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Interpretation of a Regularity in the Behavior of M_2

THE OBJECTIVE of this paper is to fit the horizontal trend in "M_2 velocity," observed for about a decade and a half, into a somewhat broader framework in which the regularity falls in place. The behavior of income velocity—or of its reciprocal, which expresses money holdings per unit of income—is important because it discloses the money demand corresponding to alternative levels of money income. Appraising this relationship is necessary to devising a rational macro policy.

Though our notion of a broader framework is modest, it nevertheless includes the broadest money-supply aggregates (M);[1] and because it includes interest rates, it will also give a window toward other assets. Awareness of the regularity we discuss is not a substitute for more complex methods of appraising the probable course of events. "Judgmental" elements must be allowed to enter into these projections regardless of approach, and no case can be made for projecting trends mechanically. However, because the regularity we discuss has been consistent for well over

1. A satisfactory definition of M_1 is currency outside the banks and the Treasury plus demand deposits (checking deposits) other than those of the U.S. government and interbank; M_2 is M_1 plus time deposits and savings accounts in commercial banks other than negotiable certificates of deposit of $100,000 or more; M_3 is M_2 plus deposits in thrift institutions (savings and loan associations, mutual savings banks, and credit unions); M_4 (which will not be used in this paper) is M_2 plus the large negotiable CDs; M_5 is M_3 plus the large negotiable CDs.

a decade and can be interpreted reasonably, there is no justification for overlooking it.

In brief, during the past quarter-century, the broadest M categories—M_3 and M_5, both of which contain major interest-yielding components that cannot be used directly as means of payments—have so far behaved as "luxury goods": their ratio to the gross national product has been rising with the real GNP of the American economy. In cross-sections, this phenomenon would not necessarily be reflected *throughout* the income scale.[2]

Within the more inclusive categories of M, the ratio of the higher- to the lower-yielding components has risen since World War II. The growth rate of the ratio of the non-M_1 component of M_2 (that is, commercial-bank time deposits and savings accounts) to the M_1 stock has been well maintained. The ratio of thrift-institution deposits to M_2 and to M_1 has also risen but at a diminishing rate and the same is true of the ratio of thrift-institution deposits plus large CDs to M_2 and to M_1. At first, this substitution, which reduced the costs of maintaining the successive mixes of Ms, took place in two ways: (1) by the accumulation of the addition to M_3 and M_5 per unit of GNP in the form of the higher-yielding M components, and (2) by a reduction per unit of GNP of the lower-yielding and the interest-free components of M_3 and M_5. In the sixties this decelerating substitution away from M_2 toward higher-yielding M assets began to be accomplished by the first method alone, with no reliance on the second. For reasons discussed below, the downward trend in M_1 per unit of GNP seems to have shown only a *temporary* analogous tendency to flatten out.

2. Aside from the usual problems of reconciling aggregative behavior reflected in time series with individual behavior observed in cross-sections, a further complication here is that a high relative position in a cross-section may often be the *consequence* of smaller risk aversion than is typical at that time of those occupying a lower position. The economically successful may thus show lower risk aversion than the unsuccessful and yet their risk aversion may be higher than it was before they rose on the income scale. Furthermore, even if everyone showed declining risk aversion with a rise of income by holding a diminishing proportion of their *wealth* in liquid form, they could still hold larger liquid assets in proportion to their current *income*. Information for a thorough exploration of this problem is lacking, but data relating to 1962 do suggest a more than proportionate rise in M holdings with rising income over a substantial segment of the income scale; see Dorothy S. Projector and Gertrude S. Weiss, *Survey of Financial Characteristics of Consumers* (Board of Governors of the Federal Reserve System, 1966).

In a process of decelerating substitution, there are reasons to expect a stage such as that illustrated by the behavior of M_2 during the sixties and seventies. To use an analogy, if with the passage of time a household spends an increasing proportion of its rising income on a luxury good but reduces the expenses of acquiring it by shifting toward less expensive brands, it can do this by reducing in relation to its income its acquisition of the more expensive brands as well as by putting all of the increment into the less expensive brands. Yet it is a reasonable assumption about utility functions that, as its income rises and its effort to lower the acquisition costs slackens, the household will stop reducing in relation to its income its acquisition of the better brands before it stops making all additions in the form of the less expensive ones. In terms of our analogy, an M brand is "better," but also more expensive, the nearer it is in the spectrum to money in the narrower sense of means of payment. While the influence of the business sector's M holdings on the trends in the economy call for some qualifications to this analogy, they will not be of great quantitative importance in our exploration of the behavior of M_2.

This interpretation of developments during more than two decades may be tied in with trends of the more distant past. The work of Milton Friedman and Anna Schwartz has demonstrated that in the historical long run, conceived of as extending back to the years following the Civil War, the ratio of M_2 to income had an appreciable *upward* trend.[3] However, this trend did not last beyond World War II. For several years—perhaps into the early fifties—the postwar reversal of the upward trend in M_2 per unit of GNP represented merely an offset to the particularly steep increase during the war; but this interpretation clearly cannot serve beyond the early fifties. Since that time, M_2 per unit of GNP at first showed a downward trend, followed in the early sixties by a horizontal trend, as Friedman noted in a discussion presented some years after the publication of the Friedman-Schwartz volume.[4] This does not exclude the possibility that M_2 has maintained its "luxury good" character, in the sense of having greater than unitary income elasticity that may have been offset by other

3. See Milton Friedman and Anna J. Schwartz, *A Monetary History of the United States, 1867–1960* (Princeton University Press for the National Bureau of Economic Research, 1963).

4. See Milton Friedman, "How Much Monetary Growth?" *Morgan Guaranty Survey* (February 1973), pp. 6–7.

variables. This possibility will also be examined in the paper. Yet even in this event the income elasticity of the higher-yielding components of M_3 and of M_5 seems to have become much greater than that of M_2.

As we see it, the likely explanation is that the non-M_2 components of the broader M aggregates did not acquire their great significance until quite late in the Friedman-Schwartz historical long run and that until that time M_2 thus played a role much more similar to the recent role of M_3 and M_5. During those many decades M_2 too showed an upward trend relative to GNP, while subsequently this trend was shown only by the higher-subscript M components. As concerns the upward trend, the higher-yielding components seem to have taken over at a time when federal insurance of thrift-institution deposits was spreading rapidly and the demand for the funds supplied by these institutions was strong. Whereas only in the earliest phases of the shift of the M mix toward the higher-yielding components was the process associated with a reduction of M_2 per unit of GNP, it has remained associated with a reduction of the ratio of M_1 to GNP, and also with a reduction, in relation to GNP, of specific holdings of liquid assets not included in any M concept. It follows that from the early sixties on, the reduction of M_1 per unit of GNP has represented on balance a transfer to the M_2 component consisting of commercial-bank time deposits and savings accounts which have risen correspondingly. This is what is expressed by the trendless "M_2 velocity."

Horizontality of the k_2 Trend

In the analysis that follows,

k_1 denotes a liquidity ratio expressed as the reciprocal of the GNP velocity of M_1, or M_1 per unit of GNP; GNP is measured at annual rates, and M_1 as average holdings during the same period;

k_2, k_3, and k_5 denote the analogously defined lagless "Cambridge k" terms for M_2, M_3, and M_5, respectively;[5]

k_{non1}, k_{non2}, k_{non3} denote the "Cambridge k" applicable to $M_5 - M_1$, $M_5 - M_2$, and $M_5 - M_3$, respectively.

Whether the trend in k_2 became horizontal in 1960 or not until 1962

5. For the origin of concepts of this type, see Alfred Marshall, *Money, Credit and Commerce* (London: Macmillan, 1923), pp. 43–46.

Table 1. "Cambridge k" Values and Related Ratios, 1952–76[a]

	k values[b]				*Related ratio*[c]	
Year	k_1	k_2	k_3	k_5	k_{non1} *to* k_1	k_{non2} *to* k_2
1952	0.361	0.475	0.589	[d]	0.632	0.240
1953	0.351	0.468	0.591	[d]	0.684	0.263
1954	0.356	0.484	0.623	[d]	0.750	0.287
1955	0.337	0.460	0.602	[d]	0.786	0.309
1956	0.323	0.444	0.600	[d]	0.858	0.351
1957	0.309	0.433	0.598	[d]	0.935	0.381
1958	0.308	0.448	0.628	[d]	1.039	0.402
1959	0.295	0.433	0.616	[d]	1.088	0.423
1960	0.284	0.420	0.613	[d]	1.158	0.460
1961	0.280	0.428	0.634	0.637	1.275	0.488
1962	0.266	0.420	0.633	0.640	1.406	0.524
1963	0.259	0.424	0.650	0.663	1.560	0.564
1964	0.252	0.421	0.657	0.676	1.683	0.606
1965	0.243	0.420	0.659	0.682	1.807	0.624
1966	0.232	0.414	0.645	0.668	1.879	0.614
1967	0.228	0.422	0.656	0.681	1.987	0.614
1968	0.224	0.422	0.653	0.677	2.022	0.604
1969	0.221	0.417	0.643	0.660	1.986	0.583
1970	0.218	0.413	0.639	0.656	2.009	0.588
1971	0.215	0.426	0.666	0.694	2.228	0.629
1972	0.209	0.429	0.682	0.714	2.416	0.664
1973	0.202	0.420	0.677	0.723	2.579	0.721
1974	0.197	0.421	0.675	0.731	2.711	0.736
1975	0.191	0.423	0.687	0.743	2.890	0.757
1976[a]	0.180	0.416	0.687	0.729	3.050	0.752

Sources: The basic data are from Board of Governors of the Federal Reserve System and U.S. Bureau of Economic Analysis.

a. The data for 1976 cover the first three quarters only and are preliminary.

b. k_1, k_2, k_3, k_5 = reciprocal of the GNP velocity of M_1, M_2, M_3, and M_5, respectively, where the M terms are as defined in text note 1.

c. k_{non1}, k_{non2} = the k terms applying to $M_5 - M_1$ and $M_5 - M_2$, respectively.

d. Prior to the issuance of negotiable certificates of deposit in 1961, k_5 was the same as k_3.

is a matter of judgment. We prefer 1962 because, after a period of downtrend, that year implies a "soft" landing at the subsequent "constant" level, while a trend that started in 1960 implies a "hard" landing (see the k_2 column in table 1). The period of trend horizontality has these characteristics: (1) the mean value of k_2 for 1962 through 1975 is 0.421; (2) the standard deviation in quarterly data is 1.19 percent of the mean, and in yearly data is 0.97 percent of the mean; and (3) the worst deviation in the quarterly data is about 3 percent of the mean, in the yearly data slightly

less than 2 percent. It seems unlikely that the 1976 observations will fall outside these ranges.

Of course, during the years 1962–75 an observer trying to look into the future could not have known the 1962–75 average; but this qualification loses much of its importance because the 1962–63 average was 0.422 and both the 1962–64 and the 1962–65 averages were 0.421. Subsequently, the mean for the period since 1962 declined somewhat—to 0.419 for 1962–70—and thereafter it returned to 0.421. Deviations from the preceding year's k_2 values have tended to be quite a bit larger than the deviations from the 1962–75 mean or from the successive means since 1962.

The coefficient of variation from the mean falls from 1.19 to 0.98 percent when a one-quarter lag is introduced between M_2 and money GNP—by this criterion a "better" lag than two quarters—and the mean value of k_2 for 1962 to 1975 then falls from 0.421 to 0.413. But the improvement is distinctly spotty: in many subperiods the simultaneous relation "wins" over the lagged one. The lagged relation wins mainly in years of significant variations of liquidity creation, such as the years of credit crunch, and the years of significantly stepped-up liquidity creation that followed.

Even precise constancy of the economy's overall k_2 would not have meant constancy in the household sector, since from 1962 to 1975 M_1 holdings of the business sector have dropped per unit of GNP and the ratio of its M_2 to GNP was not fully maintained. But because the business sector's M_1 is not a high proportion of the economy's M_2—at present, probably less than 25 percent—constancy of the economy's k_2 implies merely a small increase in the household sector's k_2. Between 1970 and 1975, according to table 1, k_2 for the economy as a whole rose from 41.3 to 42.3 percent of GNP. We estimate that from 1970 to 1975 the household sector's M_2 rose from the 25–26 percent range to the 27–28 percent range in relation to GNP (from the 36–37 percent to the 38–39 percent range in relation to disposable income).[6] Having tried to allocate M holdings to individual sectors, we have little confidence in the detailed results of more ambitious quantitative work based on specific sectoral allocation.

6. For this estimate, we used the Federal Reserve's Demand Deposit Ownership Survey for demand deposits, and the flow-of-funds statistics for ownership of time deposits and savings accounts at commercial banks, and what we consider reasonable assumptions concerning the sectoral allocation of currency.

The Upward Trend in k_3 and k_5

Both in 1953–62, when k_2 declined at an annual compound rate of 1.2 percent, and over the subsequent period of k_2 horizontally, k_3 and k_5 rose appreciably along the growth path of real GNP. However, this uptrend was interrupted for fully five years during the exceptionally long expansion in the second half of the sixties, and throughout our period it was not uncommon for this trend to be interrupted (and even reversed for a while) during cyclical expansions. The reason why the trend has come through is that the sharp rises in recession years have been greater than any reduction during expansion years. This is illustrated by figure 1 and can be seen also in table 1, both of which suggest a tendency of the public to raise k_3 and k_5 during recessions to such an extent that any liquidity loss that may occur during the next expansion should start from a higher level than it did on the previous occasion.

The results can be expressed by log-linear regressions in which k_3 or k_5 is the dependent variable and aggregate real GNP and the interest rate on three-month Treasury bills are the independent variables. The coefficient of real GNP comes out positive, that of the bill rate (or, alternatively, of the commercial paper rate) negative. The regressions are reported below. In this context we were unable to identify the complex consequences of population growth.[7]

7.

(1) $$\ln k_3 = \underset{(3.1)}{-0.420} + \underset{(3.1)}{0.056} \ln Y - \underset{(3.8)}{0.024} \ln r + \underset{(13.7)}{0.832} \ln (k_3)_{-1};$$

Sample period = 1962:2–1975:4;
$\bar{R}^2 = 0.91$; standard error of estimate = 0.008; Durbin-Watson = 1.68.

(2) $$\ln k_5 = \underset{(2.1)}{-0.337} + \underset{(2.2)}{0.050} \ln Y - \underset{(2.9)}{0.022} \ln r + \underset{(19.1)}{0.925} \ln (k_5)_{-1},$$

Sample period = 1962:2–1975:4;
$\bar{R}^2 = 0.95$; standard error of estimate = 0.01; Durbin-Watson = 1.47.

where Y is real GNP, r is the Treasury bill rate, and the numbers in parentheses are t-ratios (here and in later equations), and the data are quarterly observations.

Here and in other regressions of this type containing a lagged term on the right-hand side, the long-term elasticities corresponding to the coefficients of the explanatory variables (here, of Y and r) are found by dividing these coefficients by the difference between the number 1 and the coefficient of the lagged term.

Equations similar to 2 hold for the *preceding period starting in 1952,* with both the Y and the r elasticities smaller in absolute value (but significant by conventional standards), and with the adjustment much faster—that is, with the coefficients of the

There is good reason for not relying heavily on the numerical results of such regression analysis. The specification of models of this general type is inevitably incomplete. For one thing, there is no way to measure expectations held with changing uncertainty concerning a cyclically sensitive rate of return that bears closely on the attractiveness of physical goods (on investment in the broad sense). Even with hindsight that rate of return cannot be measured properly. The regression results hide this deficiency by "pretending" that decisionmakers experiencing a rise in income move up to the desired higher money holdings very slowly, even though in the given circumstances this is unlikely because usually money intake is increasing at the same time. What happens in these situations is not a genuinely slow movement toward desired levels but a temporary reduction of the desired level of money holdings relative to income—a delay in developing the desire to accumulate the money balances for which there will subsequently be a demand. The delay occurs because of a temporary rise of an unmeasured expected rate of return during cyclical expansions. The computational results hide this for the sample period by suggesting a low speed of adjustment to desired levels, and the elasticities obtained cannot be expected to reflect accurately the long-run effect of unspecified variables. If the log of M rather than the log of k were defined

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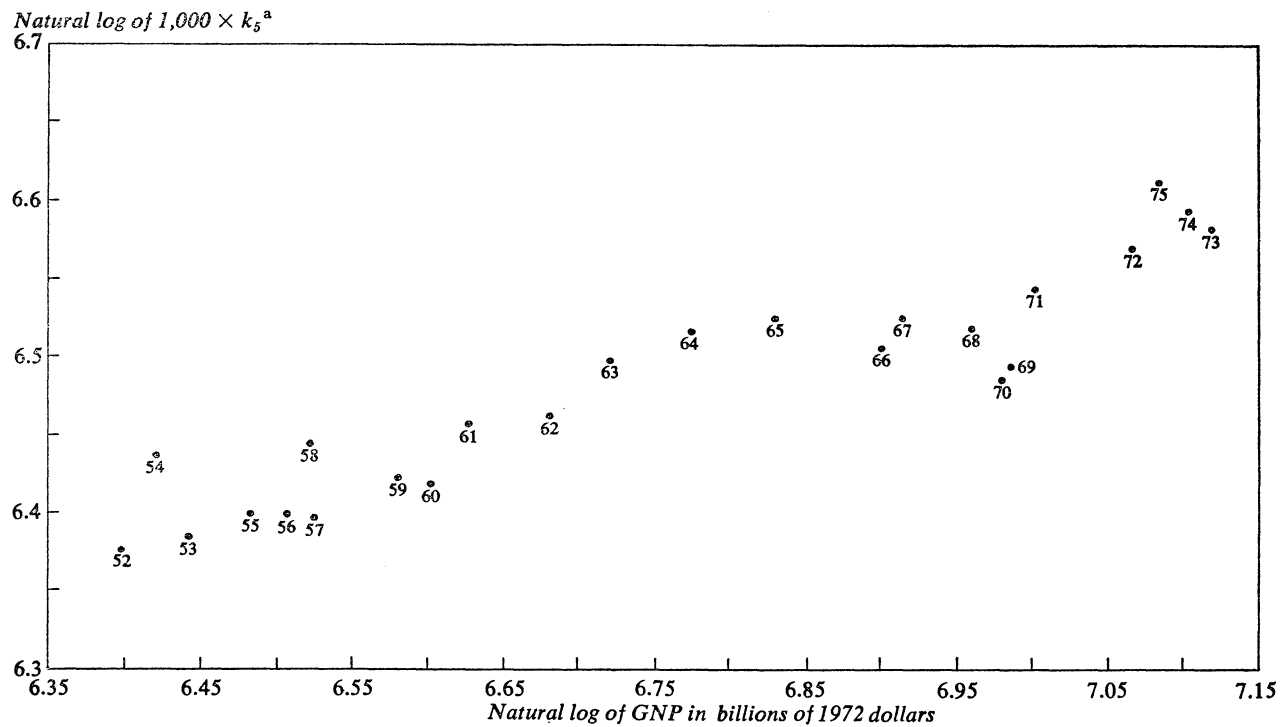
lagged term much smaller (0.493 instead of 0.925). Until 1961 there was no difference between k_3 and k_5.

Figure 1 suggests why models of this sort are apt to show particularly slow adjustment for the post-1962 span in which the very long expansion phase of a cycle interrupted the rise of k_3 and of k_5 for several years. Taking care of such delays by low adjustment coefficients reflects a basic shortcoming of such models, as our subsequent discussion suggests.

As for the behavior of large negotiable CDs per unit of GNP—k_{non3}, which even now is a small fraction of k_5—inferences for the future drawn by comparing equations 1 and 2 are practically certain to be wrong. As a result of the difference between the two adjustment coefficients, that comparison implies a negative long-term r elasticity for the CDs. This particular implication is indeed likely to have been realistic for the sixties, when the CDs were subject to interest ceilings. For 1970, when interest ceilings were removed from large CDs of less than 90-day maturity, the data convey the same impression of a negative relation between the rate of change in the volume of CDs and the interest rates on money-market instruments, not because the ceilings on longer maturities were removed only later, but because the volume of the newly deregulated CDs rose rapidly while money-market rates declined *though remaining above time-deposit rates.* But no reasonable observer could avoid the conclusion that from 1973 on CD holdings were positively and strongly correlated with money-market rates—not negatively, as a comparison of our two equations would suggest for periods longer than one quarter.

Figure 1. Relation of k_5 to the Real Gross National Product, 1952–75[a]



Sources: Same as table 1.
a. k_5 = reciprocal of the GNP velocity of M_5 (defined in text note 1).

as the dependent variable, the "cover-up" would be even more complete, and by some criteria the regression results would appear to be even "better," but for the wrong reason. This and some further considerations have led us to choose k rather than M as the variable to be explained.[8]

Increasing amounts have been accumulated per unit of the growing GNP not only of M_3 and of M_5 but also of the broader aggregate that the Federal Reserve calls liquid assets held by private nonfinancial domestic owners. However, this more comprehensive liquidity ratio rose somewhat less because its non-M components have declined relative to the GNP—from about 15 to 11 percent in the past sixteen years.

Methods of "Cheapening" the Rising Liquidity Provisions

Tables 2 and 3 illustrate how the increasing provisions of k_3 and k_5 along the growth path have been made less expensive to the public by a shift from k_1 to k_{non1} and from k_2 to k_{non2}. The tables also reveal that for some time the rise in the ratio of k_{non1} to k_1 and in the ratio of k_{non2} to k_2 had

8. In an "M model" other than one applying to M_1, the computational techniques establish a significantly less than unitary coefficient for the log of Y along with a greater than unitary long-term income elasticity of M, thus giving the impression that this very large difference is attributable to slow reactions in achieving desired objectives, though in reality the delay reflects the effect of an unspecified variable bearing on the objectives themselves. In a "k model" the misleading explanation of the delay is much less complete—hence weaker test results serve as warning signals—because the techniques cannot associate a negative coefficient for the log of Y with a positive long-term income elasticity of k (and *this* would be the analogy to what is happening in the M models).

It should be noted also that since random movements of a decision unit's Y are here usually associated with random movements of its M intake in the same direction, the risk of obtaining a spurious negative correlation between $M/Y(=k)$ and Y is small. Also, because random movements in M/Y are apt to be fewer or less pronounced than random movements in M, the disturbing effect of random movements on the results of the next period (via the lagged term) is apt to be smaller in k than in M models.

Yet the two types of model share other basic shortcomings. These include the consequences of our inability to appraise accurately the uncertainty surrounding expectations concerning movements in market rates of interest and thus the attractiveness of the prevailing long rates relative to the various deposit rates and relative to the CD rate and the bill or the paper rate. In this regard, as well as with respect to the uncertainty surrounding the rates on physical investment, the hypothetical steady long-run conditions that are supposed to be described by the elasticities have different implications from those of the sequences of disequilibria actually observed in time series.

developed both because k_1 and k_2 had declined and because k_{non1} and k_{non2} had risen. At some point in this process, increases in the ratio of k_{non2} to k_2 came to be achieved by a rise in k_{non2} alone without the reinforcement of reductions in k_2.

We now turn to our suggestion that the k_1 trend might also have moved toward horizontality had there not been special incentives for a renewed dip. For the household sector such a flattening of the k_1 trend would have meant heavy reliance on the rise of k_{non1} for a further reduction of the cost of the still rising k_3 and k_5 provisions; while for business enterprise a flattening would not call for similar emphasis on the substitution of higher-yielding M assets (rather than other assets) for M_1.

During the period 1966–71 the k_1 trend did in fact show a pronounced tendency toward flattening (see table 3). It would be unconvincing to argue that the substantial slackening of the downtrend in k_1 was merely a phenomenon accompanying the interruption of the rise in k_3 and in k_5 during the later phases of the long expansion of the sixties. Similar interruptions in earlier expansions occurred with no slackening of the downward trend in k_1; also, in the late sixties the interruption of the upward trend in k_3 and in k_5 did not strictly coincide with the flattening out of k_1.

Some investigators interpreted the behavior of k_1 in 1966–71 in terms of log-linear M_1 demand functions, implying that movements in k_1 can be adequately explained with unchanging parameter values, by the lowering effect on k_1 of a rise in real GNP and of a rise in interest rates.[9] Yet Cagan and Schwartz, when comparing longer periods extending into the early seventies with pre-1965 subperiods, have observed indications of changes in the values of the parameters, including a reduction of the absolute value of the interest-rate coefficient. From some point in the seventies, those M_1 models compiled an obviously unsatisfactory and deteriorating record.

In view of this evidence, the explanation of the temporary flattening tendency of the k_1 trend in the 1966–71 period should not rest on the

9. For more recent contributions, including critical appraisals, see William Poole, "Whither Money Demand?" *BPEA, 3:1970,* pp. 485–500; Stephen M. Goldfeld, "The Demand for Money Revisited," *BPEA, 3:1973,* pp. 577–638; Phillip Cagan and Anna J. Schwartz, "Has the Growth of Money Substitutes Hindered Monetary Policy?" *Journal of Money, Credit and Banking,* vol. 7 (May 1975), pp. 137–59; Jared Enzler, Lewis Johnson, and John Paulus, "Some Problems of Money Demand," *BPEA, 1:1976,* pp. 261–80; Laurence H. Meyer, "Alternative Definitions of the Money Stock and the Demand for Money," Federal Reserve Bank of New York, *Monthly Review,* vol. 58 (October 1976), pp. 266–74.

Table 2. Rate of Change in Cambridge k Values and Ratios, Growth Rate in GNP, and Selected Interest Rates, Business-Cycle Peaks and Troughs, 1953–75

Percent[a]

Description	Business cycle							
	Peak year to peak year				Trough year to trough year			
	1953–57	1957–60	1960–69	1969–73	1954–58	1958–61	1961–70	1971–75
Cambridge k value								
k_1	−3.2	−2.8	−2.8	−2.2	−3.6	−3.2	−2.8	−3.0
k_2	−1.9	−1.0	−0.1	0.2	−1.9	−1.5	−0.4	−0.2
k_3	0.3	0.8	0.5	1.3	0.2	0.3	0.1	0.8
k_5	0.3	0.8	0.8	2.3	0.2	0.5	0.3	1.7
k_2–k_1	1.5	3.1	4.1	2.7	2.2	1.9	3.1	2.4
k_3–k_1	4.6	4.3	2.8	3.0	4.5	3.4	1.9	2.4
k_5–k_1	4.6	4.3	3.2	4.3	4.5	3.6	2.3	3.5
k_3–k_2	7.3	5.2	1.8	3.2	6.5	4.5	1.0	2.4
k_5–k_2	7.3	5.2	2.6	5.5	6.5	5.0	1.7	4.4

Ratio involving Cambridge k values								
$(k_2-k_1)/k_1$	4.6	5.9	6.8	4.9	5.9	5.0	5.8	5.3
$(k_3-k_1)/k_1$	7.8	7.1	5.6	5.2	8.1	6.5	4.7	5.3
$(k_5-k_1)/k_1$	7.8	7.1	6.0	6.5	8.1	6.8	5.1	6.5
$(k_3-k_2)/k_2$	9.3	6.3	1.8	3.0	8.4	6.0	1.4	2.6
$(k_5-k_2)/k_2$	9.3	6.3	2.6	5.3	8.4	6.5	2.1	4.6
Growth rate of real GNP	2.3	2.6	4.2	3.4	2.5	3.5	3.9	1.8
Interest rate								
Commercial paper								
Beginning of period	2.5	3.8	3.8	7.8	1.6	2.5	3.0	5.1
End of period	3.8	3.8	7.8	8.2	2.5	3.0	7.7	6.3
Commercial-bank passbook								
Beginning of period	1.2	2.1	2.6	4.0	1.3	2.2	2.8	4.5
End of period	2.1	2.6	4.0	4.7	2.2	2.8	4.4	5.0

Sources: See table 1, where the k values are defined.
a. Continuously compounded annual rates, except interest, which is the level for the beginning and the end of the periods.

Table 3. Rate of Change in Cambridge k Values and Ratios, Growth Rate in GNP, and Selected Interest Rates, Selected Critical Periods, 1953–75

Percent[a]

Description	Period[b]									
	Near-flattening of k_1 in 1966–71					*Interruption of uptrend in k_3 and k_5 in 1965–70*				
	1953–66	*1966–71*	*1971–73*	*1973–75*	*1966–75*	*1953–65*	*1965–70*	*1970–73*	*1973–75*	*1965–75*
Cambridge k value[c]										
k_1	−3.2	−1.5	−3.1	−2.8	−2.2	...	...	...	...	...
k_3	...	...	...	...	...	0.9	−0.6	1.9	0.7	0.4
k_5	...	...	...	...	...	1.2	−0.8	3.2	1.4	0.9
k_2–k_1	3.4	3.0	1.6	3.1	2.7	...	...	...	...	...
k_5–k_1	4.6	1.9	4.2	2.9	2.6	...	...	...	...	...
k_3–k_2	...	...	...	...	...	5.5	−1.1	4.3	1.3	1.0
k_5–k_2	...	...	...	...	...	6.3	−1.5	7.4	2.7	2.0
Ratio involving Cambridge k values										
$(k_3–k_2)/k_2$	...	...	...	...	...	6.4	−0.8	3.7	1.0	0.9
$(k_5–k_2)/k_2$	...	...	...	...	...	7.2	−1.2	6.8	2.4	1.9
Growth rate of real GNP	3.5	2.4	5.4	−1.7	2.2	3.3	3.0	4.6	−1.7	2.5
Interest rate										
Commercial paper										
Beginning of period	2.5	5.6	5.1	8.2	5.6	2.5	4.4	7.7	8.2	4.4
End of period	5.6	5.1	8.2	6.3	6.3	4.4	7.7	8.2	6.3	6.3
Commercial-bank passbook										
Beginning of period	1.2	3.9	4.5	4.7	3.9	1.2	3.8	4.4	4.7	3.8
End of period	3.9	4.5	4.7	5.0	5.0	3.8	4.4	4.7	5.0	5.0

Sources: See table 1, where the k values are defined.

a. Continuously compounded annual rates, except interest, which is the level for the beginning and end of the periods.

b. The critical spans were chosen on the basis of the interruption from 1965–70 of the uptrend in k_3 and k_5, and of the temporary near-flattening from 1966–71 of k_1.

c. For k_2, not shown, the annual rate of decline was 1.2 percent for 1953–62, after which the trend became horizontal.

claim to success of some investigators in using unchanging parameter values. In our conception the temporary, significant flattening of the k_1 trend may well have had reasons analogous to those of the much more durable flattening of the k_2 trend. To analyze the flattening-out of k_2 with unchanging parameter values—that is, without assuming a weakening of the basic propensity to reduce the weight of M_2 in the broader M aggregates—seems a hopeless effort. Nor has the evidence so far established any strong case for interpreting the temporary near-flattening of the k_1 trend in the late sixties in terms of unchanging basic propensities.

Among the quantitative statements that can be made, relatively the safest are that (1) in the absence of new incentives, the reductions of k_1 and of k_2 do not last beyond a limited period; (2) therefore, the substitution of higher- for lower-yielding M and k components—the rise of ratios such as k_{non2}/k_2 and k_{non1}/k_1—comes to depend increasingly on the factors determining the rise in k_3 and in k_5; (3) the growth of real GNP and changes in returns on rival assets presumably are prominent determinants of the trend in k_3 and k_5. Applying analysis based on unchanging parameter values to the flattening-out phase of the lower-subscript ks, or to a renewed dip resulting from a revision of the attitudes that led to the flattening, is not a promising undertaking.

In considering incentives for revising such attitudes concerning k_1, two factors deserve emphasis. One is that the incentive provided by the availability of, say, 5 percent interest on commercial-bank savings accounts means more *in terms of utility* if the interest earnings greatly reduce or eliminate a continuing erosion of the real value of interest-free liquid assets than if they merely bring a real gain over the maintenance of the real value of a liquid asset. Thus inflation is likely to have been one of the essential causes of the new dip of k_1. The other important factor is that the prompt transformation of commercial-bank savings accounts into checking deposits has become so smooth that, if depositors have the two kinds of accounts in the same bank, they may by now view their checks as reasonably safe against bouncing. Furthermore, after 1971, when k_1 dipped again significantly, interest rates on commercial-bank savings accounts continued to rise, even if somewhat less than during 1966–71. Also, corporations were recently permitted to hold limited commercial-bank savings accounts, with effects that will show up mostly in the data after 1975. At present k_1 ratios continue to move lower.

No comparable incentives have so far developed to revise the attitudes

that led to a flattening of the k_2 trend in the early sixties. The differential between the passbook rates of thrift institutions and commercial banks *diminished* to one-quarter of 1 percent during that period (though both rates increased). On the other hand, rates of return on large CDs increased in some years greatly to the advantage of these assets; but this trend did not hold in all subperiods, and access to these assets is limited. To reduce k_2 by moving into goods rather than into higher-yielding M components remains too risky for the typical household; their demand for interest-bearing M seems in fact to have been strengthened, rather than weakened, by the uncertainties concerning borrowing opportunities and other matters in the recent inflationary period. The qualifications called for by the relatively small share of business in M_2 were considered above, and here we may conclude that the k_2 problem understandably has characteristics very different from those of the k_1 problem. So far there have developed no incentives for revising the attitudes that led to a flattening of k_2 in the early sixties.

Slowing of the Substitution of Higher-Yielding M Assets for M_2

Assuming that the k_2 trend is horizontal and that the k_5 trend reflects variables such as real GNP and rates of interest on money-market instruments, the trend in k_{non2}/k_2 from now on will depend exclusively on the same variables. Observed trends and regressions such as 1 and 2 in note 7 suggest this sort of substitution process. One implication of this suggestion is that, with a horizontal k_2 trend and a constant rate of increase of k_5, the increase in the k_{non2}/k_2 ratio would continue to slow, because k_{non2} would make up a continuously rising proportion of k_5 and hence the extent to which the growth rate of k_{non2} would exceed the assumed constant growth rate of k_5 would be lessening continuously.

However, this conclusion is based on the behavior of k_3 and k_5 alone, which only for a given trend in k_2 determines the behavior of the *ratio* of the higher-yielding k components to k_2—that is, the substitution ratio. The special uncertainties in appraising the influence of the same "explanatory" variables—such as real GNP and interest rates—on the behavior of k_2 itself are disturbing if the question is how long the k_2 trend will remain horizontal.

Reasons for Abstaining from Mechanical Projections

Several important reasons caution against simple mechanical projection of the k_2 trend. First, analysis of this sort is uncomfortably aggregative. We have looked at some disaggregated data that do not seem to contradict our hypothesis but also do not support an equally clear-cut disaggregated story in all details, and the level of aggregation here warns against overconfidence. Second, we have not attempted to appraise the role of a number of economic variables in shaping the environment in which the observed regularities have developed. Last but not least, institutional developments, such as interest-rate regulations and the ease of transforming one type of M into another, are unpredictable. In particular, if and when shifting thrift-institution deposits into means of payment becomes sufficiently prompt, costless, and effortless, k_3 might be the proper focus of analysis rather than k_1 or k_2.

Observations on an Analytic Ambiguity and Concluding Remarks

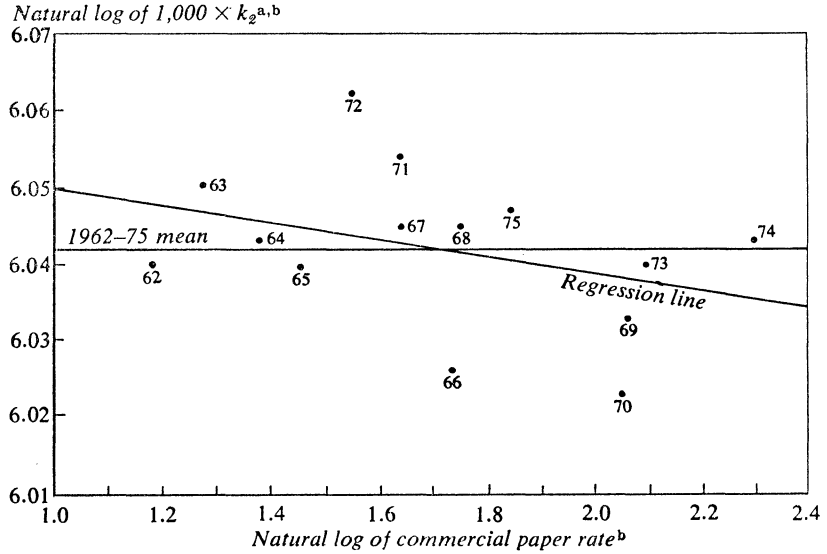
Assessing the future behavior of k_2, even on the unrealistic assumption of unchanging interest regulations and institutional circumstances, calls for a firm view of what variables have determined the post-1962 deviations of k_2 from its horizontal trend. The same variables could then be considered responsible for the trend horizontality since 1962, and any change in their behavior would put an end to the era of horizontality in a predictable way. But this effort encounters serious difficulties.

As figure 2 demonstrates, movements in money-market rates have been associated with movements of k_2 in the opposite direction.[10] However, the

10. The graph is a plot of k_2 against the commercial paper rate, but the same conclusion would be suggested by using the Treasury bill rate (see note 11).

On theoretical grounds one should use here the differential between a money-market rate and some representative commercial-bank deposit rate as well as the differential between some representative thrift-institution rate and the commercial-bank deposit rate; but these would be hard to construct. It seemed preferable to imply that the large swings in money-market rates stand for movements relative to the upward creeping commercial-bank deposit rates. As was noted, the differential between the savings and loan and the commercial-bank passbook rates was slowly declining during that period. That differential has not proved a significant variable in a regression of the kind reproduced below.

Figure 2. Relation of k_2 to the Commercial Paper Rate, 1962–75[a]



Sources: Same as table 1.
a. k_2 = reciprocal of the GNP velocity of M_2 (defined in text note 1).
b. The scaling of the axes exaggerates the slope twentyfold in this simple regression. For a regression involving further variables, see text note 11.

same figure—a simple regression with no adjustment for the role of other variables—shows that this effect was not symmetrical in the two directions. Therefore, the upward *trend* in interest rates during the period 1962–75 has not, on balance, become associated with a downward trend in k_2. Something has suppressed any k_2-reducing *trend* effect of interest rates.

It is very likely even on a priori grounds, and it is empirically demonstrable, that one of several measurable variables showing an upward trend can be introduced to "explain," in the purely technical sense, why the k_2-reducing effect of the *trend* in interest rates was suppressed. One way is to introduce total real M liquidity—or better, its non-M_2 component—as an additional variable, and to demonstrate that the sign of its coefficient is positive (and thus is the inverse of the sign of the coefficient of interest rates). Other variables, including real GNP, can also be made to perform

this function of "offsetting" the trend effect of the commercial paper rate or, alternatively, of the Treasury bill rate.[11]

If such regression results were taken at their face value, one would conclude that in a period of horizontal r trends, the k_2 ratio would be rising, because the other variables—such as real liquidity or, alternatively, real income—would continue to show an upward trend. As will be seen, this upward trend in k_2 would be very mild. Quite aside from this, these other variables could be stealing the show from an unmeasured variable in the background of the regressions. We suggested earlier that, whereas accelerating inflation probably played an essential role in promoting transfers from k_1 to the equally "safe" interest-bearing component of k_2, it may also have *raised* k_2 because it intensified uncertainties, especially about borrowing opportunities. This rising uncertainty is an unmeasured vari-

11. If M_{non2} stands for *real* M balances other than M_2, and r for the commercial paper rate, then with the 1962–75 mean value of k_2 of 0.421, the quarterly deviations from the mean might be "explained" by:

$$\ln \frac{k_2}{0.421} = \underset{}{-0.181} + \underset{(2.6)}{0.042} \ln M_{non2} - \underset{(3.1)}{0.031} \ln r. \qquad (3)$$
$$\underset{(4.4)}{}$$

$R^2 = 0.67$; standard error of estimate = 0.007; Durbin-Watson (adjusted) = 1.5.

However, if the period is truncated in 1972, the coefficients become sufficiently different (larger in absolute value) to throw doubt on the value of that equation as a forecasting device, even if a change of the absolute value of the coefficients *in the same direction* happens to have a compensating effect that rescues the predictions for some intervals.

For 1962–75 the coefficients and the tests for all practical purposes come out identically if r is defined as the Treasury bill rate (rather than the commercial paper rate); in this case, however, R^2 would be a shade lower (0.65).

The same coefficients apply to the explanatory variables in regressions in which $\ln k_2$ alone is placed on the left-hand side and the log of the mean value ($\ln 0.421$) is carried over to the right-hand side. If, further, the log of the preceding period's k_2 is added on the right-hand side—thus obtaining an adjustment model—the results show rapid adjustment toward elasticities not much different from the coefficients reported above.

Finally, if in such an adjustment model the explanatory variable M_{non2} is replaced with real GNP (Y), and r is defined as the commercial paper rate, the results for 1962–75 are

$$\ln k_2 = \underset{}{-0.757} + \underset{(2.6)}{0.041} \ln Y - \underset{(2.0)}{0.024} \ln r + \underset{(2.8)}{0.407} \ln (k_2)_{-1}. \qquad (4)$$
$$\underset{(1.6)}{}$$

$R^2 = 0.66$; standard error of estimate = 0.007; Durbin-Watson (adjusted) = 1.8.

If the definition of r is the Treasury bill rate,

$$\ln k_2 = \underset{}{-0.697} + \underset{(2.7)}{0.041} \ln Y - \underset{(2.1)}{0.024} \ln r + \underset{(2.8)}{0.477} \ln (k_2)_{-1}. \qquad (5)$$
$$\underset{(2.3)}{}$$

$R^2 = 0.66$; standard error of estimate = 0.007; Durbin-Watson (adjusted) = 1.9.

We have not tried to "explain" our relatively brief pre-1962 downtrend in k_2 in these terms. For such an effort to succeed, Y and r elasticities other than those estimated here would be required.

able not included in our regressions, but it has resulted from inflation *along with* the rising trend of the measured variable *r*. This could well be the reason why the behavior of *r* since 1962 has on balance been associated with neither a decrease nor an increase in k_2, even though the short-run effect of a change in *r* has been an opposite change in k_2. On this interpretation, the measured variables that trend upward, and appear to explain the supression of the k_2-reducing effect of the rising *trend* in *r*, have played no essential role. They merely continued to rise in a period in which inflation-induced uncertainty rose. Accordingly, a horizontal *r* trend would be associated with a horizontal k_2 trend, not with a rising one.

Some considerations favor this latter interpretation, but others argue for leaving open the question of whether during the period of k_2 trend horizontality the trend effect of rising interest rates was not, after all, offset by a measured variable with a rising trend, as various regressions suggest. One such reason is that any uncertainty that raises k_2 might be expected to raise k_3 as well. A k_3-raising effect of inflation uncertainty would in turn imply that when k_3 regressions, such as 1 and 2 in note 7, are estimated for 1953–75, they would underpredict k_3 for 1965–75. This is so because in that period the rise in money rates of interest reflected inflation, while in the preceding years it did not. Yet the regressions we have examined do not indicate a tendency to underpredict k_3 during 1965–75. On the other hand, inflation uncertainty could have raised k_2 *without* raising k_3 because of the pronounced narrowing of the margin between the passbook rates of thrift institutions and of commercial banks. Also, we had reason to question the numerical results derived from such regressions as 1 and 2.

Hence it remains an open question whether, during the period 1962–75, the effect on k_2 of the trend in interest rates was suppressed by factors that would have been present even had the interest trend been horizontal (and in that case would have succeeded in raising k_2) or by factors that come and go with the kind of inflation-induced interest trend observed during the past decade. Only in the latter case would the k_2 trend have been horizontal even for a horizontal interest trend, and short-run fluctuations in *r* would then merely cause short-run deviations of k_2 from its trend.

Pragmatically, this ambiguity may not deserve much attention. Even if the correct interpretation of the period of a horizontal k_2 trend were that some variable such as total real M liquidity, or real non-M_2 liquidity, or real income has tended to raise k_2 while *r* has tended to reduce it, the

prospective decennial rate of increase in k_2 would probably be very small for a horizontal trend in money-market rates. A corollary is that it seems to take large changes in interest rates to have a noteworthy effect on k_2. These conclusions follow from the parameter values referred to in note 11, on any reasonable assumption concerning trends in the explanatory variables.[12]

What stands up firmly is not the regression results—ours or those of other authors—but the horizontality of the k_2 trend over about a decade and a half, with the dispersion characteristics discussed in this paper. Ambiguities in the interpretation of the regression results are, of course, disturbing, yet not because it would matter much whether k_2 will be trendless or have a very mild trend. This is not the main reason for abstaining from mechanical projections of the behavior of k_2 and for supporting one's views about the prospects by "judgmental" considerations. The main reasons are the uncertainties of aggregative analysis, the unpredictability of institutional change, and the vagueness of any appraisal of variables whose behavior may have shaped the environment in which various regularities have been observed.

12. From 1953 to 1975 real M balances other than M_2 rose at an annual compound rate of 7.8 percent, and from 1962 to 1975 the increase was smaller. Regression 3 suggests that a 7.8 percent increase would raise k_2 by 3.2 percent of its present value in a decade. The regressions using real GNP rather than real M_{non2} as an explanatory variable suggest an even smaller decennial increase in k_2 for a 3.5 percent yearly growth of real GNP. To put it differently, all these regressions suggest that even if no variable had offset the k_2-reducing effect of the *r* trend from 1962 to 1975, the k_2-lowering effect of the interest movements would have been small. Some models seem to point to a somewhat greater k_2-lowering effect of past trends in interest rates and, correspondingly, to a somewhat greater k_2-raising effect of the offsetting trend in real GNP. But we find various properties of these models unconvincing.

Discussion

JAMES TOBIN REMINDED the conference that considerable stability in average velocity over a period is quite consistent with considerable variation in the rate of change of velocity. Since it is the rate of change of the money supply that is supposed to be important in stabilizing the economy, stability in the rate of change of velocity is a more important issue for policy purposes than the stability of velocity itself. Tobin reported that over the period 1965–74, average M_2 velocity had indeed been constant: the mean rate of change was a trivial −0.3 percent per year. However, the standard deviation of quarterly changes of velocity was 3.4 percent (annual rate). Tobin inferred from this that one could not place much faith in a constant relationship between the rate of change of M_2 and the rate of change of income. He had also experimented with lagged relationships; a typical example was the correlation of 0.4 that he had found between percentage changes of money income and percentage changes in M_2 lagged two quarters. Robert J. Gordon reported similarly disappointing results from an effort to predict the growth of final sales from the recent growth of M_2.

Tobin noted also that the broader the concept of money that is adopted as a control variable, the louder the noise that creeps in between the Federal Reserve's instruments of control—central bank reserves, discount rates, and so on—and the resulting outcome. Arthur Okun was concerned that the sudden adoption of M_2 or any other aggregate as an instrument of policy control would change the supply function for that class of assets, thereby jeopardizing any previous regularity of its behavior. William Fellner pointed out that the paper was concerned with the small yearly and quarterly deviations of M_2 velocity from the known mean values of more extended preceding periods, not with the larger deviations of one short period's value from that of the preceding quarter or year. He also stressed that, in pointing out the stability of the velocity of M_2, the authors had not meant to imply the reliability of M_2 as a single instrument of control. That issue required an understanding not only of the process of interest-rate determination but also of how other factors may have contributed to shaping the environment in which the M_2 regularity was observed. Such an

investigation went beyond the scope of their paper, and much of what is involved in this broader problem calls for "judgmental" appraisals.

Fellner and Stephen Goldfeld exchanged views on the difference in the functional forms in their respective papers. Fellner stated his preference for specifying the equation in terms of k, rather than M, because it had superior dynamic properties: for example, an increase in income led to an immediately rising k_2, while Goldfeld's specification implied that k_2 fell at first then rose. Goldfeld emphasized, however, that this was a result of differences in the underlying specifications of the equations and not simply of different forms of the dependent variable. Fellner agreed but reiterated his preference for a specification that did not rely on a lengthy process of stock adjustment that started by moving k_2 in the opposite direction when income rose, and then turned around in this regard.

Tobin said that he could not find a clear conceptual basis for M_2. M_1 could be characterized as the circulating medium of exchange and M_3 as including all assets on which the interest rates are fixed by the government —either at zero or some other level; M_2, on the other hand, seemed simply to be a measure of the size of commercial bank assets and liabilities— excluding certificates of deposit and bank capital. Fellner observed that the differences between M_1 and M_2 have been narrowing and M_2 can now be characterized as the medium of exchange, subject to a telephone call.