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A Monetary Analysis of the Administration's Budget and Economic Projections

KEITH M. CARLSON

THE administration's budget proposals and economic report, presented to Congress and the nation in early February, have generated considerable controversy.[1] The prospect of historically large deficits through 1987 has especially unsettled many observers. Many question the plausibility of the administration's economic forecast, which they consider too optimistic.

Economic forecasts have always been a critical part of the budget process. One can see, however, how their importance is magnified in an inflation-swollen economy. A re-estimate of GNP growth by only 1 percent, for example, results in a change of $13 billion in federal budget receipts within two years.[2] In addition, federal expenditures in recent years have become more sensitive to the pace of inflation and output, as the number of inflation-indexed programs and income-security programs, which automatically change in response to economic conditions, has increased.

Aside from the budget issue, the administration's projections are of general interest because they reflect the philosophy that guides the administration's economic policies. This year's budget and economic report provide the first detailed statement of the administration's economic philosophy. One key difference from the previous administration's philosophy is in the interpretation and role of monetary actions in the determination of economic events.

This article analyzes the role of monetary actions in the current administration's economic framework. The discussion evaluates the consistency of the administration's economic projections, given the structure of the economy and past experience with lags in the effect of economic policy. The basis for this evaluation is a monetary model of the U.S. economy developed at the Federal Reserve Bank of St. Louis.[3] The implications of the analysis also are applied to the federal budget outlook.

MONETARY ANALYSIS AND THE ECONOMIC REPORT

The Economic Report of the President and The Annual Report of the Council of Economic Advisers (CEA Report) together provide a concise summary of the economic philosophy behind the administration's decision-making. President Reagan's report devotes relatively little space to the subject of monetary policy, although the president states support for "... a policy of gradual and less volatile reduction in the growth of the money supply."[4] This support contrasts with President Carter's statement a year earlier "... that public opinion not hold the Federal Reserve to such a rigid form of monetary targeting as to deprive it of the flexibility it needs to conduct a responsible monetary policy."[5]

The most explicit discussion of the role of monetary actions in the administration's economic framework is in the CEA Report. For example, in the opening chapter, which summarizes current economic conditions, the CEA singles out the varying

[1] *Budget of the United States Government for Fiscal Year 1983* (hereafter referred to as Fiscal 1983 Budget) and the *1982 Economic Report of the President*, which also includes the 1982 Annual Report of the Council of Economic Advisers (hereafter referred to as CEA Report).

[2] See Fiscal 1983 Budget, p. 2:9.

[3] For details of this model, see the appendix.

[4] *1982 Economic Report of the President*, p. 8.

[5] *1981 Economic Report of the President*, p. 13.

and generally restrictive rate of monetary expansion as the chief culprit responsible for the economy's unsatisfactory performance in the 1979-81 period. The CEA goes on to say that "continued monetary restraint and a reduction of the within-year variability of money growth . . . are necessary both to reduce inflation and provide the basis for sustained economic growth."[6]

The CEA Report's overall theme is that the federal government's role in economic affairs should be reduced. Consistent with that theme is a program to control inflation, which, as the CEA states forcefully, is essentially a monetary phenomenon. Thus, ". . . a decrease in money growth is the necessary strategy to end inflation."[7] In light of the important role that expectations play in the inflationary process, the CEA is very specific: "For the Federal Reserve, this means setting money growth targets consistent with a sustained decrease in the rate of inflation and then adhering to those targets."[8]

After establishing these guidelines for an anti-inflationary monetary policy, the CEA details the economic prospects for 1982, 1983 and beyond. Assumptions about money growth, however, do not play an explicit role in its economic forecasts. Instead, the CEA's forecasts follow the traditional "adding-up" approach typical of previous CEA Reports; that is, the activity of individual sectors are forecast and summed to obtain an aggregate forecast. Oddly enough, the CEA, after emphasizing the connection between money growth and nominal magnitudes like GNP and the price level, and recognizing the relationship between deviations of money growth from trend and the movements of real GNP, slights the role of money growth in their projections, particularly for 1982 and 1983.[9]

ADMINISTRATION ECONOMIC PROJECTIONS

Ever since enactment of the Congressional Budget and Impoundment Control Act of 1974 (hereafter referred to as the Control Act), the incumbent administration has been required each year to present five-year projections of the federal budget. Thus, the current budget and economic reports cover the period through 1987.

The administration also must set five-year numerical goals for several key economic indicators under the provisions of the Full Employment and Balanced Growth Act of 1978 (Humphrey-Hawkins). This act originally specified the following goals: an unemployment rate of 4 percent and a rate of increase in consumer prices of 3 percent by 1983, and an interim goal for federal outlays to equal 21 percent of GNP by 1981. However, the act allowed a change in this timetable if deemed necessary, and, in January 1980, President Carter extended the timetables for unemployment to 1985 and for inflation to 1988.

A Review of Previous Long-Term Projections

Incumbent administrations have been presenting long-term economic projections since the passage of the Control Act in 1974. Table 1 summarizes these projections.[10] They represent the efforts of three different administrations: President Ford's in 1975-77, President Carter's in 1978-81 and President Reagan's in early 1982.

The table indicates that, for each administration, the one-year forecasts have been quite accurate for all of the indicators.[11] In fact, the record for GNP is good as far as four years ahead. For all the other major indicators, the forecasts tend to deteriorate beyond the two-year horizon. This may reflect the practice

[6] 1982 CEA Report, pp. 24-25.

[7] *Ibid.*, p. 55.

[8] *Ibid.*, pp. 59-60.

[9] The CEA attempts to correct for this oversight. It notes that:

> Concerns have been expressed that the Federal Reserve's targets for money growth are not compatible with the vigorous upturn in economic activity envisioned late in 1982. . . We believe that such fears, while understandable on the basis of recent history and policies, are unjustified in light of current policies and the Administration's determination to carry them through. (1982 CEA Report, p. 25.)

This statement contrasts sharply with a statement found elsewhere in its report:

> Indeed, changes in the trend of the growth rate of nominal GNP over the period 1960 to 1981 are almost entirely attributable to changes in the trend of the growth rate of the money stock (M1), as opposed to changes in the trend of the growth rate of velocity (Chart 3-3). (1982 CEA Report, p. 63.)

[10] The table is limited to the official reports published in January or February of each year and thereby excludes revised estimates when a new administration comes into power and those contained in the mid-session review of the budget.

[11] The root-mean-squared errors for table 1 are as follows:

	GNP	Real GNP	GNP deflator	Unemployment rate
1 year ahead	0.92	1.00	0.97	0.22
2 years ahead	1.01	1.32	1.72	0.45
3 years ahead	1.14	2.77	2.63	1.16
4 years ahead	0.98	3.72	3.59	1.75
5 years ahead	2.46	4.45	4.88	1.97
6 years ahead	2.16	5.16	5.10	2.22

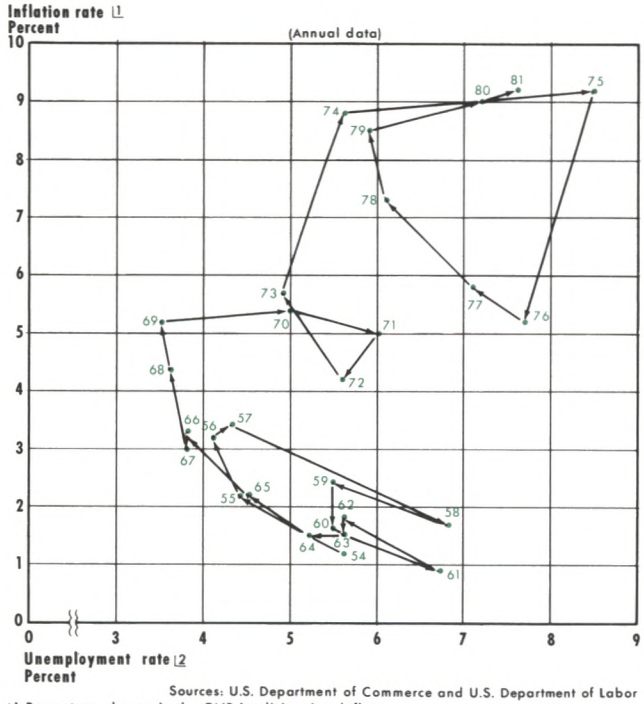
Table 1

Administration Economic Projections (percent)

Date of forecast	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
GNP													
Early 1975	7.2	12.6	12.4	12.0	10.8	10.8							
1976		12.4	12.2	12.4	11.9	10.9	9.1						
1977			11.0	11.3	11.6	10.5	7.9	6.4					
1978				11.0	11.2	10.8	10.5	9.6	8.5				
1979					11.3	9.5	10.1	9.4	7.9	6.3			
1980						8.3	10.7	12.8	12.9	12.0	11.0		
1981							11.4	13.1	12.3	11.8	11.0	10.2	
1982								8.1	11.5	10.2	9.7	9.2	9.0
Actual[1]	8.0	10.9	11.6	12.4	12.0	8.8	11.4						
Real GNP													
Early 1975	−3.3	4.8	5.6	6.5	6.5	6.5							
1976		6.2	5.7	5.9	6.5	6.5	4.9						
1977			5.2	5.1	5.9	5.5	3.9	3.5					
1978				4.7	4.8	4.8	5.0	4.7	4.2				
1979					3.3	2.5	4.2	4.7	4.4	3.4			
1980						−0.6	1.7	4.3	5.0	4.9	4.7		
1981							0.9	3.5	3.5	3.7	3.7	3.7	
1982								0.2	5.2	5.0	4.7	4.4	4.3
Actual[1]	−1.1	5.4	5.5	4.8	3.2	−0.2	2.0						
Price deflator													
Early 1975	10.8	7.5	6.5	5.1	4.1	4.0							
1976		5.9	6.2	6.1	5.0	4.2	4.0						
1977			5.6	5.9	5.4	4.7	3.8	2.8					
1978				6.1	6.2	5.7	5.2	4.7	4.2				
1979					7.7	6.8	5.7	4.5	3.4	2.8			
1980						8.9	8.8	8.2	7.4	6.8	6.1		
1981							10.5	9.3	8.5	7.8	7.0	6.3	
1982								7.9	6.0	5.0	4.7	4.6	4.5
Actual[1]	9.3	5.2	5.8	7.3	8.5	9.0	9.2						
Unemployment rate													
Early 1975	8.1	7.9	7.5	6.9	6.2	5.5							
1976		7.7	6.9	6.4	5.8	5.2	4.9						
1977			7.3	6.6	5.7	4.9	4.8	4.7					
1978				6.3	5.9	5.4	5.0	4.5	4.1				
1979					6.0	6.2	5.7	4.9	4.2	4.0			
1980						7.0	7.4	6.8	5.9	5.1	4.3		
1981							7.8	7.5	7.1	6.7	6.3	6.0	
1982								8.9	7.9	7.1	6.4	5.8	5.3
Actual[1]	8.5	7.7	7.1	6.1	5.8	7.1	7.6						

[1]As of February 1982

Chart 1
Inflation and Unemployment



Sources: U.S. Department of Commerce and U.S. Department of Labor
[1] Percentage change in the GNP implicit price deflator.
[2] Percent of civilian labor force.

whereby assumptions for the current and next year are called "forecasts," but beyond the next year are labeled "projections consistent with moving gradually toward relatively stable prices and maximum feasible employment." For the longer term, these projections seemingly ignore or seriously misjudge some fundamental economic constraints.

The failure of the U.S. economy to achieve relative price stability and "full employment" is obvious when one compares the projection record for these two indicators with actual performance. (For additional historical perspective, see chart 1.) Since the start of publishing long-term projections, *each* administration has projected a general decline of both inflation and unemployment. The actual performance of the economy, of course, has been far different. Though the rate of inflation declined from 1975 to 1976, it has accelerated on an annual average basis each year since then. The unemployment rate did fall from 1975 through 1979, but since then has risen sharply. Such persistent forecast errors are probably a reflection of the fact that each administration gives insufficient weight to the long-term effects of its economic policies. According to the most recent CEA report, "The events of the past 15 years are a good illustration of the danger of pursuing economic policies based on short-run analysis and focused on immediate problems. Sound policy requires emphasis on a time horizon during which the sometimes lengthy, and usually unpredictable, lags in economic processes can work."[12]

Current Projections

Table 2 summarizes the Reagan administration's economic projections. The nominal GNP goal for fourth quarter 1987 is $5,248 billion, which would mean a 9.8 percent average annual rate of increase from 1981 to 1987. This rate would be distributed as a 4.4 percent rate of expansion in real GNP and a 5.2 percent rate of increase in the GNP deflator. In 1987, according to these projections, real GNP would be growing at a 4.3 percent rate, the GNP deflator would be rising at a 4.4 percent rate and the unemployment rate would decline to 5.2 percent by the fourth quarter.

As a part of its program, the administration has proposed a budget plan aimed at a year-by-year reduction in the size of the federal deficit. Federal outlays are projected to decline to 19.7 percent of GNP in fiscal 1987 compared with an estimated 23.5 percent in fiscal 1982. More importantly, however, the administration announced its support of a monetary policy that will produce continued gradual reductions in the rate of monetary growth.

> From the fourth quarter of 1979 to the fourth quarter of 1980, M1 (currency plus checkable deposits) grew at a 7.3 percent annual rate. The Administration assumes a gradual but steady reduction in the growth of money to one-half that rate by 1986.[13]

The CEA notes that inflationary expectations must adjust speedily to the anti-inflationary monetary regime in order to attain these economic goals.[14]

A MONETARY ANALYSIS OF ADMINISTRATION PROJECTIONS

In sharp contrast to previous administrations, the present administration has explicitly spelled out a target path for monetary growth. It is therefore of

[12] 1982 CEA Report, pp. 49-50.

[13] *Ibid.*, p. 206.

[14] *Ibid.*, p. 26.

Table 2

Administration's Economic Projections: 1982-87 (from fiscal 1983 budget)[1]

	GNP (billions of dollars)	Real GNP (billions of 1972 dollars)	Prices (1972=100)	Unemployment rate	M1 (billions of dollars)
IV/1981 Actual	$2995	$1498	200.0	8.4%	$436.7
	(9.7)	(0.8)	(8.8)		(5.0)
IV/1982	3307	1543	214.4	8.4	457.4
	(10.4)	(3.0)	(7.2)		(4.7)
IV/1983	3671	1623	226.2	7.6	477.9
	(11.0)	(5.2)	(5.5)		(4.5)
IV/1984	4038	1702	237.2	6.8	498.1
	(10.0)	(4.9)	(4.9)		(4.2)
IV/1985	4417	1781	248.1	6.2	517.8
	(9.4)	(4.6)	(4.6)		(4.0)
IV/1986	4819	1857	259.5	5.6	537.0
	(9.1)	(4.3)	(4.6)		(3.7)
IV/1987	5248	1937	270.9	5.2	555.5
	(8.9)	(4.3)	(4.4)		(3.4)
1981-87	(9.8)	(4.4)	(5.2)	6.6	(4.1)

NOTE: All GNP data adjusted to February 1982 revision of NIA accounts; M1 reflects revision of February 1982. M1 figures correspond to monetary policy assumption stated in the 1982 CEA Report.

[1]Rates of change in parentheses.

interest to see how the administration's projections compare with those derived from an explicitly monetarist model. The framework used for this comparison is a revised and updated version of the "St. Louis model."[15]

According to the St. Louis model, nominal GNP is determined directly by a reduced-form equation relating the percent change in GNP to current and past changes in money (M1) and high-employment federal expenditures (national income accounts basis). Estimates of this equation indicate that the growth of federal spending has little net effect on GNP over a period of a year or more.[16] The primary factors affecting GNP growth are the rate of change of money and trend velocity, as embodied in the coefficients of the equation.

The change in GNP is distributed between changes in the price level and output via a price equation. The price equation specifies the percent change in the GNP deflator as a function of energy prices, demand pressure and the recent history of price change.[17] Over the long run, the estimated change in the price level is dominated by the trend of money growth. Given the change in GNP and the change in the price level, the change in output is found via the GNP identity; that is, GNP equals price level times output.

The unemployment rate also is solved for as a part of the St. Louis model. Estimated changes in output along with assumptions about the growth of potential output provide the basis for calculating the unemployment rate via Okun's Law.[18]

[15]For a discussion of the original model, see Leonall C. Andersen and Keith M. Carlson, "A Monetarist Model for Economic Stabilization," this *Review* (April 1970), pp. 7-25. For a detailed summary of the model in revised and updated form, see the appendix.

[16]For a recent study of the impact of fiscal actions on GNP, see R. W. Hafer, "The Role of Fiscal Policy in the St. Louis Equation," this *Review* (January 1982), pp. 17-22.

[17]For a further discussion of the role of energy prices in the determination of the price level, see John A. Tatom, "Energy Prices and Short-Run Economic Performance," this *Review* (January 1981), pp. 3-17.

[18]Arthur M. Okun, "Potential GNP: Its Measurement and Significance," *1962 Proceedings of the Business and Economic Statistics Section of the American Statistical Association*, pp. 98-104.

Table 3

St. Louis Model Projections for 1976-81: An Ex Post Comparison

Administration Projections as of Mid-1977

	GNP	Real GNP	Prices	Unemployment rate	M1
1976 Actual	11.6%	6.0%	5.3%	7.7%	No
1977	11.3	5.1	5.9	7.0	explicit
1978	11.9	5.3	6.3	6.3	assumption
1979	11.3	5.0	6.1	5.7	
1980	10.6	5.2	5.1	5.2	
1981	9.8	4.9	4.3	4.8	
1982	8.6	4.3	4.2	4.5	
1976-81	11.0	5.1	5.5	6.1	

1977 St. Louis Model Projections with Administration GNP Path

	GNP	Real GNP	Prices	Unemployment rate	M1
1976 Actual	11.6%	6.0%	5.3%	7.7%	5.1%
1977	11.2	5.2	5.7	7.1	6.8
1978	12.1	5.7	6.1	6.1	7.7
1979	11.1	4.5	6.5	5.7	7.8
1980	10.7	2.9	7.6	5.6	6.8
1981	9.7	0.5	9.1	6.5	6.0
1982	8.7	−0.8	9.5	8.2	5.1
1976-81	11.0	3.8	7.0	6.5	7.0

Actual Performance Using Data as of February 1982

	GNP	Real GNP	Prices	Unemployment rate	M1
1976 Actual	10.9%	5.4%	5.2%	7.7%	5.7%
1977	11.6	5.5	5.8	7.1	7.7
1978	12.4	4.8	7.3	6.1	8.2
1979	12.0	3.2	8.5	5.8	7.8
1980	8.8	−0.2	9.0	7.1	6.3
1981	11.4	2.0	9.2	7.6	6.9
1976-81	11.2	3.0	7.9	6.9	7.4

NOTE: Administration and St. Louis Model projections taken from November 1977 *Review*.

To illustrate the projection performance of the St. Louis model, table 3 presents an *ex post* summary of projections made in this *Review* in the fall of 1977.[19] The relevant projection period at that time was 1977-81. The administration's GNP projections at that time implied a path of declining growth in money, a path that was used in simulating the St. Louis model. Since the actual path of monetary expansion was similar to that assumed in simulating the model and that implicit in the administration's projections, the growth of GNP was forecast with considerable accuracy by both the administration and the model. There were differences, however, between the administration's and the St. Louis model's forecasts for real GNP, the price level and the unemployment rate, particularly after 1978. In contrast to the administration's forecast, the model projected a slow-

[19]Keith M. Carlson, "Economic Goals for 1981: A Monetary Analysis," this *Review* (November 1977), pp. 2-7. The major differences in the model used at that time and the version described in the appendix are in the treatment of energy prices and the adjustment for serial correlation.

Table 4

St. Louis Model Simulations: 1982-87 (assuming administration's GNP path)[1]

	GNP (billions of dollars)	Real GNP (billions of 1972 dollars)	Prices (1972=100)	Unemployment rate	M1 (billions of dollars)
IV/1981 Actual	$2995	$1498	200.0	8.4%	$436.7
	(9.7)	(0.8)	(8.8)		(5.0)
IV/1982	3306	1538	215.1	8.8	471.2
	(10.4)	(2.7)	(7.5)		(7.9)
IV/1983	3670	1603	229.1	8.1	507.0
	(11.0)	(4.3)	(6.5)		(7.6)
IV/1984	4037	1662	243.2	7.7	540.0
	(10.0)	(3.7)	(6.2)		(6.5)
IV/1985	4416	1720	257.1	7.5	572.9
	(9.4)	(3.5)	(5.7)		(6.1)
IV/1986	4819	1787	270.2	7.2	606.7
	(9.1)	(3.9)	(5.1)		(5.9)
IV/1987	5249	1861	282.8	6.8	641.3
	(8.9)	(4.1)	(4.6)		(5.7)
1981-87	(9.8)	(3.7)	(5.9)	7.7	(6.6)

[1]Rates of change in parentheses.

ing in output and an acceleration of the price level in the latter part of the period, both of which occurred.

Simulation Using Administration GNP Growth Path

The first issue addressed here is the feasibility of the output and inflation scenarios. The analysis does not, at this point, examine the question whether GNP can be attained with the administration monetary assumptions; it focuses exclusively on its projections of inflation and output growth, given its path for the growth of GNP. The assumptions used for the other exogenous variables in the St. Louis model are as follows: potential GNP is assumed to grow 3.3 percent per year from late 1981; growth in high-employment federal expenditures is projected at 6.3 percent per year; and the change in the relative price of energy is assumed to be zero.[20]

The results of this simulation, shown in table 4, should be compared with those in table 2. It should be noted first that the path of money growth required to attain the administration's projected GNP path is substantially higher than what they explicitly state as desired. Assuming that this GNP path is attained, however, the St. Louis model indicates that the administration's projections are indeed optimistic. The model indicates an unemployment rate of 6.8 percent in late 1987 in contrast to the administration's projected 5.2 percent rate, with annual real growth averaging 0.7 percent lower for the model simulation. The model is also more pessimistic on inflation, indicating an annual average inflation rate of 5.9 percent instead of the administration's estimated 5.2 percent.

Alternative Simulations

Since the administration explicitly supports a monetary policy of gradual reduction in the rate of monetary growth, the results of this scenario, in which M1 growth is reduced gradually and steadily to a 3.7 percent rate in 1986, are summarized in table 5. All other assumptions are the same as in the previous simulation.

[20]These assumptions are designed to be consistent with the administration's, even though they do not provide specific estimates of these variables in either the CEA Report or the Fiscal 1982 Budget. For a discussion of prospects for real GNP growth, see 1982 CEA Report, pp. 115-17.

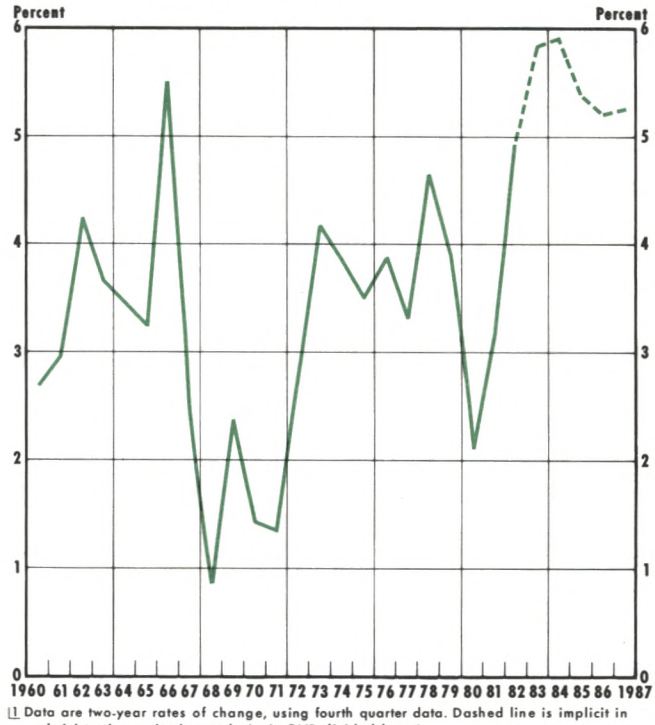
As might be expected, the model shows a growth rate of nominal GNP much less than the administration has projected (compare with table 2). The CEA is aware of this discrepancy, but does not explain why the assumed growth of velocity should far exceed its historical rates of growth (see chart 2).[21] For this scenario of a gradual reduction of money growth, the model indicates that the administration's inflation goal is easily achieved; in fact, the simulated inflation rate falls well below the administration's projected rate after 1983.[22] The simulated path for real GNP, however, is considerably different than the administration has projected. In the early years, 1982-84, the model simulates much slower output growth, followed by faster growth in the later years. As a result, the simulated unemployment rate is still at a high 6.9 percent in late 1987 compared with an administration estimate of 5.2 percent.

Finally, a third simulation was run, based on a constant 5 percent annual growth in money through 1987. The results are shown in table 6. This steady money growth path comes closer to attaining both of the administration's inflation and unemployment goals than either of the simulations summarized in tables 4 and 5. With steady 5 percent money growth, inflation averages 3.9 percent per year for the projection period, and the unemployment rate is brought to near 6 percent by late 1987.

Money Growth and the Administration's Projections: The Basic Conflict

The administration has emphasized that it is important to establish credibility in economic policy in order to "break the back" of inflation expectations. Behind this strategy is the presumption that, if inflation can be reduced more rapidly than past relationships would indicate (e.g., faster than is embodied in the estimates from St. Louis model), greater output growth would result. This prospect would produce a brighter outlook for the interim years than shown in the simulations employing gradual money reduction (table 5). There is little likelihood, however, that the unemployment rate would be reduced to as low as the administration's estimate of 5 percent.

Chart 2
Rate of Change of M1 Velocity [1]



[1] Data are two-year rates of change, using fourth quarter data. Dashed line is implicit in administration projections. Velocity is GNP divided by M1.

The more fundamental question yet to be answered is how the administration expects GNP to grow rapidly if money growth gradually declines. With the administration making explicit statements about interest rates falling in future years, apparently the result of declining inflation, velocity growth might be expected to slow rather than accelerate. Furthermore, velocity growth historically has been remarkably stable over time, an observation that the CEA itself has emphasized.[23] Thus, while the output-inflation breakdown of GNP in the St. Louis model may be open to question, there seems to be little reason to question its GNP projections.

THE FEDERAL BUDGET OUTLOOK AND ECONOMIC PROJECTIONS

The administration's economic projections are of interest because they indicate how the nation's economic welfare can be expected to change in coming years. They are also of interest because of their impact on estimates of the budget deficit. The

[21] See footnote 9.

[22] Over the long run in the St. Louis model, the inflation rate approximates the rate of monetary growth. Prior to the achievement of this equilibrium, however, the St. Louis model oscillates.

[23] See footnote 9.

Table 5

St. Louis Model Simulations: 1982-87 (assuming declining growth rate of money from 5.0 percent rate in 1981-82)[1]

	GNP (billions of dollars)	Real GNP (billions of 1972 dollars)	Prices (1972=100)	Unemployment rate	M1 (billions of dollars)
IV/1981 Actual	$2995	$1498	200.0	8.4%	$436.7
	(9.7)	(0.8)	(8.8)		(5.0)
IV/1982	3227	1501	215.0	9.7	457.4
	(7.7)	(0.2)	(7.5)		(4.7)
IV/1983	3472	1528	227.3	9.9	477.9
	(7.6)	(1.8)	(5.7)		(4.5)
IV/1984	3727	1581	235.8	9.7	498.1
	(7.3)	(3.5)	(3.7)		(4.2)
IV/1985	3989	1659	240.7	9.0	517.8
	(7.0)	(4.9)	(2.1)		(4.0)
IV/1986	4259	1754	242.9	8.0	537.0
	(6.8)	(5.8)	(0.9)		(3.7)
IV/1987	4534	1860	244.0	6.9	555.4
	(6.5)	(6.0)	(0.4)		(3.4)
1981-87	(7.2)	(3.7)	(3.4)	8.9	(4.1)

[1]Rates of change in parentheses.

Table 6

St. Louis Model Simulations: 1982-87 (assuming steady growth rate of money of 5.0 percent)[1]

	GNP (billions of dollars)	Real GNP (billions of 1972 dollars)	Prices (1972=100)	Unemployment rate	M1 (billions of dollars)
IV/1981 Actual	$2995	$1498	200.0	8.4%	$436.7
	(9.7)	(0.8)	(8.8)		(5.0)
IV/1982	3233	1504	215.0	9.6	458.6
	(8.0)	(0.4)	(7.5)		(5.0)
IV/1983	3495	1537	227.5	9.7	481.5
	(8.1)	(2.2)	(5.8)		(5.0)
IV/1984	3779	1580	236.6	9.3	505.6
	(8.1)	(4.0)	(4.0)		(5.0)
IV/1985	4085	1683	243.0	8.4	530.8
	(8.1)	(5.3)	(2.7)		(5.0)
IV/1986	4416	1784	247.7	7.3	557.4
	(8.1)	(6.0)	(2.0)		(5.0)
IV/1987	4774	1895	252.3	6.1	585.3
	(8.1)	(6.2)	(1.8)		(5.0)
1981-87	(8.1)	(4.0)	(3.9)	8.4	(5.0)

[1]Rates of change in parentheses.

Table 7

Alternative Budget Estimates: Fiscal 1987 (billions of dollars)

	Receipts	Outlays	Surplus/Deficit
Administration estimates from fiscal 1983 budget	$926	$979	$−53
St. Louis model simulation using administration's GNP path	926	1028	−102
St. Louis model simulation assuming declining growth rate of money	781	925	−144
St. Louis model simulation assuming steady 5 percent growth of money	829	940	−111

size of prospective deficits has become an issue among economic analysts, presumably because they consider it an indicator of the government's impact on credit markets and, thus, on long-term economic growth.[24] However, as is shown below, the process of estimating the deficit is an imprecise exercise.

Economic Activity and the Budget

Although the effect of the budget on economic growth is still an open issue, there is no question that the budget is sensitive to the pace of economic activity. This relationship received added emphasis in this year's budget document as budget figures appear to have become more and more sensitive to economic conditions.

In prior years, analyses of the connection between the budget and the economy focused on government revenues. Given our tax laws, different revenue estimates depend on the assumptions made about GNP and such related indicators as wages and salaries, and corporate profits. The relationship still holds, of course, but the size of today's economy is so large that a given growth rate of GNP translates into a much different dollar amount of federal revenues than it did just a few years ago. This relationship between GNP and government revenues is important because public attention seems to focus on the dollar size of the federal deficit.

At the same time, federal outlays have become increasingly sensitive to variations in economic activity. The usual effect via unemployment insurance continues to operate, but, like the revenue side, a given unemployment rate now involves a greater amount of dollar expenditures than before. In addition, automatic changes in outlays for a number of welfare programs occur when the economy slows down or speeds up. In fact, approximately 30 percent of federal outlays now are indexed to inflation. Finally, interest payments on the national debt, an important endogenous component of the budget, reflect both the size of the deficit and the level of interest rates.

Budget Implications of Alternative Simulations

To examine the sensitivity of budget estimates to alternative economic assumptions, budget equations were added to the St. Louis model. The growth of receipts was specified as a function of the growth of nominal GNP, using the elasticity implied in the administration's budget document.[25] The growth of outlays was expressed as a function of the growth of output and the rise in prices, again using the relevant elasticities from the budget document.

Table 7 summarizes the budget results for fiscal 1987 for all three simulations. Only results for fiscal

[24]Such an effect is not in the St. Louis model; incorporation of this presumed relationship between the size of the deficit and the rate of economic growth would require specifying potential output as a function of either the size of the deficit or the size of government. The only role for federal deficits in the St. Louis model is their possible relationship to the rate of money growth.

[25]Fiscal 1983 Budget, pp. 2:6-13. The implied elasticities are found by comparing the budget effects of three economic scenarios. These scenarios are higher inflation/same growth, higher growth/lower inflation, and lower growth/higher inflation, with all alternatives defined with reference to the administration's basic economic projections (summarized in table 2).

1987 are given to ease the comparison of alternative policy scenarios. Moreover, focusing on 1987 illustrates the imprecision that encompasses any budget estimates, because a small change in growth rates can translate into a difference of many billions of dollars. All simulations assume that the basic proposals contained in the fiscal 1983 budget are enacted.[26] The differences in results reflect only the impact of differing economic assumptions.

The first simulation, using the administration's GNP path as shown in table 4, yields a deficit of $102 billion; the administration estimates $53 billion. The estimate for receipts is the same as the administration's because the growth of nominal GNP is the same. Outlays are higher for this simulation because of higher inflation estimates, which push up outlays for indexed programs, and lower real growth estimates, which boost outlays for unemployment compensation and other unemployment-related welfare programs.

The second simulation, based on a gradual reduction of money growth (see table 5), yields a much larger deficit in 1987 than the administration projects. Outlays are less than projected by the administration because inflation is slower, but receipts fall even more sharply because the growth of nominal GNP is much less rapid. As a result, the deficit is estimated at $144 billion for 1987 — despite the incorporation of the administration's proposals to reduce government programs in the 1983 budget.

The third simulation, based on steady 5 percent money growth (see table 6), yields a slightly larger deficit than the simulation using the administration's GNP path. However, both outlays and receipts are lower than in that case.

SUMMARY AND CONCLUSIONS

The administration has presented a controversial set of economic assumptions and budget projections for the years through 1987. Some simulations of a monetarist model, however, demonstrate that the administration's projections contain fundamental inconsistencies. Based on U.S. economic experience since 1960,

(1) the administration's estimates for GNP growth are inconsistent with its stated monetary targets; and

(2) given its GNP growth path, its estimates of real growth, unemployment and, to a lesser extent, inflation appear too optimistic.

These conclusions also indicate that the administration's estimates of the size of the federal deficit are imprecise. Given the administration's budget plan, the pattern of declining growth in money that it supports will result in a deficit of about $144 billion in 1987, $93 billion more than is projected in the fiscal 1983 budget.

[26]This also assumes the Economic Recovery Tax Act of 1981 is left intact. The basic proposals themselves have been revised since February, but details await the outcome of negotiations between Congress and the administration. The purpose of the estimates presented here is to illustrate the budget impact of alternative economic assumptions without actually attempting to forecast the size of the deficit.

Appendix
Revised Form of St. Louis Model[1]

The version of the St. Louis model used for the simulations in this article is summarized in table 1, with the coefficients given in table 2. Equations 1, 2 and 4 are estimated with Almon constraints on the coefficients. Equation 1 is estimated with ordinary least squares. Three characteristics differentiate this model from the original version published in 1970: (1) most variables are entered in rate-of-change form rather than first-difference form; (2) the demand slack variable is entered in real rather than nominal terms; and (3) where relevant, the model's equations have been corrected for serial correlation problems.

[1]For further discussion, see Keith M. Carlson and Scott E. Hein, "An Analysis of a Modified St. Louis Model," a paper prepared for the Spring Conference on Comparing the Predictive Performance of Macroeconomic Models at Washington University in St. Louis (April 20, 1982).

Table 1
The Model

$$(1)\quad \dot{Y}_t = C1 + \sum_{i=0}^{4} CM_i\,(\dot{M}_{t-i}) + \sum_{i=0}^{4} CE_i\,(\dot{E}_{t-i}) + \epsilon 1_t$$

$$(2)\quad \dot{P}_t = C2 + \sum_{i=1}^{4} CPE_i\,(\dot{PE}_{t-i}) + \sum_{i=0}^{5} CD_i\,(\dot{X}_{t-i} - \dot{XF}^{*}_{t-i}) + CPA\,(\dot{PA}_t) + CDUM1\,(DUM1) + CDUM2\,(DUM2) + \epsilon 2_t$$

$$(3)\quad \dot{PA}_t = \sum_{i=1}^{21} CPRL_i\,(\dot{P}_{t-i})$$

$$(4)\quad RL_t = C3 + \sum_{i=0}^{20} CPRL_i\,(\dot{P}_{t-i}) + \epsilon 3_t$$

$$(5)\quad U_t - UF_t = CG\,(GAP_t) + CG1\,(GAP_{t-1}) + \epsilon 4_t$$

$$(6)\quad Y_t = (P_t/100)\,(X_t)$$

$$(7)\quad \dot{Y}_t = ((Y_t/Y_{t-1})^4 - 1)\,100$$

$$(8)\quad \dot{X}_t = ((X_t/X_{t-1})^4 - 1)\,100$$

$$(9)\quad \dot{P}_t = ((P_t/P_{t-1})^4 - 1)\,100$$

$$(10)\quad GAP_t = ((XF_t - X_t)/XF_t)\,100$$

$$(11)\quad \dot{XF}^{*}_t = ((XF_t/X_{t-1})^4 - 1)\,100$$

Y = nominal GNP
M = money stock (M1)
E = high employment expenditures
P = GNP deflator (1972 = 100)
PE = relative price of energy
X = output in 1972 dollars
XF = potential output (Rasche/Tatom)
RL = corporate bond rate
U = unemployment rate
UF = unemployment rate at full employment
DUM1 = control dummy (III/1971-I/1973 = 1; 0 elsewhere)
DUM2 = post control dummy (I/1973-I/1975 = 1; 0 elsewhere)

Table 2
In-Sample Estimation: I/1960-IV/1980 (absolute value of t-statistic in parentheses)

$$(1)\quad \dot{Y}_t = \underset{}{2.44} + \underset{(2.15)}{0.40}\,\dot{M}_t + \underset{(3.38)}{0.39}\,\dot{M}_{t-1} + \underset{(5.06)}{0.22}\,\dot{M}_{t-2} + \underset{(2.18)}{0.06}\,\dot{M}_{t-3} - \underset{(0.82)}{0.01}\,\dot{M}_{t-4} + \underset{(0.11)}{0.06}\,\dot{E}_t + \underset{(1.46)}{0.02}\,\dot{E}_{t-1} - \underset{(0.63)}{0.02}\,\dot{E}_{t-2} - \underset{(0.57)}{0.02}\,\dot{E}_{t-3} + \underset{(0.52)}{0.01}\,\dot{E}_{t-4}$$

$R^2 = 0.39$ SE = 3.50 DW = 2.02

$$(2)\quad \dot{P}_t = \underset{}{0.96} + \underset{(2.53)}{0.01}\,\dot{PE}_{t-1} + \underset{(0.75)}{0.04}\,\dot{PE}_{t-2} - \underset{(1.96)}{0.01}\,\dot{PE}_{t-3} + \underset{(0.73)}{0.02}\,\dot{PE}_{t-4} - \underset{(1.38)}{0.00}\,(\dot{X}_t - \dot{XF}^{*}_t) + \underset{(0.18)}{0.01}\,(\dot{X}_{t-1} - \dot{XF}^{*}_{t-1}) + \underset{(1.43)}{0.02}\,(\dot{X}_{t-2} - \dot{XF}^{*}_{t-2}) + \underset{(4.63)}{0.02}\,(\dot{X}_{t-3} - \dot{XF}^{*}_{t-3}) + \underset{(3.00)}{0.02}\,(\dot{X}_{t-4} - \dot{XF}^{*}_{t-4}) + \underset{(2.42)}{0.01}\,(\dot{X}_{t-5} - \dot{XF}^{*}_{t-5}) + \underset{(2.16)}{1.03}\,(\dot{PA}_t) - \underset{(10.49)}{0.61}\,(DUM1_t) + \underset{(1.02)}{1.65}\,(DUM2_t) + \underset{(2.71)}{}$$

$R^2 = 0.80$ SE = 1.28 DW = 1.97 $\hat{\rho} = 0.12$

$$(4)\quad RL_t = \underset{}{2.97} + \underset{(3.12)}{0.96}\sum_{i=0}^{20} \dot{P}_{t-i} \qquad (5.22)$$

$R^2 = 0.32$ SE = 0.33 DW = 1.76 $\hat{\rho} = 0.94$

$$(6)\quad U_t - UF_t = \underset{}{0.28}\,(GAP_t) + \underset{(11.89)}{0.14}\,(GAP_{t-1}) \qquad (6.31)$$

$R^2 = 0.63$ SE = 0.17 DW = 1.95 $\hat{\rho}_1 = 1.43$ $\hat{\rho}_2 = 0.52$

Short-Run Money Growth Fluctuations and Real Economic Activity: Some Implications for Monetary Targeting

DALLAS S. BATTEN AND R. W. HAFER

THERE is ample evidence that the rate of inflation is directly related to the long-term growth of the money supply. Indeed, this relationship has been demonstrated for various countries.[1] The implication of this finding is that the control of money growth over the long term is vital to the control of inflation, a realization that undoubtedly helps to explain the fairly recent announcements of monetary growth targets in most of the major industrial countries.[2]

Although the money growth/inflation connection is fairly well-documented, the relationship between short-run movements in money growth and economic activity is less well-known. Even though this connection has been demonstrated for the United States, its general applicability has not been tested.[3] The purpose of this article, therefore, is to investigate the relationship between short-run movements in the growth of the money stock and fluctuations in real economic activity.[4] Although the evidence presented in this article is not derived from a rigorous empirical analysis, it indicates quite convincingly that virtually every downturn in economic activity in recent years in each of the countries examined was preceded by a significant reduction in the growth of its narrowly defined money supply.

MONEY AND ECONOMIC ACTIVITY: THE THEORY

There is little disagreement that significant changes in the growth of the money supply influence economic activity. Changes in the *long-term* growth of money, measured by some moving average of money growth over a number of years, affect the rate of inflation. Indeed, several empirical studies of the United States indicate that it may take as long as five years for the rate of inflation to reflect completely the impact of a change in money growth.[5] More recent

[1]Dallas S. Batten,"Money Growth Stability and Inflation: An International Comparison," this *Review* (October 1981), pp. 7-12. See also Richard T. Selden, "Inflation and Monetary Growth: Experience in Fourteen Countries of Europe and North America Since 1958," Federal Reserve Bank of Richmond *Economic Review* (November/December 1981), pp. 19-35.

[2]Of the Group of Ten countries plus Switzerland, only two, Belgium and Sweden, do not formally announce monetary growth targets of some kind. See Organization for Economic Co-operation and Development, *Monetary Targets and Inflation Control* (Paris:OECD, 1979).

[3]Milton Friedman and Anna J. Schwartz, "Money and Business Cycles," *Review of Economics and Statistics* (February 1963), pp. 32-78; William Poole, "The Relationship of Monetary Decelerations to Business Cycle Peaks: Another Look at the Evidence," *Journal of Finance* (June 1975), pp. 697-712; and Leonall C. Andersen and Keith M. Carlson,"A Monetarist Model for Economic Stabilization," this *Review* (April 1970), pp. 7-25.

[4]The evidence presented also sheds light on the debate about the impact of M1 growth during periods of financial innovation and institutional change. By examining the connection between short-run fluctuations in M1 growth and real economic activity across countries with different financial institutions and regulations, some understanding of the relationship's robustness in a changing financial environment may be gained. For a good example of the uncertainty that pervades current thinking on the future efficacy of targeting on M1, see Anthony M. Solomon, "Financial Innovations and Monetary Policy," Federal Reserve Bank of New York, *Annual Report, 1981* (1982), pp. 3-17; and Edward Yardeni, E. F. Hutton *Economics Alert* (January 29, 1982).

[5]See Denis S. Karnosky, "The Link Between Money and Prices — 1971-76," this *Review* (June 1976), pp. 17-23; Keith M. Carlson, "The Lag From Money to Prices," this *Review* (October 1980), pp. 3-10; and John A. Tatom, "Energy Prices and Short-Run Economic Performance," this *Review* (January 1981), pp. 3-17.

studies also have demonstrated that a lengthy lag between money growth and inflation is common in several industrial countries.[6] This evidence indicates that changes in current money growth have a relatively small impact on prices *in the short run.*

For short-run changes in money growth to affect economic activity, they must initially influence the real economy more significantly than they influence prices.[7] Indeed, studies have shown that, at least for the United States, sizable reductions in money growth below its established trend rate for only a few quarters have preceded declines in real economic activity.[8]

The economic theory that "predicts" the results just described is as intuitively appealing as it is empirically verifiable. A marked and sustained decline in the growth of the money supply creates a "monetary disequilibrium": the quantity of money that individuals desire to hold exceeds the quantity that they are actually holding. By reducing their spending, they can increase their money holdings to a desired level. Eventually, this reduced spending will cause the rate of inflation to fall.

In the short run, however, producers who cannot tell immediately whether this decline in aggregate demand (spending) is permanent or just a temporary aberration initially react to the reduction in money growth (and spending) by reducing output. Therefore, the decline in money growth results in a slowdown in economic activity; if it is pronounced enough and sustained long enough, it can produce a recession. Only when the decline in spending (motivated by the monetary disequilibrium associated with the reduction in money growth) has been identified as *permanent* will producers reduce their prices and increase production back to "normal" levels. Thus, the impact of the monetary contraction on output eventually vanishes, and, in the long run, only the rate of inflation is affected by a sustained reduction in money growth.[9]

The potential usefulness of monetary targeting for economic policy purposes is evident from this discussion. First, in the long run, permanent changes in the rate of money growth are reflected by equivalent changes in the rate of inflation, other things equal. Second, if short-run money growth is volatile, the growth of real output and employment will be similarly volatile. In other words, sufficiently unstable money growth in the short run, that is, a reduction in money growth relative to its trend rate, may cause recessions. Consequently, minimizing the variability of short-run money growth appears to be essential in establishing a stable, non-inflationary environment for economic growth.

SHORT-RUN MONEY GROWTH AND ECONOMIC ACTIVITY: THE EVIDENCE

We now investigate the validity of the conceptual analysis presented in the preceding section. To examine the relationship between short-run fluctuations in money growth and real economic activity, a sample of four industrialized countries was selected: the United States, the United Kingdom, West Germany and Italy. Moreover, to make the results of the analysis directly comparable, the narrow definition of money for each country is used.[10]

To illustrate the relationship between *short-run* money growth and real output growth, charts for each country are presented for the period 1973 to the present.[11] These charts depict the deviations of short-run money growth from its trend, measured by subtracting the 20-quarter moving average growth rate of money from its two-quarter moving average growth rate. In addition, the quarter-to-quarter, compounded annual rate of growth of real GNP is

[6]Batten, "Money Growth Stability and Inflation;" and also Selden, "Inflation and Monetary Growth."

[7]This article discusses *only* the impact of changes in money growth on the real output of the economy. It does not investigate the impact of money growth changes on financial markets.

[8]Poole, "The Relationship of Monetary Decelerations to Business Cycle Peaks." See also *Economic Report of the President* (Government Printing Office, 1982), pp. 192-96, for another use of the theory presented here.

[9]The empirical problem here, of course, is dating the "long run."

[10]The M1 definition is used throughout. It should be noted that even though the narrow definition is used, it is not the variable used by all the central banks in their policy deliberations. The countries and their respective monetary target(s) are: United States (M1, M2), United Kingdom (Sterling M3), Germany (Central Bank Money Stock) and Italy (Total Domestic Credit).

[11]The period since 1973 is used for two reasons. First, it is characterized as a flexible exchange rate period, a condition giving each country more control over its own domestic money supply and, hence, economic activity than in a fixed exchange rate period. While the analysis also applies to a fixed exchange rate period, economic activity of open economies during such a period may merely reflect economic activity in the United States. Consequently, we chose the post-1973 period because we are concerned with examining the impact of changes in short-run money growth that are motivated by changes in factors indigenous to the domestic economy. Second, this period covers the time in which each country's central bank announced a monetary aggregate policy target. Prior to 1973, announced money supply growth targets were not universal.

plotted. Periods in which real output growth was negative for two consecutive quarters or more are denoted by the shaded areas; these designate periods of recession in these countries.[12]

The individual charts reveal that there is a common relationship between sharp reductions in the short-run growth of money (the two-quarter moving average) relative to its trend (the 20-quarter moving average) and real economic activity.[13] Despite the wide differences among these countries in terms of their financial structures, regulations and monetary policy objectives, the relationship between short-run deviations in their money growth from trend and declines in their real economic activity is quite similar. To see this more clearly, we briefly examine the historical record of each country in our sample.

The United States

The chart for the United States reveals three recessions since 1973. As predicted by the theoretical discussion, each recession was preceded by a sharp slowing in short-run money growth. Prior to the 1974 recession, for example, short-run money growth fell from slightly over 2 percentage points above trend to about 2 percentage points below trend, a change that is mirrored in the reduction in real GNP growth in 1973. While one may argue that the recession of 1974 was supply-oriented — a reaction to the unexpected OPEC oil shock — the chart indicates that the depth and breadth of the downturn was exacerbated by short-run money growth well below trend in late 1974.[14]

The most recent downturns in economic activity also are associated with declines in short-run money growth. For example, prior to the onset of the II/1980-III/1980 recession, money growth fell from about 3 percentage points above trend to over 4 percentage points below trend. Although money growth's sharp rebound during late 1980 helped produce the turnaround in real GNP growth in early 1981, the equally dramatic downturn in money growth relative to trend during 1981 has precipitated yet another reduction in real economic activity. Indeed, since I/1980, short-run money growth has fallen short of trend almost 90 percent of the time, and real GNP growth has been negative almost 40 percent of the time. Clearly, the dramatic slowing in short-run money growth relative to its long-run trend and the increase in its volatility during the past two years have been associated with substantial reductions in real economic activity over this period.

The United Kingdom

The accompanying chart indicates that the United Kingdom has experienced a number of "recessions" during the brief period studied. Of the six recessions shown, all but one were preceded by sharp reductions in short-run money growth. For instance, prior to the IV/1973-I/1974 downturn, money growth fell from about 5 percentage points above trend to more than 10 percentage points below trend, a reversal of about 15 percentage points in less than one year. Likewise, the I/1977-II/1977 recession came on the heels of a drop in money growth to more than 5 percentage points below its trend.

The period since late 1978 is interesting because it reveals the effect on the economy of a sustained reduction in short-run money growth below its trend. Although money growth did not dip far below trend prior to the IV/1978-I/1979 recession, short-run money growth fell from over 15 percentage points *above* trend in IV/1977 to its trend level in only three quarters, a change that is associated with the drop in real GNP growth from IV/1977 to I/1979. Also, the impact of the nature of the money growth decline during the period from IV/1977 to I/1981 is reflected by relatively stagnant output growth during this period.

Finally, the IV/1974-III/1975 recession represents an anomaly to the theory. The recession was not preceded by a downturn in short-run money growth relative to its trend; instead, money growth increased faster than its trend rate prior to this reces-

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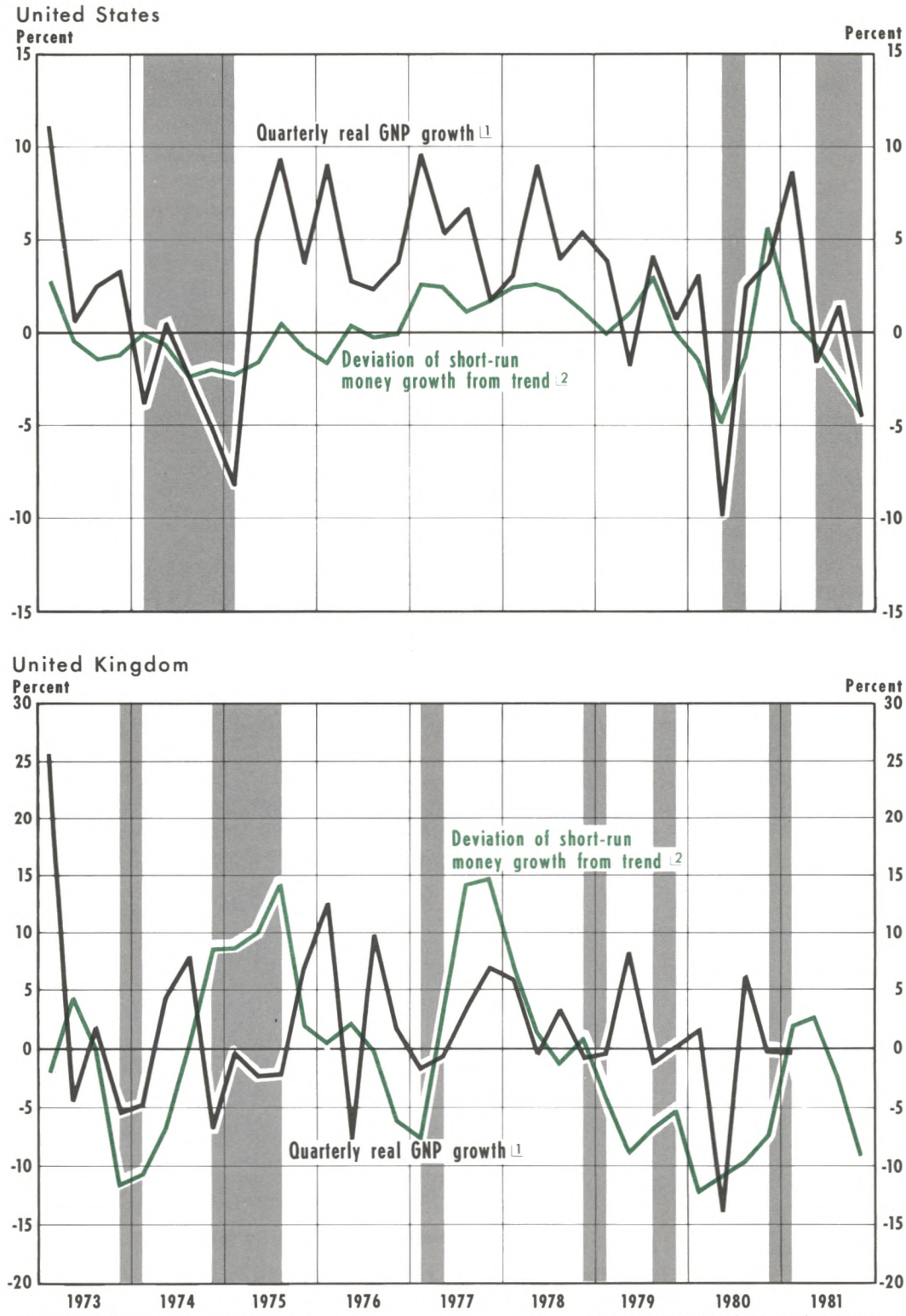
[12]The recessions in the United States are those defined by the National Bureau of Economic Research. Since recessions are not formally defined in the other countries in the sample, the generally accepted rule of thumb is that a recession is indicated by at least two consecutive quarters of declining real GNP.

[13]The purpose of this article is *not* to employ statistical methods to investigate rigorously the money/real output relationship in those countries. Instead, we are simply applying the general implications of the research that has been conducted for the United States to an analysis of these countries, as a first attempt to see if empirical relationships similar to those in the United States can be found. Obviously, the timing of the money growth/real output relationship may be different across countries and, in fact, the 20-quarter and two-quarter distinctions may not be completely applicable to all. These results, however, appear to be quite robust and, consequently, we shift to the unconvinced reader the obligation of an alternative interpretation of the data.

[14]The oil price shocks of 1973-74 and 1979-80 resulted in dissimilar monetary growth rates in the United States. For a discussion of this, see R. W. Hafer, "The Impact of Energy Prices and Money Growth on Five Industrial Countries," this *Review* (March 1981), pp. 19-26.

Money and Output Growth in Selected Countries



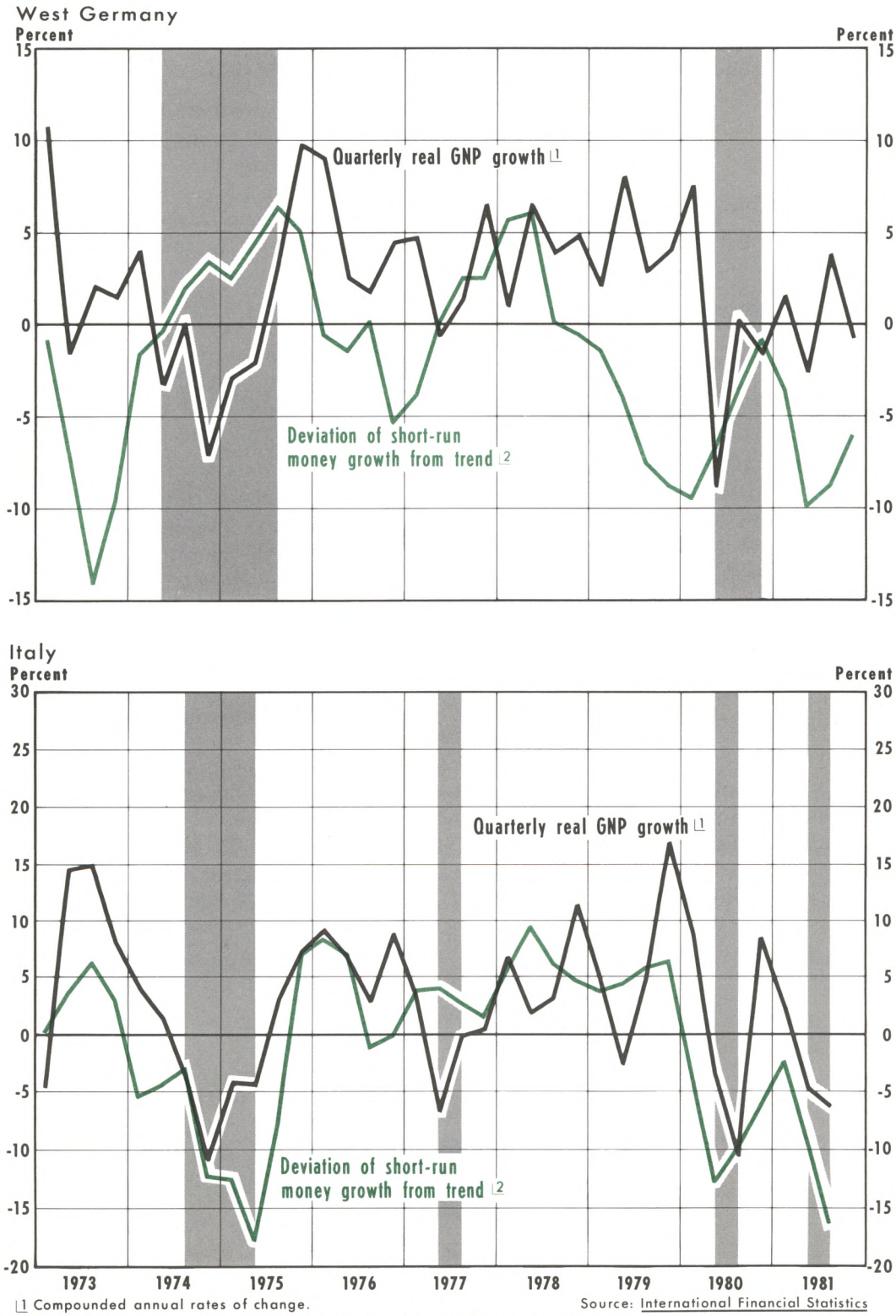
[1] Compounded annual rates of change.

[2] Two-quarter moving average money growth rate minus the 20-quarter moving average money growth rate.

Shaded areas represent periods of economic downturn.

Source: International Financial Statistics

Money and Output Growth in Selected Countries



[1] Compounded annual rates of change. Source: International Financial Statistics

[2] Two-quarter moving average money growth rate minus the 20-quarter moving average money growth rate.

Shaded areas represent periods of economic downturn.

sion. This may have been an attempt to use monetary policy to offset, at least partially, the dislocations created by the OPEC oil shock that lowered the growth of real GNP. Interestingly, the U.K. response to the 1978-79 OPEC oil shock was to decrease the short-run growth of the money stock, as shown in the chart.[15]

West Germany

The chart for West Germany again supports the theoretical discussion. Each of the two recessions is preceded by periods of money growth below trend. Although the timing is different for each episode, the reaction of the real economy to declines in short-run money growth is clear and consistent.

West Germany also presents a case in which money growth fell below trend and no technical recession occurred. From III/1975 to IV/1976, money growth fell from about 7 percentage points above trend to about 5 percentage points below trend. Although no recession followed, the level of real GNP growth fell sharply as the theory predicts: the growth rate of real GNP fell from about 10 percent in IV/1975 to zero in II/1977. Thus, while technically no recession followed the decline in money growth, real GNP growth was curtailed sharply, an example of a "growth recession."

Italy

The relationship between real GNP growth and money growth relative to trend in Italy, once again, is consistent with theoretical expectations. Of the three recessions since 1973, each was preceded by a period of sharp reductions in short-run money growth relative to its trend rate. This pattern is especially evident for the II/1974-II/1975 and II/1980-III/1980 recessions.

CONCLUSIONS

The evidence presented here suggests that sizable and sustained reductions in short-run money growth below its trend rate portend declines in the growth of real GNP. Of the 14 recessions in the four countries examined, only one — the IV/1974-III/1975 recession in the United Kingdom — was not preceded by a substantial decline in short-run money growth. Moreover, in only one instance — the III/1975-IV/1976 period for West Germany — did short-run money growth fall substantially below trend without a recession following. In that instance, however, West German real GNP growth fell from about 10 percent to zero, a result consistent with the theoretical discussion.

Thus, the evidence indicates that policymakers should be concerned with short-run fluctuations in the growth of the money supply relative to its trend.[16] If this evidence is at all useful, it demonstrates how robust the relationship between money growth and real economic activity is over the short run. Coupled with previously reported research indicating a direct, positive link between longer-term money growth and inflation, the empirical evidence favors a steady growth of the money stock in both the short and long run as the most effective means of achieving economic stability.

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[15]Hafer, "Impact of Energy Prices and Money Growth."

[16]This evidence contradicts the recent claim that "the [money growth] volatility issue itself is a hoax. No one as yet has been able to demonstrate that the reported volatility in money has any impact on either the pace of economic activity or inflation." Aubrey G. Lanston & Co., Inc., Newsletter (March 22, 1982).

Money, Credit and Velocity

MACK OTT

Shakespeare: "Neither borrower, nor a lender be" (*Hamlet*, I, iii, 75, Polonius to Laertes)

Goethe: "Let us live in as small a circle as we will, we are either debtors or creditors before we have had time to look around." (*Elective Affinities*, Bk. II, Ch. 4)

RECENTLY, many critics of monetary policy, and some monetary policymakers as well, have asserted that the links between monetary aggregates and national economic policy variables—that is, GNP, inflation and real economic growth—have been severed by a host of financial and credit market innovations. If these critics are correct, then a monetary policy based on targeting the growth of a monetary aggregate would become increasingly ineffective and inappropriate, as credit arrangements are substituted for monetary payments.[1]

The purpose of this article is to provide a theoretical framework in which to assess these claims and to examine empirical evidence bearing on their purported policy consequences. The analysis presented in this article does not support the critics' assertions. This conclusion rests on two arguments. First, the relation between money and credit requires that the amount of credit granted match the anticipated amount of money that will be available to settle the debt when it comes due. Thus, regulating the rate of monetary growth, which in turn regulates the anticipated future quantity of money, determines the amount of credit and the conditions under which it is granted. This constraining influence of monetary growth on credit would be undone only if the relation between money and income growth departed from its historical pattern.

That it has not is the second argument: the empirical evidence on velocity, the relation between money growth and income growth, reveals no significant change during the last two years from its previous history. Consequently, despite recent claims to the contrary, the growth of the monetary aggregates is still reliably linked to the economic variables of interest to policymakers.

MONEY, CREDIT AND EXCHANGE

In contemporary societies, the exchange of goods is indirect. The purchase or sale of goods, whether in organized markets or through informal arrangements, is almost always in exchange for money or money-denominated promises. Direct bartering of one good for another is either nonexistent or unimportant.

The reason for this is at once obvious, yet theoretically challenging to elucidate. In the introduction to his book, *The Theory of Money*, Jurg Niehans observes:

> Economists (and laymen) have always felt that the use of a medium of exchange increases the efficiency

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[1]For examples, see Neil G. Berkman, "Abandoning Monetary Aggregates," in *Controlling Monetary Aggregates III*, proceedings of a conference sponsored by the Federal Reserve Bank of Boston (October 1980), pp. 76-100; Benjamin M. Friedman, "The Relative Stability of Money and Credit 'Velocities' in the United States: Evidence and Some Speculations," NBER Working Paper No. 645 (March 1981); Anthony M. Solomon, "Financial Innovation and Monetary Policy" (remarks before the Joint Luncheon of the American Economic and American Finance Associations, December 28, 1981); James M. Tobin, "Inflation," in *Encyclopedia of Economics*, Douglas Greenwald, ed. (McGraw-Hill, 1982), pp. 510-23. For the contrary position—i.e., that monetary policy should be undertaken through effective control of a monetary aggregate—see Milton Friedman, "Monetary Policy: Theory and Practice," *Journal of Money, Credit and Banking* (February 1982), pp. 98-118; and Allan H. Meltzer, Robert H. Rasche, Stephen H. Axilrod, and Peter Sternlight, "Money, Credit, and Banking Debate: Is the Federal Reserve's Monetary Control Policy Misdirected?" *Journal of Money, Credit and Banking* (February 1982), pp. 119-47.

of an economy. The gain was usually considered to be large. It has both qualitative and quantitive aspects. The qualitative aspects appear when monetary exchange is compared with barter. Classical and neoclassical economists were graphic in describing the "double coincidence of wants" of the hungry tailor and the shivering baker which would be necessary for an exchange in a barter economy and the narrow limitations it imposes on the division of labor. The use of money would increase welfare by freeing exchange from the shackles of the double coincidence of wants.[2]

Robert Clower succinctly summarized the results of these advantages as imposing a constraint on the exchange process: "Money buys goods and goods buy money; but goods do not buy goods."[3] In other words, it is the nature of a system of monetary exchange to replace the cumbersome barter exchange of goods with two non-synchronized monetized exchanges: a sale of goods for money and a later purchase of goods by money. This exchange attribute in turn has implications for both the appropriate definition of money and for the monetary arrangements used in exchange.[4]

First, the period between the sale of one good for money and the subsequent purchase of another good may be long enough or predictable enough to allow the interim holding of funds in a non-transaction account. This implies that the appropriate monetary aggregate may not be narrowly defined money (i.e., M1), but a broader aggregate (e.g., M2) which contains what Milton Friedman characterizes as "temporary abodes of purchasing power" that are readily convertible at low cost into an exchange medium.[5]

Second, if the purchase of the good to be financed by the proceeds from the sale of another good precedes the sale of that other good, then the anticipated future sale proceeds may be used to mediate the earlier purchase. Of course, an exchange arrangement like this is a familiar part of modern economies; such purchases are said to be made "on credit." Credit is granted by sellers or other third party lenders to buyers precisely on the basis of the buyer's anticipated future receipts (with the lender concurring) and, of course, is measured in monetary units. As a consequence, credit is as much of a medium of exchange as is money.[6]

While both credit and money are used to mediate exchange, they are obviously different entities. The quantity of money circulating in an economy is a stock; its units are used repeatedly in a sequence of exchanges. Credit, on the other hand, is a flow and is transaction-specific; it can only mediate the transaction for which it was created.[7]

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[2]Jurg Niehans, *The Theory of Money* (Johns Hopkins University Press, 1978), p. 2.

[3]Robert W. Clower, "A Reconsideration of the Microfoundations of Monetary Theory," *Western Economic Journal* (March 1967), p. 6. Also, see Karl Brunner and Allan H. Meltzer, "The Uses of Money: Money in the Theory of An Exchange Economy," *American Economic Review* (December 1971), pp. 784-805.

[4]Milton Friedman and Anna Schwartz described this attribute as "the separation of the act of purchase from the act of sale," but criticized the medium of exchange approach as being too narrow to capture the essential nature of money:

> In order for the act of purchase to be separated from the act of sale, there must indeed be something that will be generally accepted in payment—this is the feature emphasized in the "medium of exchange" approach. But also there must be something that can serve as a temporary abode of purchasing power, in which the seller holds the proceeds in the interim between sale and subsequent purchase or from which the buyer can extract the general purchasing power with which he pays for what he buys. . . . Both features are necessary to permit the act of purchase to be separated from the act of sale, but the 'something' that is generally accepted in payment need not coincide with the 'something' that serves as a temporary abode of purchasing power; the latter may include the former and more besides.

Milton Friedman and Anna Schwartz, *Monetary Statistics of the United States: Estimates, Sources, Methods* (NBER, 1970), pp. 106-07.

[5]Two goods that are perfect substitutes are economically the same good. If two durable goods are costlessly transformable, one into the other, then they are perfect substitutes in an inventory. On this criterion, if the cost of transferring funds from a savings account to a demand account or to currency were zero, then, clearly, savings accounts would be economically indistinguishable from demand accounts or currency and would be exchange media. Conversely, if the costs of transfer were prohibitively large, savings accounts would not be a close substitute for demand deposits. Hence, as Friedman and Schwartz argue, the question of what money is cannot be settled on an a priori basis, but is an empirical question which, in part, depends on how costly inter-deposit transfers are.

[6]This observation has led Clower and others to argue that some measure of *credit availability* or line of credit be included in the policy relevant concept of money: ". . . for most practical purposes, 'money' should be considered to include trade credit as well as currency and demand deposits." Robert W. Clower, "Theoretical Foundations of Monetary Policy," in *Monetary Theory and Monetary Policy in the 1970s*, George Clayton, John C. Gilbert and Robert Sedgwick, eds. (Oxford University Press, 1971), p. 18. See also Arthur B. Laffer, "Trade Credit and the Money Market" (March 1970), pp. 239-67; and J. Stephen Ferris, "A Transactions Theory of Trade Credit Use," *Quarterly Journal of Economics* (May 1981), pp. 243-70.

[7]It has been argued that credit is not an exchange medium, but merely an arrangement that raises the velocity of money. Ironically, the same argument was once used against including demand deposits in money. As Friedman and Schwartz point out, much of the 19th century debate between the banking and currency schools centered on whether bank notes and deposits were money or merely "means of raising the velocity of bank vault cash but not as adding to the quantity of money." Friedman and Schwartz, *Monetary Statistics of the United States*, p. 95.

BOTH CREDIT AND MONEY ARE NECESSARY FOR MONETIZED EXCHANGE

The epigraphs from Shakespeare and Goethe represent conflicting views on the desirability and inevitability of credit; to wit, while money and credit are alternative exchange media, would either be sufficient to mediate all exchanges without the other? Could any of us, as Polonius suggests, avoid credit transactions completely? Conversely, could credit function as we know it without a monetary framework? Not surprisingly, the answer to both questions is no. Hence, the advice of Polonius is as fatuous as the character offering it. Both credit and money are necessary in the exchange process, each fulfilling functions that the other could not.

In order to establish this complementarity of money and credit, consider the exchange process as a contractual arrangement between buyer and seller.[8] Under this characterization, the exchange and the settlement of the contract *need not coincide in time* so that either credit or money can mediate an exchange. In the case of a credit transaction, at the time of the exchange the buyer incurs a contractual liability for a *subsequent settlement* to clear his debt. Using this contractual approach, we can now demonstrate why Goethe's claim of the inevitability of credit in any society is correct.

Credit and the Exchange of Services

Two types of goods are voluntarily offered for exchange in markets: commodities and services. By definition, a commodity is a tangible physical entity not intrinsically dependent on time (e.g., an apple, a phonograph record or an automobile), while a service is an activity or process that is intangible and intrinsically sensible only with the passage of time (e.g., a gardener's chores, a concert or a taxi ride). In a monetized economy, sellers of either type of good receive money or a promise to deliver money at a specified future time.

If only commodities were exchanged, it would be possible always to use money alone and never incur a debt. Services, however, by their very nature, cannot be exchanged without one party, either seller or buyer, extending credit to the other. Hence, a law attempting to enforce Shakespeare's admonition would not prohibit the sale of apples, automobiles or clothing; it would, however, prohibit the renting of a house, the purchase of a ski-lift ticket or the hiring of labor. In each of these latter examples, the transaction entails the exchange of money *before* or *after* the completion of the activity with, necessarily, a concomitant issuance of credit.[9]

Thus, Goethe was right: each of us inevitably engages in credit transactions every day. For example, we extend credit to our employer and receive it from our electric utility. If services of any form are to be exchanged, credit must be offered either by the seller—as in the typical employment arrangement where wages are received after the services have been delivered—or by the buyer—as in entertainment activities where the purchase of a ticket precedes the concert, game or movie.[10]

Clearly, credit is inextricably bound up with selling services in a monetized economy in order to avoid the problem of making an indefinitely large number of infinitesimal cash payments. Yet money and credit are simply alternative means of lowering the cost of exchanging goods relative to a primitive barter system. Thus, even some commodities might be too costly to exchange in customary ways if credit were ruled out (e.g., home-delivered newspapers or raw materials purchased by firms).[11]

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[8]Under Anglo-American law, an enforceable contract must have three elements:

(1) There must be an offer;
(2) There must be an acceptance precisely matching the offer—else it is a counter-offer;
(3) There must be consideration—i.e., the offeror or acceptor must make some performance that would be a detriment to him if the agreement were not fulfilled.

See "Contract" and other referenced citations thereunder in Henry Campbell Black, *Black's Law Dictionary*, 5th ed. (West Publishing Co., 1979), pp. 291-94, 277.

[9]Note that this would also rule out the existence of any firm other than owner-operated producers of commodities.

[10]Barter exchange of services is conceivable as suggested in the maxim, "You scratch my back and I'll scratch yours." Yet, even here, credit sneaks in unless the exchange is simultaneous.

[11]Credit extended by sellers of raw materials is an especially important example. If credit were not extended to producers, either deliveries would have to be made more frequently (in smaller lots) to match producers' cash flow from sales of output, or the material-using firms would have to tie up more of their capital in raw material inventories and, hence, less in the capital to process these materials. Alternatively, firms would find it more advantageous to be vertically integrated—i.e., to own their suppliers—than to acquire these materials from other firms. See "Credit Allocation: An Exercise in the Futility of Controls" (Citibank Economics Dept., 1979), p. 40. In any case—more frequent delivery, larger inventories in capital, or more vertical integration—resources would be less productively allocated than when credit is extended.

The Relationship Between Money and Credit

Money and credit are both substitutes and complements in the exchange process. On the individual level, money and credit are potential substitutes for mediating any exchange of commodities. On the societal level, money and credit are complements in the exchange process; each provides a function necessary to some exchanges that the other cannot fulfill. In fact, credit is a more general medium of exchange than money in that it facilitates exchange involving time—both in permitting the sale of services and in permitting differing delivery dates in exchanges of commodities; money without credit can act as the exchange medium only for a commodity. Yet, money is likewise crucial to the functioning of credit through its role as the primary means of settlement.

Monetary theorists generally have agreed that money in modern economies is anything that fulfills all of the following functions:

1. Medium of exchange,
2. Store of value,
3. Unit of account,
4. Standard of deferred payment.

Most economists have argued that the crucial characteristic in this list is its functioning as a medium of exchange. Typically, they have argued that any durable good can fulfill the remaining three functions, but only money can fulfill the first.

However, we have seen that credit also fulfills the medium of exchange function. Credit in our discussion has taken a special form—namely, credit measured in units of money and, implicitly, with the deferred payment to be made in units of money. In exchange systems with money and credit acting as exchange media, the other three functions in money's repertoire take on an importance not apparent in the conceptual monetary exchange models without credit.

Without agreement on the unit of account, credit transactions would have all the disadvantages of barter except simultaneity. Anthropologists, in contrast to economists, have placed more emphasis on the unit of account function because their focus is on how a monetized exchange system evolves from a barter system rather than how an extant monetized exchange system functions.[12] From this vantage, they have documented that, in moving from barter to indirect exchange, the most useful function of primitive monies is the commonly-agreed-upon valuation unit.[13]

Finally, credit mediation of exchange is facilitated by the universal acceptability of money as a means of settlement—the standard of deferred payment function. All credit contracts can be settled (directly or through civil courts) by means of a money payment; that is, money is legal tender in our economy. This general agreement on the means of settlement makes credit less costly to extend, thereby increasing its availability for exchange mediation. A decentralized use of credit requires that individuals and firms be able to clear their debts individually (i.e., pairwise) with some mutually agreeable means of settlement; without such agreement on the means of settlement, credit clearing would require a costly centralized system of record-keeping much like a "barter club."

THE RELATION OF CREDIT EXPANSION TO MONETARY POLICY

Credit is not money, but the promise of future money to the lender in return for the temporary use of current purchasing power—goods or money—extended to the borrower. Two errors that violate this logic occur every day in the financial press:

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[12]See Philip Grierson, "The Origins of Money," *Research in Economic Anthropology*, Vol. 1 (JAI Press, Inc., 1978), especially pp. 9-12 for evidence on the importance of standard of value in explaining early monetary systems. See also George Dalton, "Primitive Money," *American Anthropologist* (1965:I), pp. 44-65; and Denise Schmandt-Besserat, "The Earliest Precursors of Writing," *Scientific American* (June 1978), pp.50-59.

[13]In this context, it is ironic and revealing that contemporary "barter clubs" use dollars as the unit of account but not as an exchange medium. Consider these descriptions from "As Barter Boom Keeps Growing," *U.S. News and World Report* (September 21, 1981), p. 58:

> A participant lists items for sale, and they are advertised to the other members. If a listed item is sold, the former owner is issued trade credits—sometimes called trade dollars. These credits can later be used to purchase goods and services from other members. . . "We don't make outright trades; we perform a banking function. . ."

This is also the method by which every "barter exchange" profiled in the article appears to be organized:

> Besides credits, most barter exchanges issue barter cards that can be used for purchases at participating merchants. Through the Trade Bank International exchange, a Memphis dentist began receiving customers who used their barter cards for dental work. Within a year's time, the dentist accumulated enough trade dollars to buy carpeting for his office, install new signs and pay for flying lessons.

1. Referring to the interest rate as the price of money;
2. Identifying available credit as money.[14]

The first error is so commonplace that its repetition makes it seem valid; nonetheless, the interest rate is not the price but the rental rate for a dollar or, properly expressed, any other good. The price of a dollar is a dollar's worth of something—certainly more than a mere percentage of a dollar. No one would refer to the rental rate at Hertz as the price of a new Ford, or to the rent on a house as its purchase price, but the confusion of interest on credit with the price of money has become so common that the error no longer jangles our sensibilities. Yet the distinction is not only obvious but as important for money and credit as for owned and rented automobiles.

Similarly, the second error, referring to available credit as money, also escapes rebuke through frequent use. The annual total of credit extensions is many times larger than the year-to-year increases in either M1 or M2, and, in recent years, has been larger than the stock of M1. Considering the consumer sector (which accounts for over 60 percent of national income), a large share of credit extensions, almost two-thirds, are by institutions other than commercial banks and, therefore, do not entail monetary expansion. Considering only installment consumer credit, about 40 percent of such credit is extended by non-depository institutions with about 20 percent being extended by retailers and gasoline companies. In these retail extensions, money affects the transaction only through the anticipated monetary settlement.[15]

These errors are substantive for they focus the public's evaluation of monetary policy on regulating the flow of credit instead of controlling the growth of the stock of money. Controlling the rate of growth of the money stock in a predictable fashion enhances the predictability of the future availability of the means of settlement. This regularity of monetary expansion makes for better-informed, intertemporal decision-making and, therefore, contributes to the stabilization of credit markets. When non-monetary shocks occur, the predictable availability of quantities of money in the system allows market-determined signals—that is, interest rate changes—to allocate credit efficiently to adjust to the shocks.

Conversely, attempting to control interest rates requires the monetary authority, in effect, to allocate credit at the cost of making the growth rate of monetary expansion less predictable; since this makes the real future value of the means of settlement more variable, credit transactions become riskier, and credit markets less stable. When non-monetary shocks occur, the less predictable quantities of means of settlement with relatively fixed interest rates impede market signals from efficiently allocating credit.

Since both money and credit are exchange media, the key to effectively controlling either or both of them must be first to isolate their interconnections and mutual dependencies. This article has argued that credit is unavoidable and that a money means of settlement is necessary for a decentralized credit system. What it now addresses is how monetary and credit *expansion* relate to each other and how both of these relate to national income.

Credit and Money Creation

In contemporary market economies, the money supply grows through two types of credit transactions: the central bank creating deposits (money) and bank reserves by buying government securities, and depository institutions creating deposits (money) from increased reserves by granting loans.[16]

Of course, not all credit extensions entail monetary expansion. There are three distinct sources of credit extension: (1) bank and non-bank depository institutions (commercial banks, savings and loans, credit unions, mutual savings banks); (2) non-depository financial intermediaries (finance com-

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[14]Recent examples are (1) "The price of money—the interest rate—reflects, therefore the interaction of millions of participants in the credit market. . ." Henry Kaufman, *Washington Post*, September 23, 1981; (2) "As long as the Federal Reserve Board maintains its current course, credit—or money available to lend—will remain tight." Harry B. Guis, *Christian Science Monitor*, September 21, 1981.

[15]Source: *Federal Reserve Bulletin* (January 1982), Tables 1.21, 1.56, 1.57, 1.58, 2.16.

[16]In other words, modern monetary systems have a fiat base—literally money by decree—with depository institutions, acting as fiduciaries, creating obligations against themselves with the fiat base acting in part as reserves. The decree appears on the currency notes: "This note is legal tender for all debts, public and private." While no individual could refuse to accept such money for debt repayment, exchange contracts could easily be composed to thwart its use in everyday commerce. However, a forceful explanation as to why money is accepted is that the federal government requires it as payment for tax liabilities. Anticipation of the need to clear this debt creates a demand for the pure fiat dollar, guaranteeing its exchange value. See Abba P. Lerner, "Money as a Creature of the State," *American Economic Review* (May 1947), pp. 312-17; and Ross M. Starr, "The Price of Money in a Pure Exchange Monetary Economy with Taxation," *Econometrica* (January 1974), pp. 45-54.

panies, investment banks, brokerages, insurance companies); and (3) sellers of goods (retail and trade credit). In the first case, a depository institution lends money to a borrower who in turn uses these funds to purchase goods or repay debts; the credit extension entails monetary expansion of purchasing power because it consists of checkable deposit expansion. During the last three decades, loans by such depository institutions have accounted for between 35 and 50 percent of the annual total of credit market funds extended to the non-financial sector.[17] Alternatively put, more than half of the credit extended annually in U.S. financial markets does *not* entail deposit expansion.

In the second case, a non-depository institution (e.g., a consumer finance company) issues the credit or buys the accounts receivable of a credit-issuing seller. The latter method of credit extension is called factoring, and non-depository institutions fund this activity by either selling debentures directly or by acting as an agent for a depository institution. Under either method, the extension of credit does *not* entail an expansion of deposits but a *reallocation* of existing deposit holdings.[18]

Finally, in case three, credit may be extended directly by the seller of goods and held as accounts receivable. Often this credit is financed by the sale of commercial paper issued by the seller/credit-issuer (e.g., firms with their own financial subsidiaries such as Sears or General Motors). In these instances, whether the firm holds its own accounts receivable, factors its accounts receivable or sells commercial paper, the extended credit represents an increase in purchasing power not created by checkable deposit expansion.

In the second and third cases, credit extensions substitute for monetary mediation, while, in the first case, a dollar of money is created by each dollar of credit extended. Thus, for the case of loans by deposit creation, credit expansion has no apparent impact on the relation between the narrowly defined money supply and income since M1 and credit move together; however, in the latter two cases, credit substitutes for money which apparently would change the ratio of income to money supply.

Yet, to the extent that credit arrangements increasingly provide as ready a source of purchasing power as narrowly defined money (M1), the appearances of these cases are somewhat misleading. There should be an incentive to reduce M1 holdings and to increase the non-M1 portion of M2 holdings. For example, given the rising acceptability of bank credit cards—about 30 percent of U.S. retail and service establishments accepted them in 1972, approximately 50 percent in 1981—the utility of holding a reserve of currency or demand deposit balances in order to mediate unforeseen or spur-of-the-moment purchases has been significantly reduced for consumers.[19] Still, to clear the short-term credit card debt at month's end, a ready source of funds to shift to demand or other checkable deposits remains necessary. Consequently, even if the proportions of cash and credit purchases were constant, given the increasing acceptability of credit as an exchange medium, it would not be surprising to see consumer holdings of demand deposits decline relative to purchases (i.e., to have had a rising velocity).

IMPLICATIONS OF RISING CREDIT FOR MONETARY GROWTH AND ECONOMIC ACTIVITY

If all credit extensions represented monetary expansion, then controlling monetary growth would control credit. The same constraint that limiting reserves imposes on deposit expansion also limits

[17]Source: Board of Governors, Federal Reserve System. Of course, this credit expansion is limited by bank reserves under a given set of reserve requirements and is consequently directly controlled by the monetary authority. For this form of credit, additional credit control authority would be superfluous. This case also covers bank credit card usage since credit issued by a seller to a buyer against a bank card becomes a demand deposit increment as soon as the seller/credit-issuer submits the credit invoice to the agent bank. In both types of credit extension, direct or credit card, a depository institution creates money matching the extended credit.

[18]If a depository institution issues a loan to a creditor using the accounts or debt as collateral, then the credit extension has the same one-for-one expansion of deposits as if the loan were directly placed. From 1977 through 1980, the percentage of installment loans by non-depository institutions was .39, .37, .40, .45 respectively; source: *Federal Reserve Bulletin* (September 1981), table 1.57. A breakdown for non-installment credit has not been present in the *Bulletin* since 1975, but from 1965 to1975, commercial banks extended only about one-third of single-payment non-installment loans.

[19]The total number of merchant (i.e., retail and service) establishments in the United States rose less than 2 percent per year during the 1960s and 1970s, while the number of merchant outlets accepting MasterCard and VISA rose at over 8 percent and 9 percent per year, respectively. (Sources: *Statistical Abstract of the United States, 1980* (U.S. Dept. of Commerce, Bureau of the Census), 101st ed., and data supplied by VISA and MasterCard). To estimate the percentage of merchants accepting bank cards, we estimated total merchants for 1981 by extrapolating the 2 percent annual growth rate from 1977 forward. This was then divided into the number of merchant outlets that accept MasterCard.

credit extensions, and inflation policy can properly focus on controlling money growth, leaving the market to allocate credit. As we have seen, however, depository institutions account for less than half of the credit annually extended in the United States. Consequently, might not the purchasing power created by non-deposit credit extensions render monetary policies undertaken through control of monetary growth rates ineffective? The answer is no: money in its role as the means of settlement constrains non-depository as well as depository credit.

If an increase in the use of credit alters the money-income relationship, the income velocity of money will rise. That is, if a larger share of transactions by households or firms can be mediated by credit, those households and firms, relative to their incomes, will plan to hold less M1 and more of other assets, including non-M1 deposits. As this substitution occurs, the ratio of nominal income to M1 (velocity) will rise. Whether such a change will occur for all monetary aggregates, narrow and broad, depends on the extent to which substitutions of non-M1 assets for M1 comprise deposits included in other monetary aggregates.[20]

Velocity, v, which is the ratio of nominal gross national product, Y, to money, M,

$$(1) \qquad v = \frac{Y}{M},$$

measures the turnover rate of the average dollar in M, that is, how many times a dollar was used in a transaction involving Y during the year.[21] Expressing nominal income as the product of the price level, P, and real output, y,

$$(2) \qquad Y = Py,$$

we obtain an equation for the growth rate of velocity,

$$(3) \qquad \dot{v} = \dot{P} + \dot{y} - \dot{M},$$

from equation 1, where $\dot{}$ indicates the annualized growth rate of each variable. From equation 3, we obtain

$$(4) \qquad \dot{P} = \dot{v} - \dot{y} + \dot{M},$$

which shows the significance of velocity for monetary policy with the inflation rate, $\dot{P}$, as its target.

As is obvious from equation 4, if velocity is constant ($v = o$), then the inflation rate will be equal to the difference between the growth rates of real output, $\dot{y}$, and money, $\dot{M}$; if $\dot{v}$ is relatively constant but non-zero, then inflation would be the difference between the growth rates of money and real output plus that of velocity. If $\dot{v}$ does not depend on $\dot{M}$ or $\dot{y}$, then equation 4 implies that if $\dot{v}$ is simply predictable, even if not constant, then controlling the money supply is tantamount to controlling inflation.[22]

This interpretation abstracts from variations in real output, but, to the extent that fluctuations in the growth rate of money exacerbate such variations, setting a constant growth rate of money reduces that source of disturbance. Non-monetary disturbances to real output growth (e.g., the OPEC oil embargo), of course, may cause inflation to deviate from its anticipated path, but over longer periods of time, a steady growth rate of money will smooth real income growth as well as facilitate inflation predictability. This is the rationale for a policy of targeting on the growth rate of money and why its effectiveness depends upon the predictability of velocity.[23]

Assessing the predictability of a variable involves two separate evaluations: point forecasts and variability. The shorter the time period considered, the relatively more important is the latter characteristic; that is, while a short-run forecast of a variable may rarely be precise, if that variable does not fluctuate wildly in a fashion out of keeping with its history, then describing it as predictable is sensible.

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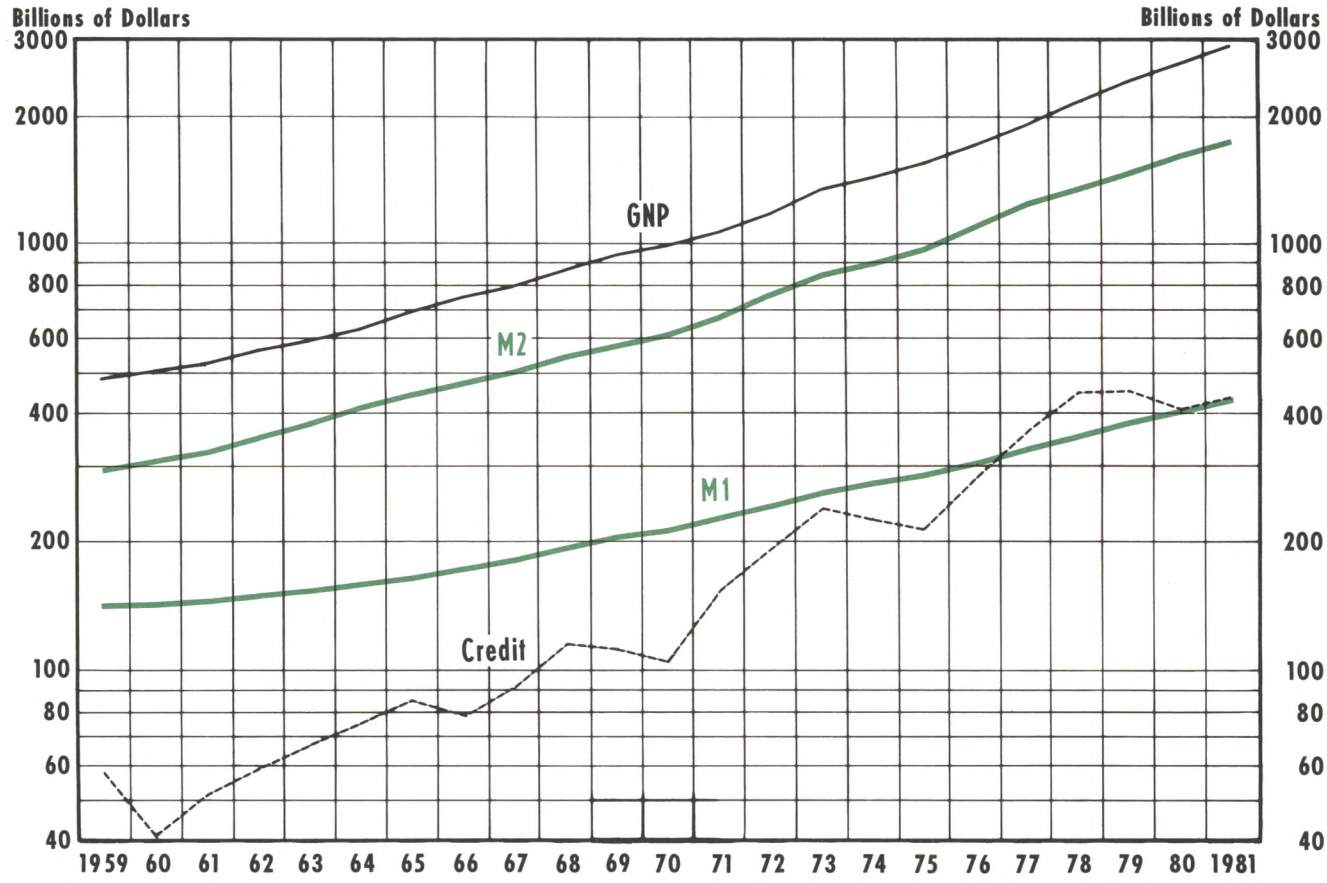
[20]Essentially, this is again Friedman's argument that the definition of money is not an a priori but an empirical issue. "The selection [of money's definition] is to be regarded as an empirical hypothesis asserting that a particular definition will be most convenient for a particular purpose because the magnitude based on that definition bears a more consistent and regular relation to other variables relevant for the purpose than do alternative magnitudes of the same general class. . . . It may well be that the specific meaning it is most convenient to attach to the term money differs for different periods, under different institutional arrangements, or for different purposes." Friedman and Schwartz, *Monetary Statistics of the United States*, p. 91.

[21]The reciprocal of velocity measures the average holding period of a dollar, how long between final income transactions. This period is germane to the Friedman notion of temporary abode of purchasing power.

[22]Note that for policy purposes we need not know precisely why the growth rate of velocity is predictable; for the purpose of formulating an inflation policy through control of a monetary aggregate, it is sufficient that it is predictable.

[23]For a more detailed statement, see Milton Friedman, "A Theoretical Framework for Monetary Analysis," *Journal of Political Economy* (March/April 1970), pp. 193-238. Friedman also argues that monetary policy is not useful in counter-cyclical policy because of lags in its impacts and that, consequently, it is more useful if steady or predictable; see his American Economic Association Presidential Address, "The Role of Monetary Policy," *American Economic Review* (March 1968), pp. 1-17, and his "Monetary Policy" lecture cited in footnote 1.

Chart 1
Income, Money and Credit



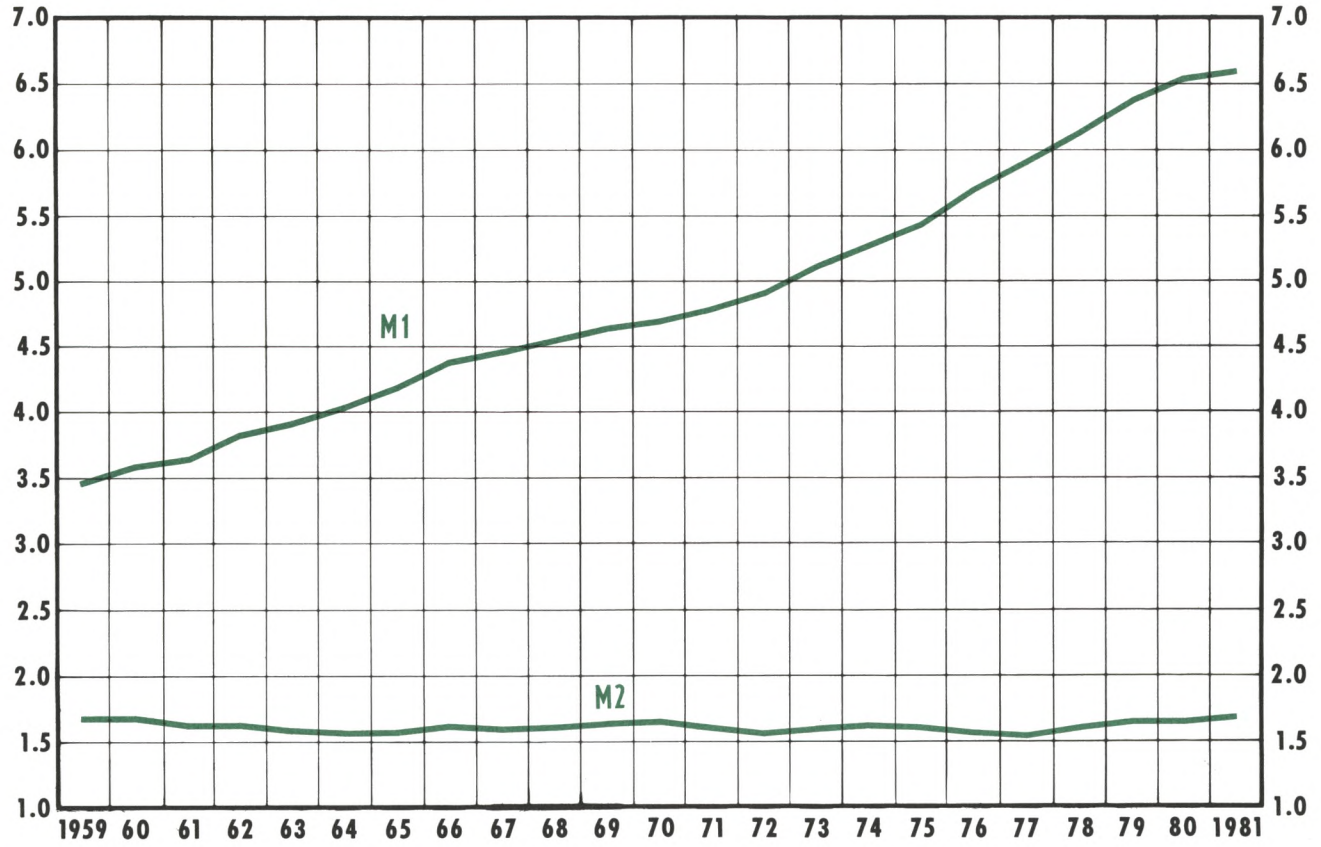
HAS RISING CREDIT SIGNIFICANTLY AFFECTED THE RELATIONSHIP BETWEEN MONEY AND INCOME?

There are several ways to assess the impact of rising credit on the money-income link. Three different procedures are used here: (1) a consideration of the levels of GNP, money and credit; (2) an examination of consumer deposit holdings, credit extensions and purchases; (3) observations of the growth rates of M1 and M2 velocities.

First, we can see whether the relationship between money and income growth appears to have changed in recent years by simply looking at the data on income, money and credit presented in chart 1. Chart 1, using a semi-log scale, depicts annual GNP, M1 and M2 holdings, and credit flows, with the last defined as the quantity of funds raised in credit markets by firms, consumers and the government, plus trade credit extended between firms.[24] On a semi-log chart, constant growth rates graph as straight lines, and equal growth rates appear as parallel lines. In this format, it is plain that from 1959 to 1981 credit's growth was the fastest of the aggregates, that GNP and M2 have grown at roughly equal rates, and that all three grew somewhat faster than M1. The credit magnitude grew at an average rate of 9.2 percent per year, while M2 grew at about the same rate as GNP during the last two decades—8.3

[24]Note that it is the flow of credit—i.e., extensions—not the stock of debt that is relevant here. Credit, as discussed earlier, is transaction-specific and can mediate only that transaction for which it is extended. Even if the promissory note from a previous credit transaction were subsequently used as collateral for another credit transaction, there would be another credit extension for that transaction. Unlike past money expansion, the stock of past extensions is, in itself, irrelevant.

Chart 2
Velocities of M1 and M2



percent and 8.2 percent per year, respectively. In contrast, M1 grew at a 5.2 percent rate.

In chart 2, the velocities of M1 and M2 are displayed. The approximate constancy of the M2 velocity is clearly evident here, as well as the persistent rise of M1 velocity. Not so evident, however, is the relatively *constant rate* of M1 velocity growth. Over the 1959-81 period, M1 velocity grew at around 3.2 percent. Indeed, except for a noticeable slowing in the late '60s, the velocity growth rate of both old M1 and new M1 has been between 3 percent and 4 percent since 1950.[25]

[25]Recently, Robert E. Weintraub, senior economist for the Joint Economic Committee of the U.S. Congress, made a similar point in a letter to the *Wall Street Journal*, October 14, 1981: "As a matter of logic, offshore and other new financial developments can contribute to inflation only if they contribute to the rate of rise of money's velocity. However, they have not. Since the early 1950's, the rate or rise of M1B's velocity has been quite steady, 3.2% yearly."

The ratio of credit to income, while persistently rising, probably understates the importance of credit in explaining the rise of M1 velocity. The credit total is misleadingly low since it represents quarterly balance sheet *changes in debt*. If credit is extended and repaid within the period of observation (one quarter for the data in chart 1), there is no change in the credit balance and, thus, no evidence that this credit extension took place; nonetheless, such extensions of credit would have mediated exchanges and contributed to spending and economic activity.

A second way to assess the impact of credit use is to focus on the behavior of individuals and families—in particular, to examine their holdings of demand and other checkable deposits as compared to credit in mediating consumer purchases. Table 1 presents data on consumer deposit holdings, credit extensions and purchases in the U.S. economy during the 1970s. By focusing on the consumer sector, three

Table 1

Consumer Deposits, Credit, Expenditures and Deposit Velocities (amounts in billions of dollars)

	Consumer Deposits and Credit					Consumer Expenditures and Mediations			Velocities			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Demand deposits	Other checkable deposits	Total checkable deposits	Consumer M2 deposits	Total consumer credit extensions	Personal consumption expenditures	Total cash purchases	Percent cash purchases	6 ÷ 1	6 ÷ 3	7 ÷ 3	6 ÷ 4
1970	$ 53.6	$ 0.4	$ 54.0	$ 458.5	$187.1	$ 634.1	$ 447.0	70.5%	11.83	11.74	8.27	1.38
1971	58.6	0.5	59.1	532.3	215.8	692.6	476.8	68.8	11.82	11.72	8.07	1.30
1972	65.4	0.6	66.0	609.8	240.8	767.0	526.2	68.6	11.73	11.62	7.97	1.26
1973	70.1	0.8	70.9	654.8	269.0	834.3	565.3	67.8	11.90	11.77	7.97	1.27
1974	73.3	0.9	74.2	694.4	269.4	914.1	644.7	70.5	12.47	12.32	8.69	1.32
1975	78.0	1.6	79.6	796.2	280.7	1016.9	736.2	72.4	13.04	12.78	9.25	1.28
1976	82.6	3.2	85.8	921.2	318.2	1127.9	809.7	71.8	13.65	13.15	9.44	1.22
1977	91.0	4.8	95.8	1034.8	373.5	1254.5	881.0	70.2	13.79	13.09	9.20	1.21
1978	97.4	7.8	105.2	1117.5	424.2	1416.6	992.4	70.1	14.54	13.47	9.43	1.27
1979	99.2	17.7	116.9	1200.1	465.8	1582.3	1116.5	70.6	15.95	13.54	9.55	1.32
1980	102.4	27.4	129.8	1286.2	449.3	1751.0	1301.7	74.3	17.10	13.49	10.03	1.36
1981	86.6	74.4	161.0	1400.8	477.2	1909.5	1432.3	74.1	22.05	11.86	8.90	1.36

Notes: (1) Gross IPC Consumer demand deposits, year-end figures. Source: *Federal Reserve Bulletin.* Figure for 1981 is preliminary.

(2) NOW and ATS accounts, credit union share drafts and demand deposits at mutual savings banks. Source: Federal Reserve Board.

(3) IPC consumer demand deposits plus other checkable deposits.

(4) M2 minus overnight Eurodollars minus overnight RPs minus money market mutual funds minus currency minus demand deposits plus IPC consumer demand deposits plus other checkable deposits. Source: *Federal Reserve Bulletin.*

(5) Consumer installment credit extensions plus non-installment consumer credit outstanding. The installment figure is 12 times the December total for that year, while the non-installment figure is two times the December total (under the assumption of a six-month, term-to-maturity structure of non-installment credit, on average). Source: Federal Reserve Board.

(6) Expressed at annual rates. Source: Department of Commerce.

(7) Personal consumption expenditures less total consumer credit [Col (6) – Col (5)].

(8) The ratio of total cash purchases to personal consumption expenditures [Col (7) ÷ Col (6)].

technical national income accounting and comparability problems are avoided. First, all personal consumption expenditures are final goods transactions and appear in GNP; in fact, they are over 60 percent of this measure. Hence, all the credit extensions to consumers are used for final goods purchases. In contrast, commercial credit and trade credit may be financing intermediate goods. Second, a direct comparison of credit use and demand deposit holdings for an identifiable set of buyers is made possible; hence, characterizations about the relative use of credit and demand deposits in relation to income are facilitated. Third, data on credit extensions are available so that a truer picture of credit utilization can be obtained than when using balance sheet changes in debt.

The data in table 1 characterize the manner in which households have made their purchases and held their deposits during the last 12 years; these data are based on fourth quarter and December observations in each year. Clearly evident is the recent substitution of non-bank checkable deposits for demand deposits (columns 1 and 2), as well as the steady decline in holdings of demand deposits relative to total purchases (column 6) measured by their velocity (column 9). Conversely, the ratio of purchases to total consumer checkable deposits, the velocity of total checkable deposits (column 10), rose much more gradually and fell abruptly in 1981 to about its level in 1970.

As the data indicate, the proportions of consumer transactions initially mediated by money and credit (column 6) varied only slightly during the 1970s; the share of purchases that were mediated by currency and demand deposits remained around 70 percent (assuming a six-month term to maturity in non-installment credit) over the decade. Thus, over this period of rough constancy in the distribution of types of mediation, the ratio of consumer expenditures to demand deposit holdings by consumers (column 9) increased by almost 45 percent. Conversely, the ratio of purchases to total checkable deposits rose only 15 percent through 1980 (column 10). Moreover, in 1981, demand deposits fell abruptly (column 1) and other checkable deposits rose even more sharply (column 2) after the institution of NOW accounts nationwide. As a result, the velocity of total checkables fell in 1981 to approximately its 1970 value.

If we assume a narrow or transactions medium definition of money, M1, the observations over 1970-80 would be evidence of a decline in the quantity of money demanded by households. On the other hand, if we consider total checkables in 1981 or assume a broader temporary-abode-of-purchasing-power definition, M2, then the ratios of consumer expenditures to the consumer deposit holdings provide contrary evidence. As shown in column 12 of the table, the ratio of consumer expenditures to the sum of household demand deposits, saving and small time deposits, and money market mutual funds varied comparatively little relative to the demand deposit and total checkables ratios. Thus, under the broader definition, the quantity of money demanded —at least the consumer portion—does not appear to have declined during the 1970s. In particular, 1980 and 1981 do not appear to be qualitatively different than the earlier years.

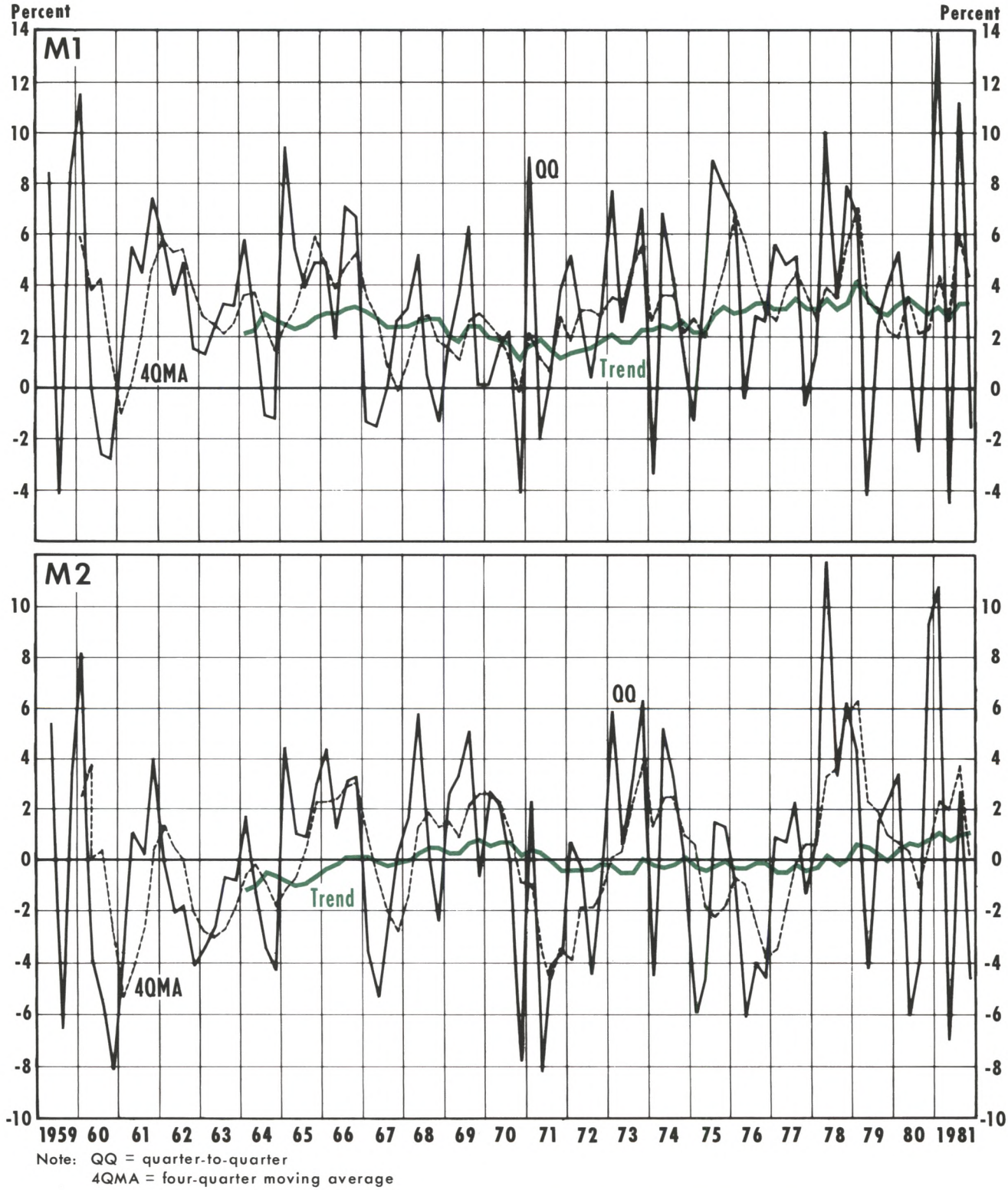
The third manner of assessing credit's impact is to determine whether the trends in the income velocities of the monetary aggregates have changed significantly in recent years. As we saw in the slopes of M1 and M2 velocities in chart 2, monetary aggregate velocities had strong trends in their growth over the two decades 1959-81. While on a quarter-to-quarter basis velocity growth rates exhibit significant variability, chart 2 suggests that over longer periods velocity growth is fairly regular. This trend regularity is substantiated in chart 3, which plots the growth rates of M1 and M2 velocities. In this chart, quarter-to-quarter (QQ), four-quarter moving average (4QMA) and 20-quarter moving average (Trend) growth rates appear. While QQ is highly variable for both M1 and M2, the 4QMA for each has a markedly smaller amplitude; considering ± 4 percent bands, only one observation for M1's velocity growth and three observations for M2's velocity growth lie beyond them. Also, the trend for each strongly underscores the apparent tendencies in chart 2; in each case, M1 and M2 velocities have stable trends, especially when measured over periods longer than a year. In particular, the charts do not reveal recent velocity growth to have been qualitatively different than in earlier years.

This lack of change in M1 and M2 velocity growth is even more apparent in table 2, which displays velocity growth rates, their standard deviations, and their ranges for 1961-81, for five-year subperiods, and for the year 1981; growth rates are computed for two observation frequencies: quarter-to-quarter (QQ) and four-quarter moving average (4QMA).

Consider the behavior of M1 velocity computed on a quarterly basis. Over the entire 1961-81 period, it has had an average growth rate of 3.16 percent per

Chart 3

Velocity Growth Rates



Note: QQ = quarter-to-quarter
4QMA = four-quarter moving average

Table 2
Annual Growth Rates of M1 and M2 Velocities During 1961-81

Aggregate	Observation frequency		Velocity Growth at Annual Percentage Rates during: 1961-81	1961-65	1966-70	1971-75	1976-80	1981
M1	QQ	Mean	3.25	3.71	1.96	3.64	3.39	4.74
		SD	3.62	2.62	3.02	3.64	3.49	9.13
		Range	−4.47, 13.90	−1.18, 9.44	−4.06, 7.08	−3.36, 9.00	−4.16, 10.02	−4.48, 13.90
	4QMA	Mean	3.12	3.17	2.36	2.94	3.77	4.35
		SD	1.58	1.79	1.52	1.16	1.51	1.39
		Range	−1.01, 6.98.	−1.01, 5.86	−.09, 5.15	.70, 5.47	1.86, 6.98	2.61, 6.01
M2	QQ	Mean	.17	−.59	.68	−.28	.81	.47
		SD	4.05	2.62	3.54	4.13	4.87	8.03
		Range	−8.23, 11.75	−4.32, 4.36	−7.81, 5.75	−8.23, 6.26	−6.09, 11.75	−7.00, 10.83
	4QMA	Mean	.04	−1.25	1.06	−.65	.60	2.06
		SD	2.36	1.87	1.72	2.41	2.68	1.41
		Range	−5.32, 6.31	−5.32, 2.29	−2.76, 3.01	−4.46, 3.96	−3.84, 6.31	.23, 3.66

year. As was apparent in chart 3, quarter-to-quarter fluctuations can be significant; yet, over the two decades, the standard deviation of its growth rate has remained about 3.00. While extrapolating the long-run velocity growth rate of M1 to 1981 underestimates the observed growth rate, the 4.74 percent rate is well within one standard deviation of either the 1976-80 mean or that of the full 1961-81 period, and represents a fluctuation that is comparatively small in terms of the range of observed growth rates during either the subperiod or the full period as shown in chart 3.

For M1, QQ and 4QMA have roughly the same average growth rates; for M2, the 4QMA growth rate is relatively more volatile than the QQ growth rate. Yet, in absolute terms the difference between QQ and 4QMA is about equal for M1 and M2 for the entire 1961-81 period (−.13) and for each subperiod except 1976-80 and 1981. For both M1 and M2, the variability (SD) of 4QMA is naturally significantly less than that of QQ. The standard deviations of velocity growth computed on a four-quarter moving average are about one-half of the quarterly version for M1 and the base and between one-half and two-thirds for M2. Moreover, the standard deviation for 1981 is smaller than for the preceding subperiod. The implication is, as usual, that quarterly monetary statistics are a less useful guide to the longer-run behavior of money than averages over longer periods.

In summary, whether we look at M1 or M2, the information displayed in chart 3 and compiled in table 2 conveys the same message: namely, the behavior of monetary aggregate velocities in 1981 is not qualitatively different than over the preceding 20-year period or any of the subperiods. This is clearest when considering the four-quarter moving average growth rates, though the more volatile quarter-to-quarter rates tell essentially the same story. While velocity growth rates were higher in 1981 than in preceding subperiods during 1961-81, there is no evidence that credit use and financial innovations have severed the link between monetary aggregates and the inflation rate.

CONCLUSION

Much of the current debate over U.S. economic policy has focused on the wisdom of targeting a monetary aggregate to control inflation. Some critics of such policies have alleged that financial innovations have both made money uncontrollable and severed its predictable link with national income and prices. Others have argued that non-monetary assets or liabilities may have a closer link than money to income over the long run. This article has focused on the predictable linkage issue by examining the principal function of money and credit, the mediation of exchange. Since credit's mediation

function depends crucially on the predictable source of monetary settlement, there is no theoretical support for assertions that the increasing use of credit has severed money's link to income. In terms of the empirical evidence for the year 1981, both M1 and M2 velocities grew reasonably close to their trend rates. This is grossly inconsistent with assertions that monetary policy is ineffective.

While the controllability issue has not been addressed in this article, an analysis of the changes in monetary aggregates in relation to Federal Open Market Committee (FOMC) directives during 1981 suggests that both M1 and M2 movements were strikingly in accord with the intentions of the FOMC.[26]

Consequently, there appears to be no reasonable foundation—theoretical or empirical—for abandoning the use of a monetary aggregate as the vehicle for monetary policy. Unless or until velocity becomes more unpredictable or fluctuates over ranges not previously observed, the usefulness of monetary aggregates in controlling inflation and maintaining economic stability will be undiminished.

[26]See Daniel L. Thornton, "The FOMC in 1981: Monetary Control in a Changing Financial Environment," this *Review* (April 1982), pp. 3-22.