# *Monetary Velocity in Empirical Analysis*

PAUL S. ANDERSON

The primary purpose of this paper is to focus attention on the substantial changes which have occurred in monetary velocity in the past. Velocity changes have tended to be overlooked in most current discussion concerning the relative importance of quantity. A secondary purpose here is to investigate some analytical approaches to understanding past velocity trends so that further movements might be anticipated to some extent.

According to Harry Johnson's review of "Monetary Theory and Policy" in the *American Economic Review* in 1962 [V], the reason why the Quantity Theory was totally rejected after the 1920's was that velocity declined so drastically and unexpectedly. Quantity and velocity are like the two sides of a coin; and, if velocity is erratic or undependable, quantity is given up as hopeless.

## *The St. Louis Equation*

We can use the St. Louis GNP predicting equation of Andersen and Jordan as a current illustration of the dependence of the Quantity Theory on stable or cooperative velocity [I]. Admittedly this is somewhat unfair since the aim of that equation was to compare the relative impacts of monetary and fiscal actions on GNP. But it apparently has turned out to be a rather good predicting equation, and this has tended to give it both popularity and validity.

The prediction results of the equations are presented in Chart 1, and they are impressive: The visual association between the predicted and actual changes in GNP is more striking than the $R^2$ of .63. Even when the prediction is in error, it appears to be pointing out quite accurately the short-term trend. One would not have thought that changes in the quantity of money would forecast so well the future

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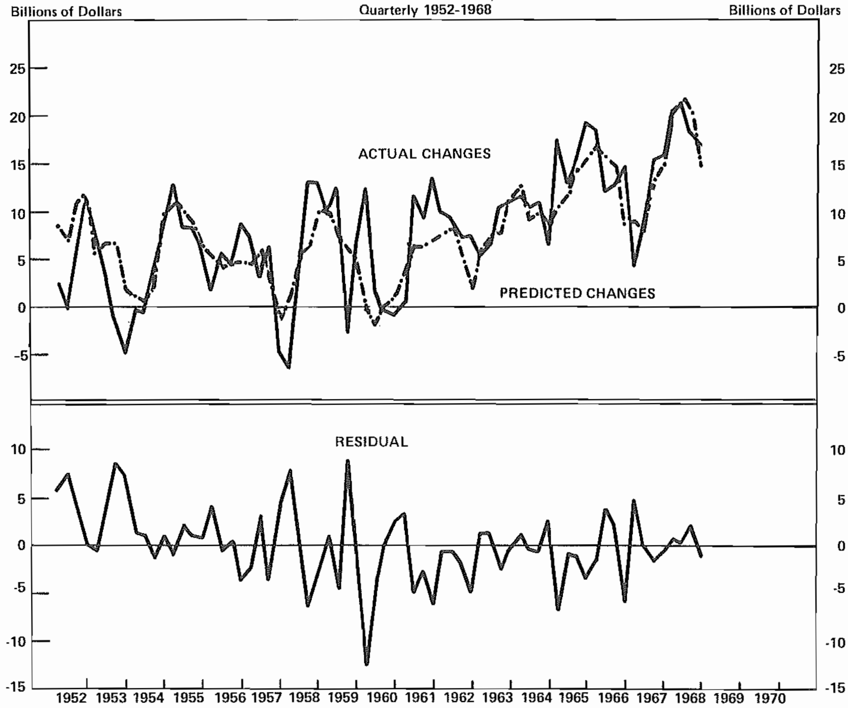
CHART I

'ST. LOUIS' GNP PREDICTING EQUATION

Quarterly 1952-1968




## NOTES TO CHART I

Predicted values are based on the coefficients of equation 1.3[r] in the Federal Reserve Bank of St. Louis November 1968 Review, revised to include data through the fourth quarter 1968 as shown below:

| Quarter | t | t-1 | t-2 | t-3 | Sum | Constant | $R^2$ | S.E. | D.W. |
|---|---|---|---|---|---|---|---|---|---|
| $\Delta M$ | 1.49 | 1.56 | 1.45 | 1.26 | 5.77 | 2.35 | | | |
| | (2.49) | (3.54) | (3.33) | (1.97) | (7.58) | (2.94) | .63 | 3.95 | 1.78 |
| $\Delta E^*$ | .41 | .51 | -.05 | -.71 | .16 | | | | |
| | (1.60) | (2.60) | (-.26) | (-2.81) | (.51) | | | | |

r: Quarterly data from I/1952-IV1968.

E*: Gramlich weighted high-employment series.

NOTE: Change in GNP/Change in E*, Change in M, First Differences, 4th degree current and 3 lags.

course of GNP. These results could easily lead to over-reliance on the ability of money to determine future changes in business activity.

So, as we admire or envy these results, we are well-warned to exercise extreme caution. On its face, the St. Louis equation implies a stable velocity for the increments of the money stock. As the history of the Quantity Theory shows, this is a dangerous assumption to make. Specifically, the equation presumes a velocity of the increments to the money stock of 5.77 times a year (this is the sum of the coefficients). Meanwhile, overall or average velocity almost doubled during this 1952 to 1968 period, going from 2.8 to 4.6. (Conceptually, the high but stable 5.77 level of incremental velocity can be reconciled with the lower but rising average velocity by assuming that 5.77 is the velocity ceiling and that actual average velocity will asymptotically approach this velocity ceiling.)

But the actual relation between the incremental and average velocities in this equation seems more complex and can be brought out by a simplified illustration. Following are hypothetical money stock and GNP data for two successive years; the values are roughly the magnitudes that prevailed in the early 1950's:

| | MONEY STOCK | VELOCITY | GNP |
|---|---|---|---|
| Year 1 | $100 | 3.00 | $300 |
| Year 2 | 102 | 3.06 | 312 |

*Components and Increments*

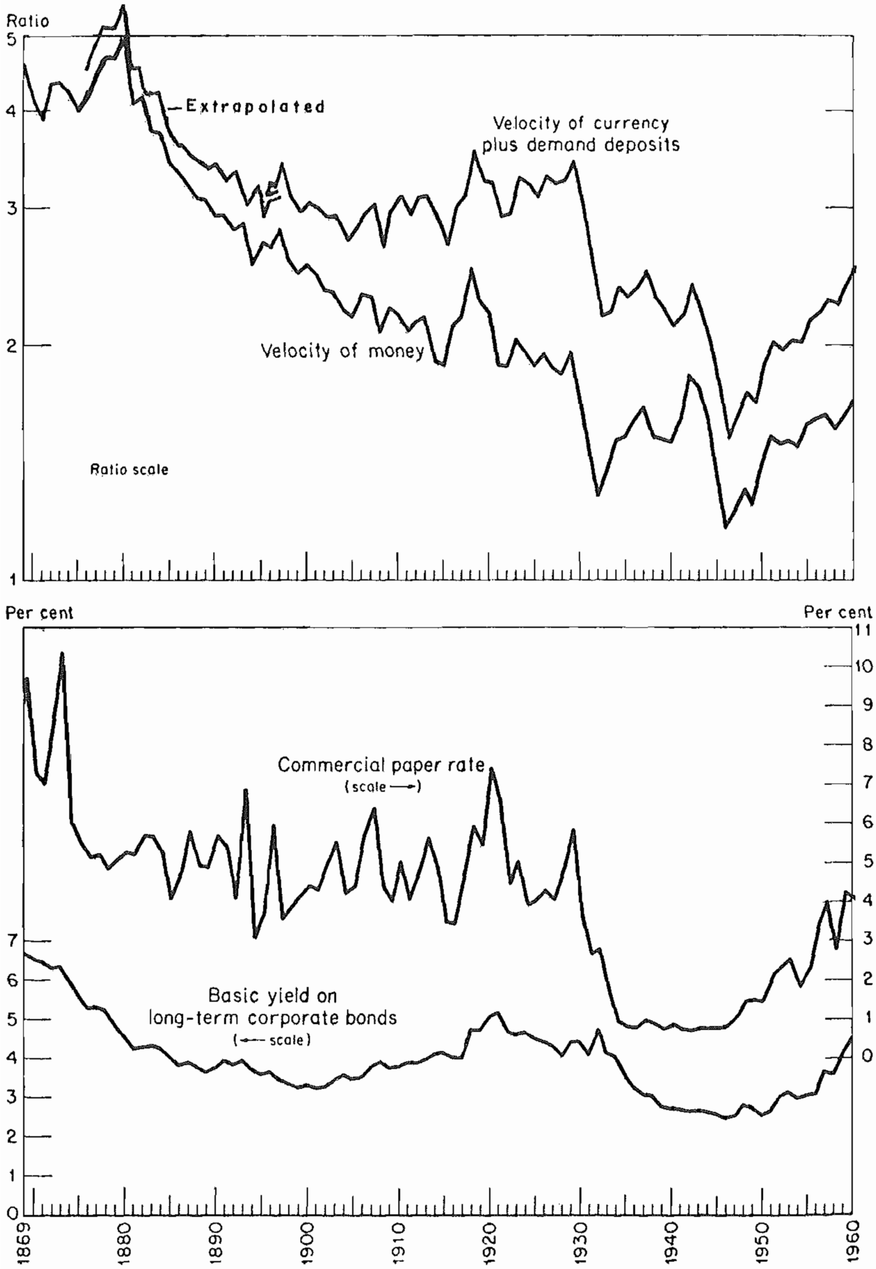
The GNP growth of $12 billion can be accounted for by two analytical procedures—by components and by increments as follows:

| | MONEY STOCK | VELOCITY | GNP |
|---|---|---|---|
| Components | 100 (old) | +.06 | +6 |
| | +2 | 3.06 | +6 |
| | | | 12 |
| Increments | +2 | 6.00 | 12 |

The St. Louis equation uses the increments explanation, according to which the entire increase in GNP is accounted for by the $2 billion increase in the money stock turning over 6 times a year. This implies that the old money stock continues to turn over only 3 times a year. It might be understandable that newly-created money is used more actively than old money. But then the implication is that, in the following Year 3, the $2 billion increment of Year 2 has a reduction in its turnover rate to 3.06 times a year, which seems implausible.

## CHART 2

Interest Rates and Two Measures of Velocity, Annually, 1869–1960




SOURCE: III, P. 640

The components method of accounting for the GNP increase appears straightforward and simple, with part accounted for by an increase in the turnover rate of the pre-existing money stock and part by the increase in the money stock which turns over at the same new, slightly higher, rate of use. This method allows for an increase in GNP even if there is no increase in the money stock. It might be notable that the biggest prediction error made by the St. Louis equation was in the first quarter of 1960 when the money stock had actually declined for several quarters.

The St. Louis equation ignores the substantial post-war change in average velocity, but that has not hurt its overall results. In times past, such neglect would have been disastrous, predictionally speaking. For example, in the 1930's, average velocity was falling, meaning that incremental velocity was below the average. On the basis of average velocity during the 1920's, the increase in the money stock from 1929 to 1939 would forecast a $30 billion growth in GNP; instead, actual current dollar GNP was $15 billion lower. Since extreme velocity changes have occurred in the past, is there any assurance they will not occur in the future?

## *Determinants of Velocity*

Quantity theorists have, of course, been concerned with velocity shifts, and they have tried to obtain some velocity determinant which would help explain the seemingly erratic shifts. We can briefly mention the two explanations which Harry Johnson noted as being rather promising. The first was Friedman's luxury-good theory, according to which the economy chooses to hold relatively more money as it grows richer [III, p. 639]. Increases in relative holdings of money leads to reduced velocity, of course. As shown in Chart 2, this explanation worked rather well up to World War I, but since then it has fared rather badly. It is generally refuted by cross-section data of individuals and businesses. It may be that the pre-World War I velocity decline actually reflected an increasing relative need for money as the market economy represented an increasing share of total production in the country.

The second school of velocity explanations that Johnson noted used the interest rate—usually a long-term corporate bond rate—as the chief determinant. What is troublesome here is that interest rates are a price, and it seems awkward to consider price as a determinant; it is usually considered a resultant. It seems to me that Meltzer, for example, took this resultant view in denying the existence of the liquidity trap during the 1930's when he attempted to demonstrate that the interest rate is driven down as velocity declines [VI].

Even though interest rates might be more suitably considered a resultant rather than any causal factor, they do serve in their resultant status as a ready indicator of changes in the general monetary environment, which changes, in turn, are associated with, or cause, velocity changes. For example, currently, eager borrowers are seeking money. By contrast, in the 1930's, we might say that redundant money was searching for users, but there were very few users. Naturally, velocity is going to behave very much differently in these two environments. The level and trend of interest rates do indicate, in at least a rough sort of way, which type prevails at any given time.

We will suggest here an alternative indicator of whether the economy is actively seeking more spendable funds or whether funds are overabundant. In addition to being an indicator, this alternative framework does have a direct operational connection to rates of spending. This approach entails an analysis of differing methods or processes of money creation.

### *Different Processes of Money Creation*

To introduce the concept of differing modes of money creation, we can go back to the situation in the early days of the Federal Reserve. The first bank reserves consisted of gold and Government money deposited at the Federal Reserve banks; but, after that, additional reserves were created by member bank discounts. In fact, from 1918 to 1920, these discounts actually exceeded total reserve balances by as much as 50 percent. After 1920, however, open market purchases of acceptances and, increasingly, Government securities became the main channel of reserve creation.

It has frequently been pointed out that in discounting the initiative is with the commercial banks, while in open market operations the initiative is with the Federal Reserve. This is an important difference; for, when commercial banks must borrow their reserves, we can be quite sure these reserves are really necessary. Conversely, when borrowed reserves become unnecessary, we can be quite sure they will be extinguished by repayment of borrowings. Thus, when all reserves are discounted reserves, their total will quite likely fluctuate pretty closely with the need for them. We can call discounted reserves internally- or endogenously-generated reserves.

Reserves supplied through open market operations are in some respects similar to, and in other respects different from, discounted reserves. Open market reserves are simply substitutes for discounted reserves during the boom phase of the cycle when commercial banks are supplementing open-market reserves with discounted reserves. But during the recession phase of the cycle, open-market reserves are unlikely to decline as rapidly as discounted reserves would have; they are inelastic on the downside with perhaps an "unneeded" amount being imposed on banks. Thus, their total level is less sensitive to fluctuations in the demand for reserves than discounted reserves. Open-market reserves might be termed externally- or exogenously-imposed reserves.

There are conceptually two types of money supplies which are analogous to endogenously-generated reserves and exogenously-imposed reserves. The first is endogenously-generated money which arises from the demands of the private sector and which leads to a demand for reserves. The second is exogenously-induced money which arises because reserves are imposed on banks, leading them to acquire assets, usually Treasury bills, and creating demand deposits in the hands of sellers. There is a formal similarity between endogenously-generated and exogenously-induced money and the Gurley-Shaw "inside and outside money" [IV]; but, as we shall see, the relative impacts or influences are almost the reverse. The first money supply category is typified by deposits arising from loans which represent an immediate need for funds. Loan deposits are "purchased" by an interest rate which normally is not an insignificant cost. They are also obtained generally through shorter-term loans which come up for reconsideration fairly often. For these reasons, there is a virtual guarantee that this type of deposit will either be used or liquidated. It lives under constant tension.

A loan deposit, generally, directly represents one step in the processes of production and distribution. Thus, it tends to be self-liquidating as the transaction it finances is completed. This is, of course, the concept encompassed in the "real bills" doctrine. Not only does a loan deposit exert a push to start a productive phase, but also it exerts a pull to complete that phase since the borrower desires to get the proceeds for repaying his loan.

The life of an induced "bill" deposit presents quite a contrast. When a Treasury bill is initially issued by the Government, the proceeds are likely to represent the ending of a cycle of production and distribution rather than the beginning. (This fact apparently has implications for equations such as the St. Louis one where Government expenditures are set as a determinant of GNP. This point is discussed later.) While the recipient of the payment financed by the bill issue could extinguish the deposit by acquiring the bill, a bank will probably bid it away if it has excess reserves. When they have excess reserves, banks have a more inelastic demand for earning assets than do other holders, such as corporations. Banks are highly leveraged, so even the low return on Treasury bills during an "easy money" period is important to them. Furthermore, they have lower acquisition costs than do other prospective holders. Therefore, when the central bank begins supplying "unneeded" reserves to the banking system, banks are almost certain to respond by acquiring short-term securities from other holders, thereby creating "bill deposits."

Once a bill deposit is created, it is almost a mathematical certainty that this deposit will gravitate to less and less active holders. The more active holders will get rid of such deposits by using them in productive or financial payments, the latter including purchases of securities from non-bank holders, prepayment of current liabilities, retirement of stock or bonds, etc. These financial transactions will eventually shift the bill deposit to a relatively inactive holder who may keep it dormant for long periods.

Regression analysis can be used to quantify the velocities of each of the two types of deposits. In the last 60 years there has been quite a bit of variation in the relative levels of each, so positive results can be expected. The general form of the resultant regression equation will have GNP as the dependent variable and the two money supplies as independent variables.

### *Difficulties in Defining the Components*

There are a number of difficulties, however, in defining each of the money components. The asset side of the aggregate balance sheet of commercial banks must be used in the differentiation; and, unfortunately, there is no direct connection between the asset side, i.e., cash assets, loans, and investments, and the liability side, i.e., demand deposits, time deposits, and capital. There is also the question of how to handle the currency component. As a first approximation, loan deposits can be represented by loans. But not all types of loans are "real bills" in character. Real estate mortgage loans, for example, are mainly long-term. Furthermore, they are usually associated with time, rather than demand, deposits. Interbank loans should not be used as measures of loan deposit money since interbank deposits are not part of the money supply. Other types of loans probably should also be excluded. But, before 1939, the only loan breakdowns available are for real estate, collateral, and all other. Therefore, up to 1960, only real estate loans were excluded in arriving at loans which represent "real bills" deposits. Since 1961, business loans, expanded to the level of non-real estate loans, were used as the loan proxy. Such loans can be taken as a proxy for the series that is desired.

Another problem is the fact that, in certain years before 1931, total loans less real estate loans exceeded the money supply. This meant that some of these included loans were offset by time deposits or capital accounts (in addition to the currency component). The maximum discrepancy occurred in 1930 when the money supply equalled 88 percent of included loans. To take account of this discrepancy, included loans were reduced by 12 percent to give "loan-money" loans.

The currency component of the money supply was handled the same way as demand deposits because currency usually gets into the hands of the public through a debit to some demand deposit. Conceptually, it seems preferable to have ignored currency in this framework, but the statistical results would then not have been as good.

### *Statistical Results of Quantitative Velocity*

The regression results are presented in Table I. The first section uses the conventional money supply as the money stock, while the second uses the "Boston Supply," i.e., published money supply plus Treasury deposits at commercial and Federal Reserve banks. As noted elsewhere [II], when total GNP is associated with a money stock, the proper money stock should include Government working balances. The statistical results of the two versions are practically the same in most cases. Income velocity of loan money generally averages in the 3.5-4.5 times a year range, while that of bill money averages around 1.0-1.5. Most coefficients are highly significant.

One interesting by-product of the statistical investigations of the period since 1911 was a finding with regard to deficit financing. Gross Federal debt was inserted as an independent variable, and its coefficient turned out negative and almost significantly so when it

## TABLE I

## COEFFICIENTS OF GNP REGRESSION EQUATION 1911-1968

| Data form | Constant | Loan money | Bill money | Federal debt (inT+1) | Time | $R^2$ (corrected) | S.E. | D.W. |
|---|---|---|---|---|---|---|---|---|
| | | | Money Stock = Conventional Definition | | | | | |
| Level | 23.1 (1.9) | 5.8 (22.2) | | | | .8956 | 61.8 | .08 |
| Level | -15.7 (5.0) | 5.0 (74.3) | 1.9 (30.1) | | | .9940 | 14.8 | .51 |
| Level | -9.6 (2.5) | 4.5 (21.4) | 1.1 (3.8) | 0.3 (2.5) | | .9946 | 14.1 | .50 |
| Level | -18.0 (3.3 | 4.3 (18.8) | 0.9 (2.8) | 0.3 (2.7) | 0.7 (2.1) | .9949 | 13.7 | .52 |
| Annual Change | 5.4 (3.2) | 2.9 (9.1) | | | | .5884 | 11.2 | 1.39 |
| Annual Change | 2.2 (1.3) | 4.0 (10.3) | 1.4 (4.1) | | | .6799 | 9.8 | 1.49 |
| Annual Change | 1.9 (1.2) | 3.5 (8.8) | 0.7 (1.7) | 0.3 (2.9) | | .7182 | 9.2 | 1.69 |
| Annual Change | -2.1 (0.8) | 3.1 (6.6) | 0.6 (1.5) | 0.3 (2.7) | 0.2 (1.7) | .7280 | 9.1 | 1.82 |
| | | | Money Stock = Conventional Definition Plus Treasury Operating Balances | | | | | |
| Level | 23.1 (1.9) | 5.8 (22.2) | | | | .8956 | 61.8 | .08 |
| Level | -15.1 (5.1) | 5.0 (73.5) | 1.7 (29.9) | | | .9939 | 14.9 | .56 |
| Level | -11.6 (2.2) | 4.7 (14.0) | 1.2 (2.7) | 0.2 (1.1) | | .9940 | 14.9 | .53 |
| Level | -19.4 (3.2) | 4.3 (11.8) | 0.8 (1.6) | 0.3 (1.6) | 0.8 (2.3) | .9944 | 14.3 | .53 |
| Annual Change | 5.4 (3.2) | 2.9 (9.1) | | | | .5884 | 11.2 | 1.39 |
| Annual Change | 2.9 (1.8) | 3.7 (10.7) | 1.0 (4.0) | | | .6756 | 9.9 | 1.58 |
| Annual Change | 2.6 (1.7) | 3.1 (7.7) | 0.2 (0.5) | 0.4 (2.4) | | .7039 | 9.5 | 1.80 |
| Annual Change | -2.0 (0.7) | 2.7 (6.0) | 0.2 (0.4) | 0.3 (2.3) | 0.2 (1.9) | .7180 | 9.2 | 1.93 |

NOTE: Money and debt data as of June 30. Loan money equals .88 X total loans other was concurrent with or leading GNP. But it had a significant, positive coefficient when it followed GNP by one, or even two, years. As shown in the table, insertion of the debt variable reduced the coefficients of the two money stocks significantly. In fact, in the annual change equations, it reduced the coefficient of bill money to below the 5 percent level of significance. These results seem to indicate that the money stock does pick up the impact of the deficit on a concurrent basis because actual governmental expenditure seems to occur after the activity it generated has been completed. This, incidentally, is consistent with the finding that bill money has a low income velocity since, once the Treasury bill is issued to pay for the obligation incurred, the activity represented by the obligation has been completed. The time coefficient is positive in both equations, supporting the Fisherian expectation of a slowly rising velocity trend—although it may also reflect structural changes in the economy such as the decline of agriculture.

### *Higher Use Rate for Loan Money*

Thus, experience over the period 1911 to 1968 does support quite strongly the notion that loan money has a substantially higher use-rate than bill money. Two bits of evidence are especially noteworthy. The first is that the velocity estimates secured by the level and the incremental equations are quite similar—which, I think, is a rather strong indication of basic stability of the estimates. The second, as may be seen from Chart 3, is the fact that the estimate based on the proportions of the two types of money traced the velocity decline after 1929 rather well. The use of bond rates as a velocity indicator would lead to an estimate of 1932 velocity, for example, which would be higher than the level for 1928 and 1929. The two-money estimate does tend to lag actual velocity, however. This lag will be discussed later.

A crucial test of the coefficients or velocities of the two types of money is provided by computing regressions for the post-war period. Both the monetary and general economic environments since World War II have been markedly different from the preceding four decades, and it would not be surprising if the velocity coefficients were also quite different. As shown in Table II, the quarterly *level* equations for the 1952-1968 period are quite erratic with their large negative constants, but the coefficients in the quarterly change equations have about the same comparative values as in the long-term equations. Use of the conventional money supply yields somewhat higher correlations and t-values than use of the Boston Supply. This apparently reflects the fact that Treasury balances are rather erratic over the shorter term.

Since the two-type money equation performs reasonably well in the post-war period, it is interesting to see how well it compares with the St. Louis equation as a predictor of GNP. Preliminary results (final Almon lag computations have not been made) indicate that the two-type money equation with the same lag structure predicts about as well, perhaps a little better, than the St. Louis equation.

Comparison with the St. Louis equation brings out some of the characteristics of the two types of money. Most important—and unfortunately from the point of view of prediction—loan money is not much of a leading indicator. In a four-quarter lag equation, the current and T-1 quarters carry 60 percent of the sum of the coefficients. By contrast, in the case of bill money, the current and T-1 quarters carry only 40 percent of the sum. Loan money correlates substantially better with GNP when it follows GNP, which

CHART 3

ACTUAL AND ESTIMATED INCOME VELOCITY, 1911 - 1968

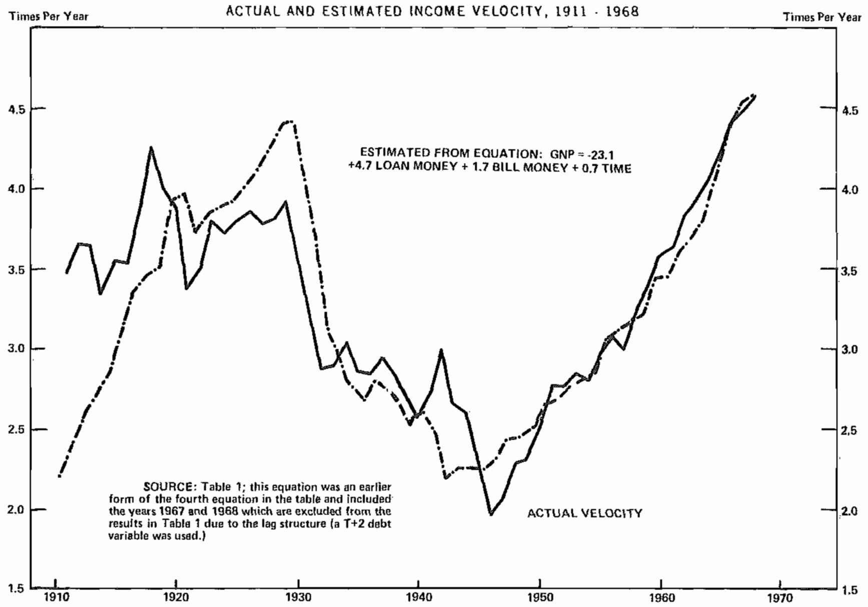


TABLE II

COEFFICIENTS FOR GNP REGRESSION EQUATION
QUARTERLY DATA, 1952-1968

| Data Form | Constant | Loan Money | Bill Money | $R^2$ | S.E. | D.W. |
|---|---|---|---|---|---|---|
| Money Stock = Conventional Definition Plus Treasury Cash Balances | | | | | | |
| Level | -549.7 (6.5) | 8.5 (61.1) | 6.5 (8.5) | .9883 | 16.4 | .23 |
| Quarterly Change | 3.2 (3.4) | 4.8 (7.1) | 1.3 (2.5) | .4612 | 4.9 | 1.34 |
| Money Stock = Conventional Definition | | | | | | |
| Level | -428.3 (3.6) | 8.4 (40.7) | 5.7 (5.1) | .9829 | 20.0 | .07 |
| Quarterly Change | 2.5 (3.0) | 5.6 (8.8) | 2.6 (4.6) | .5617 | 4.4 | 1.29 |

NOTE: Loan money in these equations is taken as total business loans at commercial banks.

means that GNP has a stronger influence on loan money than vice versa. Again by contrast, the correlation between bill money following GNP and GNP is negative.

Before turning to some of the policy implications of the two-type money theory, a warning is in order. Loan money may simply be a rather sensitive business cycle indicator, and thus its movements may only be *associated* with changes in spending and GNP rather than being a central part of the mechanism by which these spending changes are accomplished. Of course, while loan changes *are* a rather good cycle indicator, they also do seem to be a handy vehicle through which the economy can economize on the amount of money by facilitating rapid shifts of funds from one user to another and thus insuring that spending capacity is fully utilized.

## *Policy Implications of the Two-Type Money Theory*

The two-type money theory has different implications for recessions and booms. During recessions, the Federal Reserve can induce an increase in bill money, but the problem is that such an increase might simply replace loan money at a three-to-one ratio, leaving total expenditures unchanged. It hardly seems likely that a bill holder, like a corporation holding bills for tax payments, will be persuaded to spend just because commercial banks bid bill yields so low that the corporate treasurer did not find it worthwhile to enter the bill auction. It appears quite extreme to assume that a corporation will decide to build a new plant or enlarge inventories just because bill yields fall from, say, two to one percent, and it surrenders its bill holdings for cash.

As to boom implications, the two-type money theory traces out how inflation can be fed even if the money stock rises more slowly than real output—which has been precisely the case since 1964. But since 1964, the proportion of loan money has risen from 63 to 90 percent of the total. With a 2.5-to-1.0 velocity ratio, predicted overall average velocity rises a little over half as much as the percentage point rise in the loan money proportion, so over the 1964-68 period, the prediction was for a 17 percent rise. Actual average velocity rose over 13 percent, or about 3 percent per year. This has also been the inflation rate over that time. Thus, the inflation since 1964 can be accounted for entirely by velocity rises.

Since the loan money proportion is now around 90 percent, there may be some hope that not much potential exists for further rises in velocity. Specifically, since the loan money proportion can only rise 10 more percentage points, only a 5 percent further rise in velocity is indicated. Of course, there may be a basic upward time trend in velocity, but this appears to be a rather small influence. It is encouraging to note that average velocity has risen less than 3 percent over the past four quarters even though interest rates have risen to unbelievable levels.

To conclude, the primary purpose of this paper has been to focus attention on velocity. When actual and potential velocity changes are ignored, the importance of the quantity of the money stock also tends to be downgraded, if not ignored. With regard to monetary policy implications, velocity changes have tended to be quite perverse and have served to blunt the effectiveness of policy. During recessions, induced increases in the money stock have been largely dissipated in decreased velocity. But during the boom when restraint is desired, the potential that was built up by velocity declines during the recession begins to surface, and even drastic limitation of monetary growth does not halt inflation.

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# DISCUSSION

LEONALL C. ANDERSEN

Paul Anderson concludes that, "Velocity changes have tended to be quite perverse and have served to blunt the effectiveness of monetary policy." He argues that the influence of a change in the money stock on GNP is largely dissipated by offsetting changes in velocity. This contention is used to question the usefulness of the reduced-form equation developed by Jordan and myself relating changes in GNP to current and lagged changes in money and Federal Government expenditures.

Anderson bases his argument on the point of view that the response of GNP to changes in the money stock depends on whether this change is accompanied by a similar change in bank loans or by a change in bank investments. An increase in what he calls "loan money" increases velocity more than an increase in "bill money." The first is used to purchase goods and services while the latter is not. During a recession, an increase in money is more likely to be reflected in a rise in bill money, thereby lowering velocity; and in a boom it is more likely to be reflected in a rise in loan money, resulting in a rise in velocity.

I find his study interesting and suggestive of an important consideration for monetary policy decisions based on controlling movements in the money stock. However, I do have reservations about some of the underlying assumptions and the conclusions. He assumes a distinction in terms of the influence on velocity between changes in bank deposits which are accompanied by changes in loans and those accompanied by changes in investments; and he further assumes that this distinction is maintained as the deposits are used for transactions. Such a distinction may be true at the time of the first transaction between the bank and the borrower, but I believe that the distinction becomes quickly blurred beyond this first transaction. I am not convinced by the statement, "Once a bill deposit is created, it is almost a mathematical certainty that this deposit will gravitate to less and less active holders."

Assertions of such distinctions show up frequently in monetary

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literature. For example, many postulate that an increase in nonborrowed reserves will have a greater influence on bank credit expansion than a similar increase in borrowings from Reserve Banks. This may be true for the first bank; but, when deposits move to another bank, it is impossible for that bank to distinguish the accompanying increase in its reserve account from nonborrowed or borrowed sources. This latter bank responds to an increase in its total reserves.

Anderson relies on the "accommodation principle" of bank behavior to support his argument that an increase in loan money will have a greater influence on spending than an increase in bill money. This principle postulates that banks will always accommodate a rise in loan demand by reducing excess reserves and holdings of investments and by increased borrowing from Reserve Banks. A decrease in loan demand has an opposite response.

This view of bank behavior is different from that of the portfolio approach, which is based on the "profit-maximization principle." According to this principle, bank behavior regarding the composition of their earning assets between loans and investments, their holdings of excess reserves, and their borrowings from Reserve Banks is based on alternative yields and costs.

Albert Burger and I tested these two hypothesized principles of bank behavior in a paper presented at last winter's meeting of the American Finance Association. We were led to reject the accommodation principle. Bank response to interest rates was consistent with the profit-maximization principle and not with the accommodation principle. Moreover, GNP was found not to influence behavior regarding borrowings from Reserve Banks and loan behavior, and it was related to excess reserves in a negative manner, contrary to accommodating behavior. This evidence leads me to doubt the validity of the key point of Anderson's analysis.

It is still possible that changes in money will result in offsetting movements in velocity. One frequently made argument is that an increase in money will lower interest rates, thereby decreasing velocity because of an increase in the demand for money. I argue that this would be temporary. As Cagan reported at last winter's meeting of the American Finance Association, interest rates decrease for about two quarters after an increase in money, but then begin to rise. If the demand for money responds to interest rates, then velocity would begin to rise after the initial decrease in interest rates following an increase in money.

A change in money could also result in a brief offsetting movement in velocity, even if the demand for money did not respond to interest rates. If money influences GNP with a lag distributed over time, then a decrease in the rate of monetary expansion would necessarily result in a rise in velocity, but only for a short period, because GNP would temporarily continue to rise in response to the previous, more rapid rate of monetary expansion. The shorter the lagged response of GNP to changes in money, the briefer will be the period, and the smaller would be the amount of the rise in velocity.

The hypothesis that changes in money are associated with offsetting changes in velocity may be tested by regressing changes in velocity on current and lagged changes in money (narrowly defined). Anderson's hypothesis that changes in loan money relative to bill money is associated with offsetting movements in velocity may be tested by regressing changes in velocity on current and lagged changes in the ratio of loans to bank credit. The accompanying table reports the results of regressing changes in velocity on both of these variables included in the same regression.

**Regression Coefficients of Changes in Velocity on Current and Lagged**

| | Change in Money Stock | | Change in Loan/Bank Credit Ratio |
|---|---|---|---|
| t | -0.01455*<br>(2.70) | | 2.65773<br>(2.98) |
| t-1 | 0.00639<br>(0.91) | | -2.33197*<br>(1.96) |
| t-2 | 0.00089<br>(0.11) | | -0.48525<br>(0.49) |
| t-3 | 0.01014<br>(1.54) | | 0.37452<br>(0.47) |
| Sum | +0.00298 | | +0.21503 |
| Constant | | 0.02543 | |
| $R^2$ | | .37 | |
| S.E. | | 0.02856 | |
| D.W. | | 1.52 | |

1953-I - 1969-I Ordinary Least Squares

This regression supports both views as well as supporting my argument that the induced changes in velocity will be brief. With the loan-to-bank credit ratio constant, velocity is negatively related to the current quarter change in money, but positively in succeeding quarters. The over-all response of velocity to a change in money is small, as measured by the sum of the coefficients. With money held constant, the response of velocity to a change in the loan-to-bank credit ratio is positive, as postulated by Anderson, in the contemporaneous quarter, but it is virtually offset in the following quarter.

In conclusion, these induced changes in velocity do not support the view that they are of such a nature as to negate the usefulness of money in economic stabilization. The offsetting movements in velocity are short-lived, with velocity moving back to its trend growth after the first quarter. If the rate of monetary expansion is changed infrequently, these velocity problems are of little importance for basing monetary policy on growth of the money stock.

My analysis has been limited to the past 15 years; I have not considered the broad sweep of history as did Anderson. Consequently, I have no evidence regarding abnormal situations such as those of the 1930's. However, I believe that the more recent experience has greater relevance for testing hypotheses which can be used for contemporary monetary management.