and the narrowly defined money supply.

We note from Table 1 that on the average in this three-year period, the money supply increased by $150 million a week. The range of weekly changes was, however, nearly $10 billion. If we look at the mean or average deviations over the period, we note that the movement in any given week was likely to vary from the average by $1.6 billion, or by more than one thousand per cent. As we move to the 4-week (month) and 13-week (quarter) figures, we see that the amount of deviations around the average change do not alter greatly. On the other hand, the longer the period, the larger the growth in the money supply. As a result, the relative deviations decrease steadily.

When we look across the table, we see that in a single week it would be difficult to predict what factors would accompany a change in the money supply. While they do not vary quite as much as the money supply, the weekly movements of all of these factors except for time deposits tend to be several hundred per cent as large as the average change in the money supply. In many weeks, of course, these other forces fall randomly around zero. Thus, their impact on changes in the money supply in some weeks will net out.

When we look at the data for a month, we see the effect of the fact that insofar as these movements are random the average of their deviations does not increase. Some of the factors are not random though. An obvious example is excess reserves. These may be relatively large in a one-week period, but banks are able to bring them closer to zero as they have time to average several weeks. On the other hand, seasonal forces and government deposits at member banks seem to vary as much or more by months as by weeks.

Finally, over a quarter most of the noise has worked itself out of the system. The average change in the money supply, since it has a positive weekly growth, is comparatively larger. In this longer period, the change in government deposits has, with the exception of demand deposits, the largest relative fluctuations. Time deposits have a somewhat greater absolute movement, but related to their size they move far less. Their total reserve impact is considerably smaller.

Finally, let us look at the last two columns. The first shows movements in the amount of reserves furnished to take care of seasonal demands for credit. These seasonal movements exist strongly in private deposits. They are even greater in the government deposits. There is also a minor seasonal in time deposits.

The final column shows the changes in the seasonally adjusted bank credit proxy. 1/ While the growth in deposits subject to reserves

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1/ The bank credit proxy is the sum of the deposit liabilities of member banks subject to reserve requirements. Changes in it for short periods are highly correlated with changes in bank assets. Its values and those for changes in required reserves are developed simultaneously. It is the most easily estimated of the monetary aggregates and has far less "noise" than most of the others.

is more than twice as large as is that for the money supply, it has a good deal more stability. For example, the standard deviations for the weekly changes in the credit proxy (not seasonally adjusted) is less than two-thirds that for the money supply. Its relative average weekly deviation is only about one-third as great.

For the seasonally adjusted series shown in the table its deviations are still less. Of course, somewhat similar relative improvements would also be shown if the seasonally adjusted money supply were included in the table. We see in Table 2 that its absolute deviations are only about three-quarters of that for the money supply. In terms of its own relative size, the deviations are only about one-quarter as great.

It is probable that some trade-offs would be possible which would reduce the present fluctuations in the narrowly defined money supply at the expense of the more broadly defined money supply--which the bank credit proxy is frequently considered to be. It would, however, require a new type of operations, and new markets and institutions. Whether or not such a trade-off would be worthwhile is not at all obvious. On the opposite side, the fact that the seasonal and irregular movements in the money supply are so great does not, of course, mean that it is either necessary or worthwhile for the Federal Reserve to offset them. As pointed out initially, both of these are problems for cost-benefit analysis.

The data do, however, indicate that in any attempt to control the money supply closely and directly through altering the rate of reserve creation, a great deal of the effort would be spent in trying

to offset noise or irregular movements. At the same time, if reserves were allowed to change only in accordance with the small changes required for additions to the money supply, the financial markets would have to absorb all of the other forces removing or releasing reserves. This would cause interest rates to fluctuate widely. I know of no studies which attempt to measure the gains or losses from such a policy probably because most monetary theorists agree it would not be a logical or sound endeavor.

The Federal Reserve Money Market Strategy

It is also clear that as a matter of fact the Federal Reserve does not attempt to increase the money supply by a given amount in any period through furnishing a fixed amount of reserves on the assumption that they would be multiplied to result in a given increase in money. (The multiplier it is recognized would not be a constant but would vary from period to period depending on relative interest rates and the actions of groups other than the monetary authorities. Sophisticated advocates of a policy based on highly controlled reserve generation recognize that monetary action must also be taken either to anticipate changes in the multiplier or to determine it.)

Instead, the Federal Reserve follows what has been termed a money market strategy:[2/]

2/ For those interested in more detailed statements of some of the concepts and problems, cf., J. M. Guttentag, "The Strategy of Open Market Operations," Quarterly Journal of Economics, Vol. LXXX, No. 1 (February 1966), pp. 1-38; and P. H. Hendershott, The Neutralized Money Stock (Homewood, Illinois:Richard D. Irwin, Inc., 1968), 159 pp.
(Footnote 2 continued on next page.)

1. The operational directives of the Open Market Committee specify alterations in the margin between required reserves and the amount of reserves furnished by the System. These margins are considered significant in their direct impact on bank operations, but probably more important, they influence the interest rates on money market instruments.

2. The amount of marginal reserves to be furnished and the money market rates sought are picked so as to influence the direction and rate of change of a more remote intermediate monetary variable.

3. The desired rate of change in the intermediate monetary variable is that judged to be the most effective in aiding the economy to move toward its ultimate optimum goals.

A possible side advantage of this strategy is that it can be followed even though it might be impossible to get agreement among the members of the FOMC either as to ultimate goals, or to the form or level of an intermediate monetary variable, or as to how to define what strategy is being followed.

Each decision-maker may believe one or the other of the following types of variables is most significant at a given time:

Intermediate Monetary Variables

(1) Monetary or credit aggregates such as: the money supply narrowly or broadly defined; deposits of financial institutions; member bank liabilities or credit; broader concepts of credit flows, liquid assets, wealth, and lending.

2/ (Continued) The present discussion is my personal construct. As indicated in the text, many and even most members of the FOMC might disagree with my construct. They would build an entirely different one of their own to express their view of what are obviously identical operations.

(2) Relative and absolute real or nominal interest rates.

(3) The general atmosphere of the credit markets and banking as reflected in expectations; demand for credit; the amount of credit being supplied; rates of change.

Because significant relationships exist among all these variables, influencing one will move others in the same direction although not necessarily to the same degree. As a result, if there is an agreement as to the operational variables the manager is directed to follow, there need be no meeting of minds with respect to which intermediate monetary variables should be controlled or as to the proper degree of control.

The movements of these intermediate variables can be influenced by a change in the level of any of the policy instrument variables within the power of the Fed. These are primarily:

Policy Instrument Variables

(1) The purchase or sale of open market securities.

(2) Repurchase agreements on securities.

(3) The discount rate.

(4) Regulation Q ceilings.

(5) Required reserve ratios.

A change in an instrument variable reacts with other forces in the credit markets and the economy to shift the demand and supply for funds. At each Open Market meeting, estimates are made as to the effect changes in particular instrument variables will have on those money market variables which respond most clearly to Federal Reserve policy, namely:

Money Market Variables

(1) Borrowings of member banks from the Federal Reserve.

(2) Net free reserves.

(3) The Federal funds rate.

(4) Call money rates to government bond dealers.

(5) The three-month bill rate.

The expected movements in the money market variables are accompanied by estimates of growth in the intermediate monetary variables. Each possible setting of the money market variables, given the projected state of the economy, the banking system, Treasury operations, etc., is expected to lead to a unique growth rate for an intermediate monetary variable.

Debates may occur with respect to desired goals; desired movements of the intermediate financial variables; the importance of specific instrument variables; or as to the correctness or errors in the judgment models--which are used to estimate changes in the economy, as well as the changes in the intermediate variables, and the money market results of shifting the instrument variables.

All these considerations are summed up when the manager of the Open Market Account is instructed to buy or sell securities in order to achieve specific (within a range) values for the money market variables. The manager of the Account operates in the securities markets accordingly. At times, because of outside influences, the specified relationships for all variables cannot be achieved simultaneously. When this occurs, the manager uses his discretion in an attempt to achieve

those settings which he believes are most consistent with the goals of the Committee.

This intent to control intermediate monetary variables through the money market variables is shown by the inclusion in most directives of a proviso clause. The manager is provided the growth rate for the bank credit proxy (within a range) expected to result from the directed settings of the money market variables. If the proxy moves outside the projected limits, he is instructed to operate in the open market so as to alter the money market variables in order to influence the credit proxy toward its projected path. The proviso clause is an attempt to correct for errors which may arise if the relationships among the money market variables and the intermediate monetary variables have not been projected correctly, or if errors were made in projecting the other financial and economic variables which also influence the proxy's growth.

This picture of operations can be expressed symbolically:

Where:
- IMV = Intermediate monetary variable
- R_b = Borrowed reserves
- R_f = Free reserves
- Q = Q ceiling
- r_b = Treasury bill rate
- r_f = Federal funds rate
- r_c = Call money rate to dealers
- GNP = Economic activity
- L = Liquidity preference of corporations, banks, financial institutions, etc.
- T = Treasury cash management
- r_d = Discount rate
- RR = Required reserves
- S = Open Market operations

Then:

$$\Delta \text{ IMV} = M (R_b, R_F, Q, r_b, r_f, r_c, \text{GNP}, L, T) \qquad (1.0)$$

$$r_b; r_f; r_c = r (r_d, R_b, R_F, \text{GNP}, L, T) \qquad (2.0)$$

The change in the intermediate monetary variable, however defined, is determined by the interaction of the Federal Reserve controlled variables, certain money market rates strongly influenced by the Federal Reserve, changes in output and prices; movements in the financial sector and liquidity functions; and the Treasury as in (1.0).

The Federal Reserve action may influence directly the IMV. It also will influence money market rates as in (2.0).

$$\Delta RR_{T+2} = \Delta IMV \qquad (3.0)$$

$$R_b, R_f = R(\Delta RR, S) \qquad (4.0)$$

The change in the intermediate monetary variable approximately determines the change in required reserves two weeks later (3.0). Given the change in required reserves, the manager of the Open Market Account can (within the limits of his operating misses) determine exactly the level of net free reserves (4.0). The banking system, given a level of net free reserves, determines its own level of borrowings and excess reserves simultaneously.

When the manager is directed to influence the money market variables and through them intermediate monetary variables, he cannot at the same time control the changes in total reserves. Most reserves additions will follow directly from the previous changes in the IMV (credit proxy). The manager will operate so as to furnish slightly more or less than the change in required reserves (4.0) so as to interact with the market (2.0) to obtain the settings he is attempting to achieve. This means in most cases, he will furnish most (say, 90 per cent or more) of the changes in required reserves which have been previously determined by the various market interactions.

An Elastic Currency

It is now possible to restate one logical reason for following the money market strategy. We saw how great are the misses, the random movements, and the influence of other forces on reserves when compared to the changes required for growth in the narrowly defined money supply. If one attempted to increase reserves according to an exact schedule, the market would have to shift rapidly in order to accommodate seasonal forces, errors in operation, Treasury cash operations, and the type of irregular movements which the Federal Reserve now accommodates.

An attempt to control growth in the money supply directly through controlling the amount of reserves created runs into the difficulty that in any quantity-price relationship if one controls the quantity tightly the price must be allowed to move freely and through an extremely wide range. In addition to many other considerations, the problem would have to be faced of what costs and what structural changes the economy would experience if interest rates fluctuated widely as the result of an attempt to control directly a single use of monetary reserves.

Our financial structure and capital markets are extremely well developed and efficient. The amount of funds bought and sold in our money markets averages well over 10 to 12 billion dollars per day. The amount of money raised on a gross basis by the economy totals over $600 billion for maturities of under one year and over $220 billion with maturities of over a year each year. In such a system, major advantages result if the monetary aggregates react flexibly to absorb the daily, weekly, and monthly seasonals, shock, and other irregular forces.

This need for flexible reactions in the monetary aggregates was a major factor in the formation of the Federal Reserve. It has always been a central interest in its operations. The need for such flexibility may be greater today than in the past. Our capital markets operate with an extremely low ratio of equity capital. We have developed highly specialized financing institutions and techniques. The underwriting of our public debt is done at extremely low margins. These are possible because the market does not have to shoulder the risks of widely fluctuating interest rates from irregular short-term movements. The additional reserves created to satisfy the purely seasonal or irregular demands for short-term funds disappear quite rapidly. They influence total demand or the supply and demand equilibrium for financial funds only slightly. It is not evident why one should want rates in the money markets to fluctuate in response to their movements.

Most decision models and loss functions would, I believe, show that beyond certain limits it is highly advantageous for the Government to assume the risks from irregular movements. The position of these limits will depend at any time on the ability of the private sector to assume such risks, on the shape of loss functions, on the variance of movements and similar matters.