Does Money Still Matter?

Willis L. Peterson

The basic tenant of the quantity theory, that money matters, has been challenged by a number of recent empirical studies. Benjamin Friedman and Kenneth Kuttner (1992) report that the empirical relation between money and economic activity appears to have changed after 1970, with money now playing a less important role. In an earlier study, Robert Gordon (1982) finds little evidence that anticipated changes in the money supply affect real output. And contrary to Milton Friedman's (1968) admonition that instability in the rate of growth of the nation's money supply has caused large and damaging fluctuations in economic activity, Robert Litterman and Laurence Weiss (1985) find that monetary fluctuations have not been a major factor causing instability in the economy.

Using the Granger causality test, Christopher Simms (1972) found that causality runs entirely from money to GNP without feedback. However, in a later study Simms (1980: 250) reports that "a nonmonetarist explanation of the dynamics, based on the role of expectations in investment behavior, seems to fit the estimated dynamics better." In a more strongly worded conclusion, Christopher Niggle (1991) argues that monetarist rules are nonsensical because the money supply is determined endogenously by the interaction of banks and borrowers. In other words, even if money does matter, the monetary authority cannot stabilize the economy or influence economic activity because of an inability to manage the money supply.

In the original quantity theory, money (M) has a direct impact on nominal income (Y or GDP). Since the quantity equation of exchange,

$$MV = Y, \tag{1}$$

is an identity, in order for a change in M to not change Y, the income

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Willis L. Peterson is the Morse Distinguished Teaching Professor in the Department of Applied Economics at the University of Minnesota, St. Paul.

velocity of money (V) must change proportionally in the opposite direction. Is that plausible?

This question is addressed by the new quantity theory as set forth by the Cambridge equation,

$$M = kY, \tag{2}$$

where k (1/V) is the proportion of nominal income held as money (Friedman 1956). If people are holding the desired equivalent of their annual income as money, a change in M creates disequilibria. For example, an increase in M causes actual k to exceed desired k, unless desired k increases for some reason. If desired k does not increase, equilibrium is reestablished by an increase in GDP, not by a decrease in M; all money must be held by someone. The increase in Y comes about by an increase in spending as people attempt to draw down their monetary assets. The opposite occurs if M decreases. Now actual k is less than desired k. To build up their money balances, people decrease their rate of spending, thereby reducing Y, and reestablishing equilibrium k.

The main use of the new quantity theory is to explain and predict changes in k or V. Consider an increase in M that exceeds the growth of real output. There will be inflationary pressure, unless desired k increases (V decreases). But during inflation money becomes a less desirable asset to hold. Therefore asset holders will attempt to decrease k rather then increase it. Although individuals can rearrange their asset mix, away from money in favor of other assets, in the aggregate they cannot. Yet asset holders can reestablish equilibrium to the new, smaller desired k by increasing Y, that is by spending at a faster rate as they attempt to draw down their monetary balances. Thus any change in k or V that occurs because of an increase in the growth rate of M can be expected to accentuate rather than mitigate the effects of the change. However, growth rates of M probably have to exceed what has been experienced by the United States for this phenomenon to have a noticeable effect.

In the event of a decrease in M, or a decrease in its rate of growth, the opposite can be expected. If actual k falls below desired k, agents can reestablish equilibrium by spending at a slower rate, causing Y to decrease, or at least decrease its rate of growth. If unemployment threatens, they may try to build up their cash balances—that is, increase desired k. They can do so by decreasing their rate of spending causing a smaller Y than would otherwise occur. Thus, an attempt to increase desired k, or decrease V, also accentuates the dampening effect of the original tight money situation. Consequently we should

expect k to increase, V decrease, in times such as the Great Depression, which it did.

Since the new quantity theory predicts that any change in k or V that occurs because of a change in the growth rate of M will accentuate rather than mitigate the after effects, the results reported by the aforementioned empirical studies stand in contrast to the quantity theory—the original and the new. Either the empirical studies are reporting erroneous results, or the quantity theory is wrong.

This paper has three objectives: (1) to report the results of conducting a statistical test of the quantity theory, with particular emphasis on whether the relation between money and nominal GDP has changed over time, (2) to present economic evidence bearing on the causality question of whether money is endogenously determined, and (3) to provide evidence from an estimated labor market model on whether money is neutral or non-neutral in its effect on unemployment.

Statistical Test of the Quantity Theory

By necessity, empirical work on the impact of money on economic activity must utilize aggregate, time-series data. The problems of using such data are well known: serial correlation, multicollinearity, lack of relative variation among the variables, and spurious correlation due to trend. To mitigate those problems, a first difference equation of the quantity equation of exchange is estimated:

$$\dot{Y} = A + b\dot{M}, \tag{3}$$

where the dots indicate annual percent change of the variables. In this case b is an elasticity rather than a velocity—the percentage change in nominal income associated with a 1 percent change in the money stock. Although it is asking a lot of the money variable to predict changes in a rate of change of GDP, a statistically significant b coefficient represents a robust test of the theory.

The time period considered is 1929 to 1994, omitting 1940–48, the World War II years and the immediate postwar adjustment period. The wide variety of economic conditions that existed over this period, ranging from the Great Depression of the 1930s to the double-digit inflation of the 1970s and the recessions of the early 1980s and 1990s, yields data with enough variability to conduct a meaningful test of the quantity theory.[1]

[1]All data utilized in this study are from the *Economic Report of the President* (1969 and 1994) except the pre-World War II money data and data on deposits in postal savings banks and mutual savings banks, which are from Friedman and Schwartz (1970).

The proper definition of money remains an unsettled issue. Basically, this is an empirical question: Which definition is the best predictor of GDP? Here three definitions of money are utilized: M1, M2+, and MD. M1 is currency plus demand deposits. M2+ is defined as M2 plus large denomination time deposits and deposits in thrift institutions, including postal savings and mutual savings banks deposits, which were relatively important in the early part of the period. MD is the difference between M2+ and M1:

$$MD = M2+ - M1. \tag{4}$$

Because the annual percentage rates of change between M1 and MD are not highly correlated over the study period ($r = .31$), these two components of M2+ can be inserted as separate variables in the regression. If the less liquid forms of money included in MD are not important determinants of economic activity, the coefficient on MD should be small and insignificant.

Two lag structures of the effect of money on nominal GDP were tried: the percentage change in M from the preceding year, $(M_t - M_{t-1})/M_{t-1} \times 100$, and the percentage change from two years back, $(M_t - M_{t-2})/M_{t-2} \times 100$. In the quantity theory regressions the shorter lag yielded larger t-ratios and R^2s. Hence the shorter lag is utilized throughout the paper. Also to correct for serial correlation, all regressions are estimated by the auto-regressive Cochrane-Orcutt technique. Finally, all equations contained a constant term which is not shown because of its irrelevance.

As shown in columns 1 and 2 of Table 1, M2+ is a better predictor of GDP than M1. Column 3 shows the results of inserting a slope dummy on M2+ for the 1930–69 period. During the 1970s and 1980s there were large changes in the composition of M2+, away from currency and demand deposits in favor of less liquid forms (Table 2). Possibly the finding that money is no longer an important determinant of economic activity is due to the use of an improper definition. The coefficient on M2+ of .782 reflects the relationship between M2+ and GDP over the 1970–94 period. Although the slope dummy is positive, indicating a slightly larger coefficient on M2+ for the 1930–69 period, it is not statistically significant. From this result, it appears that the relationship between M2+ and GDP has been relatively stable over the 57-year period under consideration.

The regression results obtained when M2+ is divided into the two components, M1 and MD, are shown in column 4 of Table 1. It is noteworthy that the M1 coefficient increases in size and significance when MD is added to the equation. This suggests that statistical estimates of the quantity equation, or other relations involving money,

TABLE 1

STATISTICAL TEST OF THE QUANTITY THEORY: FIRST-DIFFERENCE EQUATIONS

Independent Variables	Regression Coefficients[a]				
	(1)	(2)	(3)	(4)	(5)
% Δ M1	.259 (1.81)[b]			.458 (4.05)	.366 (1.97)
% Δ M2+		.809 (6.82)	.782 (5.27)		
% Δ MD				.531 (6.36)	.656 (4.28)
% Δ M2+D3069			.066 (.422)		
% Δ M1D3069					.188 (.853)
% Δ MDD3069					−.181 (−1.11)
R^2	.374	.521	.522	.533	.566
D.W.	2.15	2.05	2.04	2.03	2.04

[a]The dependent variable for each equation is the annual percentage change in nominal GDP.
[b]Figures in parentheses are *t*-ratios.

TABLE 2

PROPORTION OF M1 IN TOTAL U.S. MONEY SUPPLY

1929–34	.602	1970–74	.284
1935–39	.680	1975–79	.229
1949–54	.603	1980–84	.168
1955–59	.510	1985–89	.141
1960–64	.403	1990–94	.162
1965–69	.335		

can result in specification bias if the less liquid forms of money are omitted from the equation(s). Also the MD coefficient is larger than the M1 coefficient, implying that the less liquid forms of money are even more important determinants of nominal GDP than M1. The

sum of the M1 and MD coefficients of .989 shown in column 4 suggests that annual percentage changes in money, broadly defined, are nearly proportional to changes in nominal GDP.

The statistically insignificant slope dummies for both M1 and MD coefficients shown in column 5 come as something of a surprise considering the large change that has occurred in the composition of M2+ over this period. As shown in Table 2, M1 accounted for over 60 percent of the total money supply in the immediate pre- and post-WWII period, declining to about 15 percent in the 1980s and 1990s. In any case, the relation between both M1 and MD and nominal GDP appears to have been relatively stable over the 1929–94 period.

The Causality Question

Whether money affects economic activity or vice versa, remains an unsettled issue. As an alternative to the Granger test of causality, which is purely statistical and devoid of economic content, one might ask what economic conditions are consistent with the hypothesis that changes in the money supply are determined endogenously by autonomous changes in consumer, investor, or government spending. An increase in the propensity to spend by one or more of these groups, at any given income level, could stimulate bank lending and increase the money supply along with GDP. Changes in imports or exports also could affect bank deposits and the money supply.

To test that hypothesis, annual percentage changes of the following variables are regressed on annual percentage changes in M1 and MD over the 1929–94 period:

APC = consumer spending/disposable income,
API = investment spending/private saving,
APG = federal government spending/GDP,
APD = federal government spending/revenue,
IM = nominal imports,
EX = nominal exports.

If year-to-year changes in the growth of the money supply are endogenously determined by changes in the propensities to spend by consumers, investors, and the federal government, their respective coefficients should be positive and significant.

Federal government spending financed in part by the purchase of bonds by the Federal Reserve can exhibit a positive coefficient even though the change in the quantity of money is induced by Federal Reserve action. In this case a positive coefficient on the federal spending/GDP variable would be consistent with the hypothesis of an endog-

enously determined money supply growth but would not be a definitive text of the hypothesis. Hence, the variable APD (average propensity to incur a deficit) is added to "hold constant" the effect of "printing money" to finance federal government deficits. The regression results are presented in Table 3. The same data used for the Table 1 regressions are utilized here.

As shown in Table 3, the coefficients on the private consumer and investment spending propensities are negative for both M1 and MD, and for MD they are highly significant. The coefficients on federal government spending are negative but not statistically significant. The trade coefficients are statistically insignificant. The negative coeffi-

TABLE 3

A TEST OF THE HYPOTHESIS THAT THE MONEY SUPPLY IS ENDOGENOUSLY DETERMINED

Dependent Variables	Regression Coefficients[a]	
	(1)	(2)
	% Δ M1	% Δ MD
% Δ APC	−.642	−1.10
	(−1.35)[b]	(−2.70)
% Δ API	−.064	−.163
	(−1.18)	(−3.45)
% Δ APG	−.091	−.101
	(−1.41)	(−1.77)
% Δ APD	.063	−.006
	(1.32)	(−.144)
% Δ IM	.022	−.099
	(.201)	(−.951)
% Δ EX	−.101	−.107
	(−1.13)	(−1.38)
R^2	.253	.639
D.W.	1.80	1.78

[a]The independent variables for the regressions are the percentage change in M1 (column 1) and the percentage change in MD (column 2).

[b]Figures in parentheses are *t*-ratios.

cients do not support the hypothesis that changes in the money supply are endogenously determined by autonomous changes in private or federal government spending. Nor does international trade appear to exert an influence over the money supply. These results imply that the direction of causation is from money to spending, rather than the other way around.

The results presented in Tables 1 and 3 support the hypothesis that money still matters—that is, the quantity theory is correct and the results reported by the aforementioned empirical studies are wrong.

Sources of Unemployment Variation

Although variations in M1 and MD appear to be important determinants of variations in nominal GDP, the quantity theory cannot tell us how much of the effect is on real output and how much is on prices. If real output is affected by changes in the money supply, money is non-neutral. The principal concern here is the effect of money on unemployment.

Unemployment above the natural rate implies disequilibrium in the labor market which rules out models that require equilibrium conditions. Thus, a reduced-form model of the U.S. labor market is estimated to measure the impact of money on unemployment.

Since the demand for labor is a derived demand, derived from the demand for goods and services, shifts in the demand for goods and services cause shifts in the demand for labor. If money is non-neutral, affecting the demand for goods and services, it should also affect the demand for labor.

Short-run wage stickiness, or incomplete adjustment to labor demand or supply shifts, will result in changes in the gap between the quantity of labor demanded and the quantity supplied, that is, in the unemployment rate. Therefore, a reduced-form, first-difference equation model of the labor market can be written as:

$$\dot{U} = f(\dot{D}_l, \dot{S}_l), \tag{5}$$

where $\dot{U}$, $\dot{D}_l$, and $\dot{S}_l$ represent annual rates of change in the unemployment rate, the demand for labor, and supply of labor respectively.

Shifts in the demand for labor can come from two sources: internal (I) and external (E) to the private sector. Thus,

$$\dot{D}_l = g(\dot{I}, \dot{E}). \tag{6}$$

Internal sources are taken to stem from changes in the average propensity to consume (APC) and to invest (API). As defined previously,

$$APC = \frac{C}{DI} \tag{7}$$

$$API = \frac{GDI}{S}, \tag{8}$$

where, C = consumer spending,
DI = disposable income,
GDI = gross private domestic investment, and
S = gross private saving (households plus firms).

Thus,

$$\dot{I} = h(\dot{APC}, \dot{API}). \tag{9}$$

External sources affecting labor demand include monetary, fiscal, and international trade factors. Monetary forces emanate from changes in monetary policy. Two alternative measures of monetary policy changes are utilized: (1) changes in the money supply (M) and (2) changes in the interest rate (i).

Fiscal forces are measured by changes in federal government spending (FS) and federal taxes (FT). As in the Keynesian and aggregate demand-supply models, changes in federal government spending or taxes can shift the demand for goods and services, thereby shifting labor demand.

Forces affecting labor demand from the trade sector are measured by annual percentage changes in imports (IM) and in exports (EX). The usual argument is that imports cause a reduction in demand for domestic goods, thereby decreasing labor demand and increasing unemployment. The opposite is expected for the effect of exports on labor demand. Thus,

$$\dot{E} = j(\dot{M}, \dot{FS}, \dot{FT}, \dot{IM}, \dot{EX}), \text{ and} \tag{10}$$

$$\dot{E}' = k(\dot{i}, \dot{FS}, \dot{FT}, \dot{IM}, \dot{EX}). \tag{10'}$$

Autonomous factors affecting the supply of labor are proxied by changes in the labor force participation rate (LPR). Short-run increases in this rate could increase the unemployment rate until the new entrants are assimilated into the work force:

$$\dot{S} = l(\dot{LPR}). \tag{11}$$

Combining equations (9) through (11) into equation (5) yields:

$$(12) \qquad \dot{U} = m(\dot{APC}, \dot{API}, \dot{M}, \dot{FS}, \dot{FT}, \dot{IM}, \dot{EX}, \dot{LPR}), \text{ and}$$

$$(12') \qquad \dot{U}' = n(\dot{APC}, \dot{API}, \dot{i}, \dot{FS}, \dot{FT}, \dot{IM}, \dot{EX}, \dot{LPR}).$$

The results of estimating equations (12) and (12′) are shown in Table 4. The first regression, shown in column 1, incorporates the two money variables, M1 and MD, as indicators of monetary policy, while in regressions (2) and (3) interest rates are used instead. Since changes in short-term nominal interest rates are a function of rates of change of the money supply, it is not correct to include both the interest rate and money as explanatory variables in the same equation.

The annual percentage change of APC exhibits a positive coefficient in all three equations—the higher the unemployment rate the higher is APC. It appears, therefore, that unemployment is not caused by a decrease in desired consumer spending. Although total consumer spending may decline during time of higher unemployment, as in the Great Depression, that does not appear to be due to a decrease in desired spending as measured by APC, but rather to a decrease in money to maintain spending. In fact, APC reached 1.00 in 1933. Since consumer spending accounts for over 80 percent of total private spending, the private sector can be seen as having a stabilizing rather than a destabilizing effect on the economy.

The negative and statistically significant coefficients on both M1 and MD attest to the short-run non-neutrality of money. This does not mean that higher long-term growth rates of money will necessarily yield lower rates of unemployment. In these results it is the change in growth rates that matters.

Although the interest-rate coefficients in regressions (2) and (3) are both positive, neither is statistically significant, in contrast to the results of the Fuhrer and Moore (1995) study. Of the two, the Federal Reserve discount rate is least important, implying that the Federal Reserve should be more concerned about regulating the growth of the money supply than about influencing interest rates.

The coefficients on the two fiscal policy variables, growth rates of federal government spending, and federal taxes, do not come close to being statistically significant in all three regressions. The import variable coefficient also is not statistically significant in all three regressions and is even negative in regression (1). Apparently in years of relatively full employment, consumers purchase more imported as well as domestic goods. In other words, it appears that the U.S. economy drives imports rather than the other way around. The export coefficients have the expected negative sign and are statistically significant in all three equations. Since U.S. exports have traditionally

TABLE 4

SOURCE OF VARIATION IN U.S. UNEMPLOYMENT RATE 1929–94

Independent Variables	Regression Coefficients[a]		
	(1)	(2)	(3)
% Δ APC	.221 (1.81)[b]	.342 (2.55)	.321 (2.48)
% Δ API	−.070 (−5.10)	−.039 (−2.61)	−.042 (−2.93)
% Δ M1	−.070 (−2.28)		
% Δ MD	−.084 (−3.15)		
Δ int. rate		.415[c] (1.54)	.078[d] (.363)
% Δ fed. spending	.007 (.568)	.008 (.591)	−.009 (.642)
% Δ fed. taxes	−.001 (−.336)	−.0001 (−.056)	.0003 (.009)
% Δ imports	−.005 (−.198)	.036 (1.23)	.029 (1.00)
% Δ exports	−.050 (−2.67)	−.059 (−2.61)	−.053 (−2.23)
% Δ labor participation rate	.473 (1.62)	.467 (1.41)	.442 (1.30)
R^2	.752	.672	.658
D.W.	2.04	2.17	2.19

[a]The dependent variable for each regression is the annual rate of change in the unemployment rate.
[b]Figures in parentheses are *t*-ratios.
[c]Interest rate on Moody's Aaa bonds.
[d]Federal Reserve discount rate.

accounted for less than 10 percent of GDP, possibly the increase in exports during times of decreased unemployment stems from the increase in production for the domestic market.

On the supply side of the labor market, the coefficient for the labor force participation rate, although positive, is not statistically significant.

It appears that there is ample demand for the output from as many people as wish to participate in the labor force. One might conclude that to maintain full employment, it is not necessary to ration jobs or keep out migrant workers. The total economy is *not* like an individual business firm or industry which faces a limited demand for its product.

Conclusion

In this study money is broadly defined to include M2 plus large denomination time deposits and deposits in thrift institutions, referred to as M2+. Dividing M2+ into two components, M1 and the remainder (MD), each was found to bear a stable relationship to nominal GDP over the 1929–94 period, in spite of large changes in the proportion of each in the total money supply. There is no indication that autonomous changes in consumer, investor, or federal government spending affects the money supply in the same direction. The same is true of international trade. To the contrary, those components of GDP appear to reduce the instability in GDP caused by fluctuations in the rate of growth of the money supply.

The results obtained by estimating a reduced-form model of the U.S. labor market attest to the short-run non-neutrality of money on unemployment. On the other hand, changes in interest rates, federal spending and taxes, imports, and the labor force participation rate do not show up as having a statistically significant short-run impact on changes in the unemployment rate.

Overall, the results of this study stand in contrast to the Keynesian view that unemployment stems largely from an unwillingness of consumers and investors to spend. The results even take us beyond the new classical hypothesis that monetary and fiscal policies to combat unemployment are at best ineffective and possibly counterproductive. The evidence presented here suggests such policies are in fact unnecessary. The so-called business cycle in reality appears to be a monetary policy cycle since unemployment above the natural rate appears to be due mainly to the unstable growth of the money supply.

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