Some Major Problems in Monetary Theory

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SOME MAJOR PROBLEMS IN MONETARY THEORY*

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I

Monetary policy operates directly on the Federal Reserve's portfolio of government securities, the requirement ratios, and the rediscount rate. The transmission of the desired effects to the target variables (income, employment, and prices) presupposes a systematic connection between policy and target variables crucially mediated by a set of monetary magnitudes. It therefore appears convenient to subdivide the monetary mechanisms into two branches: one relates policy and monetary variables and the other associates monetary variables with income or prices. Money supply theory explicates the first subrelation and money demand theory together with aggregate demand theory defines the second subrelation. Existence and nature of these subrelations form the central issue of recent policy discussions. An evaluation of the degree of effectiveness of monetary policy consequently involves a comparative appraisal of rival theories concerning the properties of the two subrelations. Such appraisal has barely begun, particularly as many conceptions advanced still require a translation into properly formulated hypotheses. This situation explains the emergence of abundant references to observable patterns which actually possess no evidential significance or discriminating power but are diligently adduced to support contentions concerning the usefulness of monetary policy.[1] Analysis of these patterns indicates that they are equally consistent with alternative hypotheses which imply opposite statements about the effectiveness of monetary policy. Explication of vague conceptions into empirically significant theories thus forms a necessary step in the resolution of conflicting ideas. The construction and comparative assessment of such theories alone assures "cognitive respectability" to policy discussions.

[1] Three observation statements, one referring to the relative growth of nonbanking financial intermediaries, another referring to large or increasing excess reserves in a deflationary environment and a third to a systematic association between restrictive policy and rising velocity, whose truth we may concede, have been advanced in support of the contention that monetary policy is decreasingly effective. The fallacy involved is revealed by constructing a hypothesis which implies the three observation statements together with a statement about an unreduced or even increasing degree of effectiveness for policy actions. Logical analysis thus exhibits the three observation statements to be consistent with a theory which implies continued usefulness of monetary policy.

47

II

Long neglected, money supply theory has recently attracted more attention, and a variety of promising leads have been developed. A rough outline of a potentially fruitful formulation follows.

The institutional arrangements of our financial system suggest that the money stock, assets, and liabilities of all financial institutions are jointly determined by the operation of the credit markets. The banks' net flow demand for earning assets is determined by the banks' wealth (balance-sheet) position and pertinent market prices; i.e., an index of interest rates formed on the bank oriented credit market. The public's net flow supply of assets to the banks depends on the public's wealth position, the index rate, interest rates on related credit markets, and current income. The equilibrium of net demand and supply determines the index rate as a function of the public's and the banks' wealth position, interest on other credit markets, and income. This flow equilibrium is consistent with continuous changes in the banks' wealth position, in particular with changes in the portfolio of earning assets. A determination of this stock magnitude is obtained with a condition of stock equilibrium, equating the banks' net flow demand to zero. The banks' net borrowing from the Federal Reserve banks is explained by a flow demand function with balance-sheet position, index rate, and rediscount rate as arguments. The optimal stock of outstanding discounts and advances to commercial banks is again determined by a condition of stock equilibrium equating net borrowing to zero. All equilibrium conditions, stock or flow, can be justified in terms of a rapid adjustment of interest rates and bank positions relative to time units implicit in the definition of observable magnitudes associated with the hypothesis. More significant is the cognitive function of such equilibrium conditions: They imply that variations in exogenous variables are a necessary condition for the occurrence of variations in endogenous variables.

The construction is completed by specifying the processes changing the banks' volume of "free" cash assets. Money stock, the banks' portfolio of earning assets, the index rate, the volume of reserves, the volume of excess reserves, and the amount of indebtedness to Federal Reserve banks are jointly explained by this formulation in terms of the (adjusted) monetary base[2] plus the cumulated sum of reserves liberated (or frozen in) by past changes in the requirement ratios, the rediscount rate, two parameters expressing specific asset preferences

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[2] The adjusted monetary base is equal to the monetary base minus discounts and advances. The monetary base is the amount of money directly issued by the authorities. Its precise definition depends on the institutional arrangements.

of the public, an index of interest rates on related credit markets, the outstanding stock of government securities, and income.[3]

The "money supply function" is thus obtained as a solution of the formal structure describing the operation of the bank oriented credit market. The function defines a relation between policy variables and the money stock. Partial correlation analysis based on monthly data or on quarterly averages of monthly data and covering very differently situated sample periods confirms this connection between the monetary base, the reserve requirements, and the money supply. It appears that the monetary base is the most important magnitude explaining the behavior of the money stock. Explanations which disregard the base yield thoroughly unreliable results or factually erroneous conclusions.[4] The relative importance of the base does not signify irrelevance of other explanatory magnitudes. Variations in reserve requirements contribute substantially to the behavior of the money stock as do the shifts in parameters expressing the public's asset preferences between currency and deposits, or between demand and time deposits.

A useful operation of monetary policy depends on the effective transmission of policy actions to the money stock and, conceivably, to other monetary variables. Existence or absence of such a transmission, particularly in a deflationary environment, is still under consideration. The hypothesis outlined enables a systematic inquiry into crucial links of the monetary mechanism which endanger a persistent connection between policy and monetary variables. With a vanishing interest elasticity of the public's net supply of assets to banks, a vanishing elasticity of the banks' net demand for assets with respect to an accrual of excess reserves, and an indefinitely large interest elasticity of the banks' asset acquisition, the monetary variables would respond to neither open market nor to requirement policy. Experience indicates that a direct evaluation of the public's and the banks' behavior properties yields, at best, tenuous and unclear evidence. The hypothesis eliminates this difficulty by a transformation of not directly assayable propositions into statements to which we may associate a meaningful appraisal procedure. The hypothesis implies that each of the three specified elasticities is a sufficient condition for the money supply function to have a derivative not exceeding unity with respect to the base and a zero de-

[3] See Appendix A for a concise formal statement, together with a few observational results.

[4] The Radcliffe *Report* apparently misses the significance of the base. The report complains that the money supply grew during the last decade in spite of a constant cash ratio and concludes that the money supply was evidently uncontrolled. The report neglects completely that the base is the most important determinant of the money stock and that the base grew continuously and at an accelerating rate since 1949 by courtesy of U.K. policy.

rivative with respect to the requirement ratios and with respect to the parameters expressing the public's pertinent asset preferences. Consequently, any evidence bearing directly on the properties of the money supply function contributes indirectly to assay propositions about the crucial elasticities in the structure of the bank oriented credit market. Estimates derived from observations generated under radically different economic conditions consistently yield values of the "monetary multiplier" (i.e., the derivative of the money supply function with respect to the base) in the range 1.5 to 3.5 and confirm the significance, expected sign, and expected relative order of magnitude of other derivatives. The persistent pattern of the results obtained under deflationary and inflationary "economic climates" is incompatible with the indicated behavior elasticities blocking the transmission of policy actions to the monetary variables.

Discussions about monetary policy frequently assign to bank reserves a crucial significance in the money supply mechanism. The precise meaning of these statements is often ambiguous, and their formulation permits the following three alternative explications: the volume of bank reserves is a policy variable; the volume of bank reserves is immediately and completely controlled by policy variables; and the volume of bank reserves is a target variable; it is chosen by the authorities as a signal for appropriate policy actions. The first interpretation can be immediately dismissed. The third interpretation admits bank reserves as an endogenous magnitude determined by the total interaction of all pertinent relations. The important issue under this interpretation bears on the rational choice of signs by the monetary authorities, and I contend that to include bank reserves among the signs to be watched raises the likelihood of inappropriate actions, measured in terms of income stabilization. The second interpretation raises a substantive issue. It usually involves a dismissal of the public's asset preferences as a determinant of money supply behavior and, in particular, a dismissal of the public's marginal propensity to hold currency. Its logical structure appears to exhibit a causal ordering of money stock, reserves, and monetary base which conflicts with the causal ordering determined by the theory outlined. The second interpretation implies a linear ordering from B over R to M; whereas, the theory specifies both M and R as jointly dependent on B. This latter formulation permits an evaluation of the issue with the aid of partial correlation analysis, and we observe that the results are more compatible with the theory outlined than with the second interpretation.[5]

[5] The partial Kendall coefficients for the period 1947-57, computed from quarterly averages of seasonally unadjusted monthly values, are:

$$M, B/R = +.581 \qquad M, R/B = .058$$

III

An effective connection between policy variables and monetary variables is a necessary but not a sufficient condition for the transmission of policy actions to the relevant target variables. A useful operation of monetary policy requires, in addition, an effective causal connection between monetary and target variables. Observations of high correlations between income or prices and the money stock affirm the significant existence of the second subrelation. However, this correlation conveys no information about the causal ordering of the underlying structure which generates the relation. We are yet confronted by rival interpretations of this relation. One interpretation recognizes, in the observed correlation, the demand for money and denies the existence of any significant feedback from monetary variables to aggregate demand for output. Another interpretation explains the second subrelation in terms of the joint interaction of a "demand pull" for money and an "asset push" on aggregate demand. Under the first interpretation monetary policy would be useless, unless we acknowledge a substantial interest elasticity of aggregate demand; whereas, the second interpretation provides a theoretical basis for policy actions.

Both interpretations admit the notion of a demand function for money, and the suitable formulation of the substantive issue concerning the causal nexus of the monetary variables requires explicit consideration of this demand function. The Keynesian analysis generalized the Cambridge demand schedule by relating the desired money balance to both interest rate and current income. A demand function of this type can be derived from a number of higher level hypotheses. Such analytical formulation may exhibit the theory under consideration as a connected part of a more general structure, but it cannot justify the theory's empirical content. Quarterly observations drawn from the period 1939-57 and annual observations covering the period 1929-59 yield coefficient estimates which are statistically significant and also possess the expected sign. The results thus confirm the basic idea, expressed by the Keynesian demand function, viz., that desired balances are systematically associated with interest rates and a major component of current transactions. Purely "associative laws" form a considerable part of our systematic knowledge, and they contribute usefully to elucidate a number of broad policy problems. Nevertheless, the usefulness of a theory rises with our ability to specify relatively stable orders of magnitude.

It should be noted that the hypothesis outlined can be extended to cover related credit markets and thus to incorporate the behavior patterns of nonbanking financial institutions. A preliminary investigation of the comparative usefulness of the hypothesis yielded an average error of 1.8 per cent in predicting ten observations not contained in the sample underlying the coefficient estimates.

Stability of the quantitative properties permits a successful application of the hypothesis to more detailed policy situations. Unfortunately, the demand hypothesis under consideration does not satisfy these more stringent requirements.

A diligent search for more fruitful hypotheses is under way. Promising modifications are suggested by an errant tradition which relates desired balances primarily to "wealth" and interest rates. The success of these modifications depends decisively on a useful specification of the term wealth. One line of investigations, opened by Professor Friedman, determines an index of wealth with the aid of a functional containing current income's time function as an argument. This demand theory explains the desired balances in terms of the wealth index per capita (labeled "permanent" income), population and permanent prices. The Friedman hypothesis yields an explanation of velocity which consistently subsumes both secular and cyclic behavior and to this extent, at least, appears more highly corroborated than the Keynesian demand function. Yet, the demand theory formulated by Friedman has to prove its mettle under a more detailed quantitative appraisal. A casual inspection of the data, particularly for the thirties and fifties, reveals quite substantial differences between actual and estimated velocities, and the signs of the deviations seem broadly related to the comparative levels of interest rates in the two periods. Two modifications of the Friedman theory were therefore tentatively considered, both of which maintain the advance gained in the explanation of velocity. Each modification incorporates an index of interest rates; one replaces permanent prices by current price, and the other replaces permanent prices by transitory income in current prices. Estimates were based on annual data drawn from the period 1919 to 1959 and computed for a number of subperiods. With one exception, having a very small power of discrimination, the interest elasticities are significantly negative; the elasticity of desired balances with respect to "permanent income" dominates persistently; its value exceeds considerably the value of interest elasticity and is approximately three times the elasticity with respect to current prices or transitory income.[6]

The concept of a demand for money helps clarify the nature of the chain linking monetary variables and current output. The demand function for money reveals an aspect of the public's allocation pattern for wealth. The optimal composition is determined by the "inherited"

[6] The modification of the Friedman hypothesis involving current prices was estimated for the total period and four subperiods. Only the subperiod 1919-34 yielded a positive and nonsignificant interest elasticity. The modification involving transitory income was estimated for the total period and two subperiods. The estimated interest elasticities are all significantly negative and cluster closely in the range —.27 to —.22. See furthermore Appendix B.

portfolio, the price-constellation, and the preferences between types
of assets and liabilities. Variations in prices and the inherited position
induce, in general, readjustments in the optimal portfolio. These re-
arrangements and the associated price movements are an essential
feature of the monetary mechanism which transmits changes in policy
variables to national income or current output. Deviations of actual
from desired balances induce readjustments in the public's balance-sheet
position involving the whole range of assets and liabilities. These re-
adjustments in asset portfolios spill over into the markets for current
output. Three links of the chain are of particular significance: bonds
are not the only substitute for money, for substitutability permeates
the whole spectrum of assets, production of assets is a close substitute
for the existing assets, and many services are close substitutes for the
holding of assets. An increase in the public's money balances generated
by suitable policy actions thus triggers a substitution chain in the
public's portfolio which spills over to new production of assets and
services and thus affects aggregate demand for output.

   This general argument can be represented by an extensive class of
formal structures. These formalizations explicate the idea that optimal
stocks and flows (i.e., purchases) depend simultaneously on prices and
wealth. The money stock affects the demand decisions for assets and
output as a component of the inherited wealth position, and the useful-
ness of monetary policy hinges on the circumstance that such action
simultaneously modifies the market situation confronting the public
and its inherited portfolio. The precise incorporation of wealth into the
demand function, particularly into the components of aggregate de-
mand for output, still requires investigation. One view holds that net
worth completely summarizes the relation between a portfolio position
and demand behavior. This view implies that variations in the compo-
sition of a constant net worth exert no effect on demand. Another view
contends that both net worth and its composition affect demand be-
havior. A particularly important aspect of this problem concerns the
comparative order of asset and liability effects. The net worth hy-
pothesis, for instance, assigns equal significance to both. The resolution
of this issue has far-reaching ramifications. Our interpretation of non-
banking financial intermediaries, of changes in their portfolio composi-
tion exemplified by a loan expansion balanced by a sale of government
securities, and of new issues of government securities depends sub-
stantially on the existence and order of magnitude of the liability effects.
The degree of inflation resulting from a reallocation of resources to the
government financed by an injection of base money is independent, un-
der a net worth hypothesis, of the monetary multiplier. This multiplier

would be significant in case the asset effects exceed the liability effects, and demand behavior depends on the composition of net worth.

The general idea of a balance-sheet reaction process with eventual spill-over to current production of assets and services appears to explain without difficulties a number of observable patterns. A broad range of observations is consistent with hypotheses based on this idea and diffi-cult to reconcile with theories which neglect or explicitly deny the chain of interdependent balance-sheet adjustments. Among the pertinent ob-servations we may note the following four: A constant deficit financed by new issues of base money has been associated without exception with a rising price level, and stabilization occurred only when the relation be-tween deficit and the rate of change of the base was broken. The elimina-tion of controls after a large accrual of money balances permits a de-layed adjustment of actual to desired wealth positions, and the usually occurring increase in prices reveals the operation of this process. Further-more, cross-section data seem to indicate that money balances are not erratically distributed among economic units relative to other com-ponents of wealth. In particular, larger balances are associated, in the average, with greater values of most other important types of assets and liabilities. Lastly, the operation of the portfolio adjustment mechanism implies that, at least in periods exhibiting sufficiently large variations in the money stock, hypotheses which incorporate this monetary vari-able as an argument of the aggregate demand function for output yield better results than hypotheses which eliminate any reference to mone-tary variables.[7] These remarks do not justify a particular class of monetary theories—but they do constitute a case for considerable in-vestment of resources to further a detailed investigation of the chain connecting monetary and target variables.

APPENDIX

A. The money supply hypothesis is characterized by the following variables and relations: $M=$ money stock (including time deposits); $b=$ monetary base; $E=$ banks' portfolio of earning assets; $k=$ rate at which reserves are liberated or frozen in by current changes in reserve requirements; $K=$ integral over time of k; $v=$ volume of excess reserves; $i_1=$ index of bank loan-rates and bond yields; $i_2=$ index of interest rates on related credit markets; $d=$ rediscount rate; $n=$ banks' volume of in-debtedness to Federal Reserve; $S=$ government securities outside gov-ernment sector (including central bank); $Y=$ national income; $C^p=$ cur-rency held by public; $T=$ time deposits held by public. The equations are:

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[7] Some evidence bearing on this problem was presented in the paper by K. Brunner and A. Balbach, "An Evaluation of Two Types of Monetary Theories," *Proceedings of the Western Econ. Asso.*, 1959.

(1) $\dot{E}^d = h(i_1, d, v, E, n)$; $h_1 > 0 > h_2$; $h_3 > 0 > h_4$; $h_5 < 0$
banks' net flow demand for earning assets.

(2) $\dot{E}^s = f(i_1, i_2, E, S, Y)$; $f_1 < 0 < f_2$; $f_3 < 0 > f_4$; $f_5 > 0$
public's net flow supply of assets to banks.

(3) $\dot{n} = g(i_1, d, v, E, n)$; $g_1 > 0 > g_2$; $g_3 < 0 < g_4$; $g_5 < 0$
borrowing from Federal Reserve by commercial banks

(4) $C^p = c_0(z) + .15M$
public's demand for currency.
z is an unspecified vector, not immediately needed for our purposes. The analysis uses c_0, the demand component independent of the monetary wealth.

(5) $T = t_0(y) + .15M$ public's demand for time deposits.
y is an unspecified vector. t_0 is the demand component independent of monetary wealth.

(6) $\dot{v} = a_1\dot{b} + k - a_2\dot{c}_0 + a_3\dot{t}_0 - a_4\dot{E}$; accrual of excess reserves; $0 < a_i < 1$ for every i.
The detailed nature of the coefficients a_i is determined by the institutional arrangements of the system.

(7) $h = f$ condition of flow equilibrium
(8) $h = 0$ condition of stock equilibrium
(9) $M = b + E$ definition of money supply
(10) $g = 0$ condition of stock equilibrium for n

A linear approximation to the solution for the money supply can be obtained from the above system:

$$M = m_0 + m_1b + m_2K - m_3c_0 + m_4t_0 + m_5Y - m_6S + m_7i_2$$

$$m_1 \sim 1 + m_2; \qquad m_1 \sim m_3 > m_4 > m_5 \sim m_6 > 0$$

It seems that as a first approximation we may often neglect the last three terms, particularly in case they exhibit offsetting movements. Quarterly data from the period II/1929–IV/1933 were used to compute one such approximation. The regression estimated from the sample period 1929-40 (annual data) reveals the order of magnitude pattern of the coefficients. The regressions were deliberately selected from the most deflationary environment of recent experience. Sample period II/1929-IV/1933:

$$M = 9.07 + 1.86(b + K) - 2.75c_0 + 1.11t_0$$

$$R = .997 \quad (.83) \qquad\qquad (.49) \quad (.24)$$

$$.50 \qquad\qquad -.83 \qquad .77$$

Sample period 1929-40:

$$M = 8.93 + 1.50b + .23K - 2.12c_0 + 1.11t_0 + .06Y - .09S$$

$$R = .995 \quad (.12) \quad (.24) \quad (.56) \quad (.24) \quad (.02) \quad (.02)$$

$$.90 \quad .15 \quad -.51 \quad .59 \quad .43 \quad -.53$$

The numbers in parenthesis below the regression coefficients are standard errors. R indicates the multiple correlation coefficient and the second row of numbers below the regression coefficients are the partial correlation coefficient.

B. The three types of demand functions yielded the following estimates for their respective total sample period:

(1) sample period 1929-55 (annual data):

$$\log \frac{M}{N} = -.30 - .23 \log i + .89 \log \frac{Y}{N}$$

$$R = .990 \qquad (.06) \qquad\qquad (.03)$$

$$-.64 \qquad\qquad .97$$

(2) sample period 1929-55 (annual data):

$$\log \frac{M}{N} = -2.06 - .22 \log i + 1.53 \log w + .57 \log \frac{y}{w} + .57 \log p$$

$$R = .990 \quad (.07) \qquad\quad (.59) \qquad\quad (.15) \qquad\qquad (.15)$$

(3) sample period 1919-55 (annual data):

$$\log \frac{M}{N} = -3.45 - .30 \log i + 1.70 \log w + .48 \log P$$

$$R = .993 \qquad (.05) \qquad\quad (.12) \qquad\quad (.06)$$

$$-.73 \qquad\quad -.93 \qquad\quad .82$$

Numbers in parenthesis are standard errors. M=money stock (including time deposits); N=population; i=index of bank loan rates and bond yields; w="permanent" income per capita; Y=GNP in current prices; y=GNP per capita in constant prices; p=implicit GNP deflator; P=index of wholesale prices.

Equation (b) is obtained by rearranging the original regression which contains $\log i$, $\log w$, and $(\log Y/N - \log w)$ as arguments. R=multiple correlation coefficient. Second row of numbers below regression states the partial correlation coefficients.