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Monetary Growth, Inflation, and
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Projections Through 1983

*By William G. Dewald and Maurice N. Marchon**

Beginning in 1975 each Administration has published its views about the future performance of the U.S. economy. Administration budget documents have included economic assumptions and objectives and budget projections through the coming five years. However, the underlying econometric models and/or analyses used to generate the projections are not identified. Furthermore, the documents have been mute about the monetary growth that would be consistent with the stated objectives. The latest projections, presented in the 1979 Federal Budget prepared by the Carter Administration, were issued in January 1978[1] and updated in July 1978.[2]

This article evaluates these latest Administration economic projections and determines their implications for monetary growth, using a small econometric model of the economy in which monetary growth plays a major role. The article also uses the model to analyze the implications of alternative monetary growth rates for the economy and to identify trade-offs between inflation and unemployment.

THE MODEL

The article uses a modification of the econometric model developed by the Federal Reserve Bank of St. Louis, which is a model of the aggregate demand for and supply of goods and services.[3] In the model, changes in aggregate demand and supply determine the rate of inflation, the real growth rate, the

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1 ***The Budget of the United States Government, Fiscal Year 1979*** (Washington: Superintendent of Documents, U.S. Printing Office).

2 ***Office of Management and Budget, Mid-Session Review of the 1979 Budget,*** July 6, 1978.

3 Leonall C. Andersen and Keith M. Carlson, "A Monetarist Model for Economic Stabilization," Federal Reserve Bank of St. Louis ***Review.*** April 1970, pp. 7-25. The spending equation in the model is based on Leonall C. Andersen and Jerry L. Jordan, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," Federal Reserve Bank of St. Louis ***Review,*** November 1968, pp. 11-24. A reestimation of the model appeared in Leonall C. Andersen and Keith M. Carlson, "St. Louis Model Revisited," ***International Economic Review,*** Vol. 15, No. 2, June 1974, pp. 305-27.

unemployment rate, and short-term interest rates.[4]

The aggregate demand for or spending on goods and services, measured by changes in nominal gross national product (GNP), is assumed to be determined by variables outside the model, referred to as exogenous variables. The most important exogenous variable is a monetary policy variable, which is measured by the annual growth rate of the money supply, M1, defined as currency and demand deposits held by the nonbank public. Nominal GNP is also specified to be affected by high employment Federal Government spending and by the demand for exports. The aggregate supply of goods and services is assumed to be exogenous, determined outside the model by long-run factors such as capital accumulation and population growth. It is measured by changes in high employment real GNP, as estimated by the President's Council of Economic Advisers.

The rate of inflation, measured by the per cent change in the GNP price deflator, is assumed in the model to be directly affected by expected aggregate demand for and supply of goods and services. More precisely, the rate of inflation depends partly on current demand pressure, which is defined as the difference between the expected demand for goods and the supply of goods and services. Thus, the inflation rate is affected by those exogenous variables that affect nominal GNP, such as the growth rate in M1. The impact of M1 on inflation is indirect in that M1 affects the demand for goods and services, which affects demand pressure. Demand pressure in turn has a direct impact on inflation.

In the model, inflation also depends directly on inflationary expectations. The treatment of inflationary expectations is the most important modification of the St. Louis model. While expected inflation is assumed to be related to a weighted average of past inflation rates in both models, the St. Louis model uses weights based on an estimated relationship between long-term interest rates and inflation. This approach is built on the hypothesis of Irving Fisher that real interest rates — interest rates adjusted for expected inflation — are constant, so that variations in nominal interest rates reflect variations in expected inflation.[5] The weights used in the modified model are derived from an estimated relationship between inflation and past values of inflation, demand pressure, and international prices. This approach uses past information as it was estimated to be related to inflation. For this reason, the modified model may be said to use a rational expectations approach to the determination of inflationary expectations.[6]

4 An appendix lists all of the equations of the model. The complete empirical estimates are presented in a working paper, "Monetary Growth, Inflation, and Unemployment: Projections Through 1983," which is available on request from the Federal Reserve Bank of Kansas City. These estimates are also published in "Macroeconomic Goals and Prospects of the Carter Administration," ***Bulletin of Business Research,*** Ohio State University, November 1978. The present model grew out of earlier work as represented by William G. Dewald and Maurice N. Marchon, "A Modified Federal Reserve Bank of St. Louis Spending Equation for Canada, France, Germany, Italy, the United Kingdom, and the United States," ***Kredit und Kapital*** (11. Jahrgang 1978/Heft 2), pp. 194-212; and William G. Dewald and Maurice N. Marchon, "A Common Specification of Price, Output, and Unemployment Rate Responses to Demand Pressures and Import Prices in Canada, France, Germany, Italy, the United Kingdom, and the United States," ***Weltwirtschaftliches Archiv*** (forthcoming).

5 Irving Fisher, ***The Theory of Interest*** (New York: Kelley & Millman, 1954).

6 Rational expectations as originally defined by Muth would require that expectations be generated by a relationship in the independent variables that actually generate the variable to be forecast. John F. Muth, "Rational Expectations and the Theory of Price Movements," ***Econornetrica.*** July 1961, pp. 315-35. As in the case of Rutledge, and Kane and Malkiel, a weak form

Changes in the actual real output of goods and services, measured by changes in real GNP, are assumed in the model to be determined by estimated changes in both nominal GNP and the inflation rate. Since nominal GNP is assumed to depend solely on exogenous variables, such as the money supply, the modified model manifests one-way causality or recursiveness. That is, changes in nominal GNP affect changes in real GNP and/or inflation, but there is no feedback effect on nominal GNP.

The unemployment rate is assumed to be determined by the percentage gap between high employment output and actual output. The unemployment rate is indirectly affected by the M1 growth rate. That is, M1 affects nominal GNP directly, which, in turn, can affect real GNP in the short run and, therefore, the gap between high employment and actual output.

The model contains one short-term interest rate—the 4- to 6-month commercial paper rate—which is assumed to depend on demand pressure and inflation. For example, increases in demand pressure or in the rate of inflation are assumed to place upward pressure on interest rates. Thus, the model exhibits a positive relationship between high inflation and high interest rates.

In summary, the model determines five major variables—changes in nominal GNP, the rate of inflation (per cent changes in the GNP deflator), changes in real GNP, the unemployment rate, and a short-term interest rate. These variables are related to variables outside the model, such as the growth rate of M1, and by the parameters that define and measure the relationships among the variables in the model.

To use the model to make and analyze economic projections, the values of these parameters must be estimated. The parameters of the modified model were estimated by applying econometric procedures to historical data for the first quarter of 1953 through the second quarter of 1978. Given the model and the estimated parameters, projections can be made for the future behavior of the variables determined by the model. For this purpose it is necessary to make assumptions about the behavior of the model's exogenous variables, such as the M1 growth rate and the high employment GNP growth rate.

EVALUATION OF CARTER ADMINISTRATION PROJECTIONS

To evaluate the Carter Administration projections using the modified St. Louis econometric model,[7] the first step was to determine the monetary growth rate that would be required, according to the model, to achieve the Administration's goal for real output in 1983. In determining the required monetary growth rate, it was necessary to make certain assumptions about the behavior of the exogenous variables other than money that according to the model will affect real output during the 1978-83 period. It was assumed that

of Muth's hypothesis is used which defines expectations as rational if they fully incorporate relevant information that is available when the forecast is made including past values of the variable to be forecast. John Rutledge, A *Monetarist Model of Inflationary Expectations,* Lexington Books, 1974. Edward J. Kane and Burton G. Malkiel, "Autoregressive and Nonautoregressive Elements in Cross-Section Forecasts of Inflation," *Economem'ca.* January 1976, pp. 1-16.

7 Keith Carlson evaluated the Administration's projections in 1977 with an updated St. Louis model. Keith M. Carlson, ."Economic Goals for 1981: A Monetary Analysis," Federal Reserve Bank of St. Louis *Review,* November 1977, pp. 2-7. He later examined unemployment-inflation trade-offs in "Inflation, Unemployment, and Money: Comparing the Evidence From Two Simple Models," Federal Reserve Bank of St. Louis *Review.* September 1978, pp. 2-6.

Table 1

CARTER ADMINISTRATION'S PROJECTIONS COMPARED WITH MODEL PROJECTIONS

	(Actual) 1977	1978*	1979†	1980	1981	1982	1983
Real GNP							
Level: (Billions of 1972 Dollars)							
Carter	1,333	1,392	1,453	1.51 2	1,576	1,640	1,706
Model	1,333	1,380	1,439	1,499	1,566	1,638	1,713
Per Cent Change:							
Carter	4.9	4.4	4.3	4.1	4.2	4.1	4.0
Model	4.9	3.5	4.3	4.2	4.5	4.6	4.6
Nominal GNP							
Level: (Billions of Dollars)							
Carter	1,887	2,095	2,330	2,576	2.838	3,107	3,383
Model	1,887	2,091	2,326	2,570	2,841	3,142	3,476
Per Cent Change:							
Carter	11.0	11.0	11.2	10.6	10.2	9.5	8.9
Model	11.0	10.8	11.2	10.5	10.5	10.6	10.6
GNP Deflator (1972 = 100)							
Per Cent Change:							
Carter	5.9	6.3	6.6	6.2	5.7	5.2	4.7
Model	5.9	7.0	6.9	6.4	6.1	6.0	6.0
Unemployment Rate (Per Cent)							
Carter	7.0	6.0	5.7	5.4	4.9	4.4	4.1
Model	7.0	6.0	6.1	6.0	5.7	5.3	5.0
Short-Term Interest Rates (Per Cent)							
Carter‡	5.3	6.5	6.6	6.6	6.3	5.8	5.3
Model§	5.6	7.4	7.6	7.4	7.6	7.9	8.3

*Actual first half as of July 31, 1978. Extrapolated second half.

†It is assumed that the annual M1 growth rate is 8 per cent; the high employment Federal Government spending growth rate, 7.8 per cent; the nominal exports growth rate, 10 per cent; the import price inflation rate, 10 per cent; and the high employment real output growth rate, 3.5 per cent. Administration projections were obtained from **The Budget of the United States Government: Fiscal Year 1979** and the **Mid-Session Review of the 1979 Budget** published by the Office of Management and Budget.

‡Three-month Treasury bill rate.

§Four- to six-month commercial paper rate.

high employment Federal Government spending will grow at a 7.8 per cent annual rate as the Administration projects. Also, it was assumed that during the projection period, exports, import prices, and high employment output will conform with recent experience, with exports and import prices increasing 10 per cent and high employment output growing at a 3.5 per cent annual rate. Given these assumptions, the model indicates that M1 will need to grow at an annual rate of about 8 per cent to achieve the Administration's real output projection of $1.7 trillion for 1983. (See Table 1.) In other words, when the model is used to project the behavior of the economy during the 1978-83 period (the projection period begins in mid-1978), under the assumption that M1 grows at a constant annual rate of 8 per cent during the period, the model projects a level of real output for 1983 of approximately $1.7 trillion, the same as the Administration's projection.

The next step in evaluating the Administration's projections was to compare the projections for variables other than real output with the model's projections for these variables, again using the assumption of an 8 per cent M1 growth rate. These comparisons indicate that within the framework of the model, the Administration's projections for real output are inconsistent with the Administration's projections for inflation. Along with the real output level of $1.7 trillion in 1983, the Administration, projects an inflation rate of 4.7 per cent (Table 1). However, along with the real output level of $1.7 trillion, the model projects an inflation rate of 6 per cent, well above the Administration's projection. Stated another way, the model implies that a monetary growth rate of 8 per cent would be needed to achieve the Administration's real output goal, but that the 8 per cent money growth rate would result in considerably more inflation than projected by the Administration.

This difference in inflation rates projected by the Administration and the model is reflected in a difference in interest rate projections. The Administration projects short-term interest rates at about 6.5 per cent through 1980 and then an easing to 5.3 per cent in 1983. According to the model, though, an 8 per cent monetary growth rate would provide so much inflationary pressure that short-term interest rates would remain at about 8 per cent over the entire projection period. (See Table 1.)

The model indicates that the Administration goals for unemploymerit and inflation are also inconsistent. The Administration's unemployment goal for 1983 is 4.1 per cent. (See Table 1.) The model indicates that a monetary growth rate even as high as 8 per cent—the growth rate that would result in a 6.0 per cent inflation rate instead of the Administration's 4.7 per cent—would not achieve the Administration's unemployment goal. The 8 per cent monetary growth rate would result in an unemployment rate of 5.0 per cent, according to the model. A higher monetary growth rate would be needed to achieve the Administration's unemployment rate of 4.1 per cent. However, such a money growth rate would result in an inflation rate even higher than 6.0 per cent and considerably higher than the Administration's 4.7 per cent rate.

IMPLICATIONS OF ALTERNATIVE MONEY GROWTH RATES

The model's projections for the behavior of nominal GNP, real GNP, inflation, and the unemployment rate during the period under alternative assumptions about the growth of M1 are shown in Charts 1 through 5.[8] As a

8 These projections assume steady monetary growth rates during the projection period. Yet, if a policy of steady monetary growth were announced and if the public expected the policy to be achieved, the relationships

point of reference, the Administration's projections for these variables are also shown. For both the Administration's projections and the model projections, under the assumption of an 8 per cent **M1** growth rate, the charts show graphically the data presented in Table 1. Thus, Chart 1 shows that an **M1** growth rate of 8 per cent results in the achievement of the Administration's real output projection of $1.7 trillion in 1983.

The model's projections indicate that an **M1** growth rate during the projection period of 6.5 per cent—the upper limit of the Federal Reserve's long-run growth range **for M1**[9]—would be sufficiently low to avoid an acceleration in the 1977 inflation rate of about 6 per cent. (See Chart 2.) However, reducing monetary growth to 6.5 per cent in the 1978-83 **period—compared** with the 8.2 per cent rate recorded in the year and one-half ending in mid-1978—would result in a temporary slowdown in the real growth of the economy and an increase in the unemployment rate. (See Charts 3 and 4.) The model indicates that an **M1** growth rate higher than 6.5 per cent would be required to avoid a temporary economic slowdown. For example, a monetary growth rate of 8 per cent would result in a growth rate in real GNP of between 4 and 5 per cent during most of the projection period. Moreover, the 8 per cent money growth rate would be associated with a decline in the'unemployment rate to 5 per cent in 1983. However, the higher money growth rate would leave the inflation rate in 1983 at 6 per cent.

The model indicates that an **M1** growth rate of zero would have a dramatic impact on the economy. The model implies that the appropriate monetary growth rate for long-run stable prices is close to zero. This is not surprising, since a zero growth rate is not so different from the actual experience in the 1950's following the Korean war, a period of remarkably stable prices. Under current circumstances, moreover, the model indicates that an anti-inflation policy featuring zero monetary growth would indeed eradicate inflation by 1983. However, such a policy would also produce a substantial increase in unemployment and a decline in the economic growth rate. By 1983, the unemployment rate would exceed 11 per cent and the real economy would have just started growing at a rate sufficiently strong to bring the economy out of a deep recession. Any policy of sharply reducing the monetary growth rate, short of reducing it to zero, would also have a pronounced impact on the economy. Thus, the model shows that an **M1** growth rate of 4 per cent—the lower limit of the Federal Reserve's long-run growth range for **M1—would** bring the inflation rate down to 3.2 per cent in 1983, but would raise the unemployment rate above 8 per cent in that year.[10]

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underlying this model might be altered. The new relationships would presumably result in faster responses of the economy to monetary policy than are indicated by this model.

9 The Federal Reserve's growth rate range for M1 has been adjusted to account for the impact of automatic transfer savings accounts introduced on November 1, **1978.** Assuming an unchanged stance of monetary policy, it is necessary to reduce the **M1** growth rate range as currently measured. The reduction is required because the new automatic transfer savings accounts are expected to attract funds from demand deposits and thus change the relationship between **M1** and the economy.

10 If by some good fortune, productivity increased so that potential real output grew at an annual rate of **4** per cent rather than **3.5** per cent as has been the average experience, the inflation rate would drop about 0.4 percentage points but the unemployment rate would increase by **0.4** percentage points in **1983** relative to the simulated outcome with unchanged potential growth and **6.5** per cent money growth. Given the other assumptions a decrease in import inflation from 10 to **5** per cent would decrease domestic inflation by **0.6** percentage points and the unemployment rate, **1.1** percentage points relative to what would otherwise occur in **1983.**

Chart 1
REAL GNP PROJECTIONS FOR ALTERNATIVE M1 GROWTH RATES

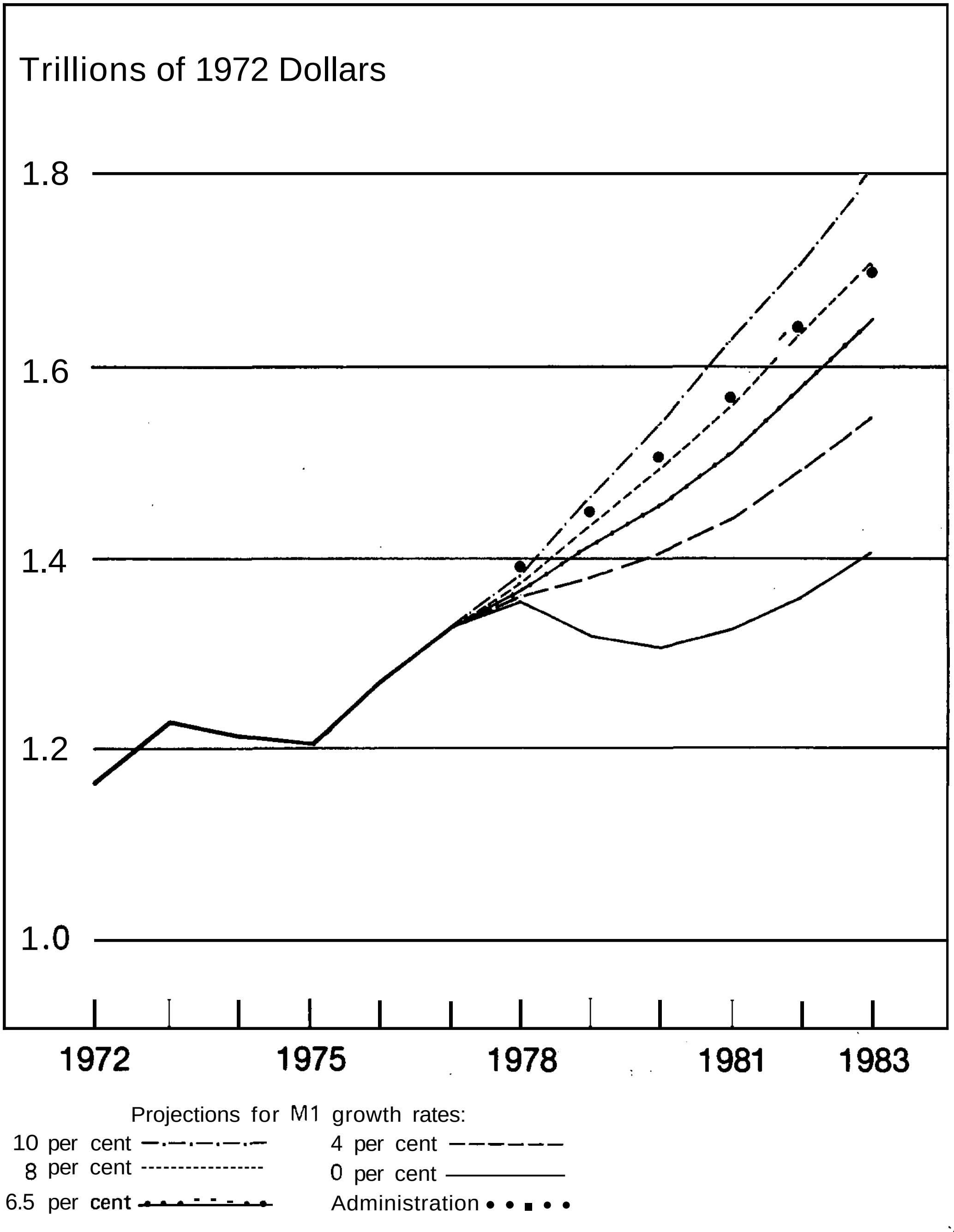


Chart 2
GNP DEFLATOR GROWTH RATE PROJECTIONS FOR ALTERNATIVE M1 GROWTH RATES

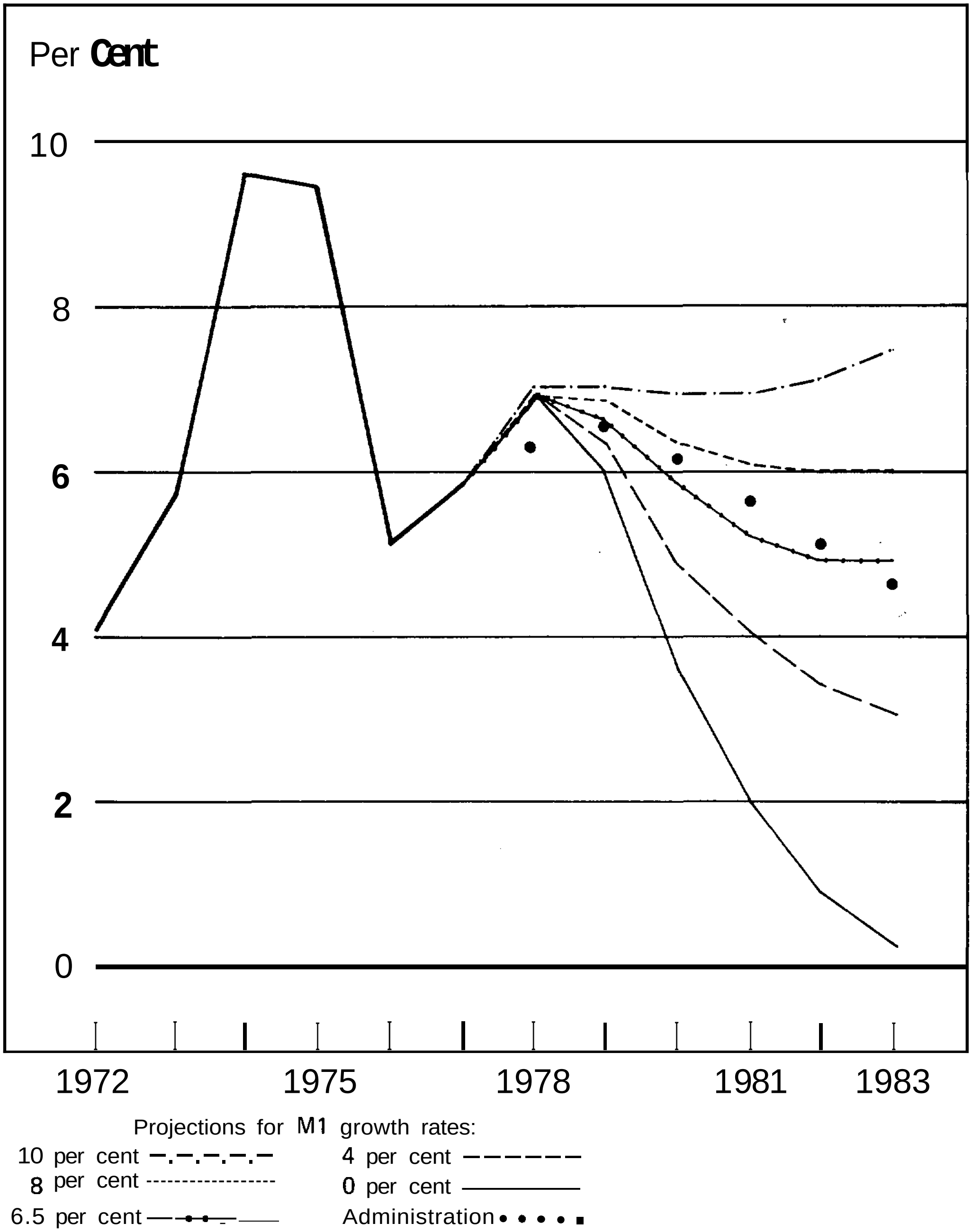


Chart 3
REAL GNP GROWTH RATE PROJECTIONS FOR ALTERNATIVE M1 GROWTH RATES

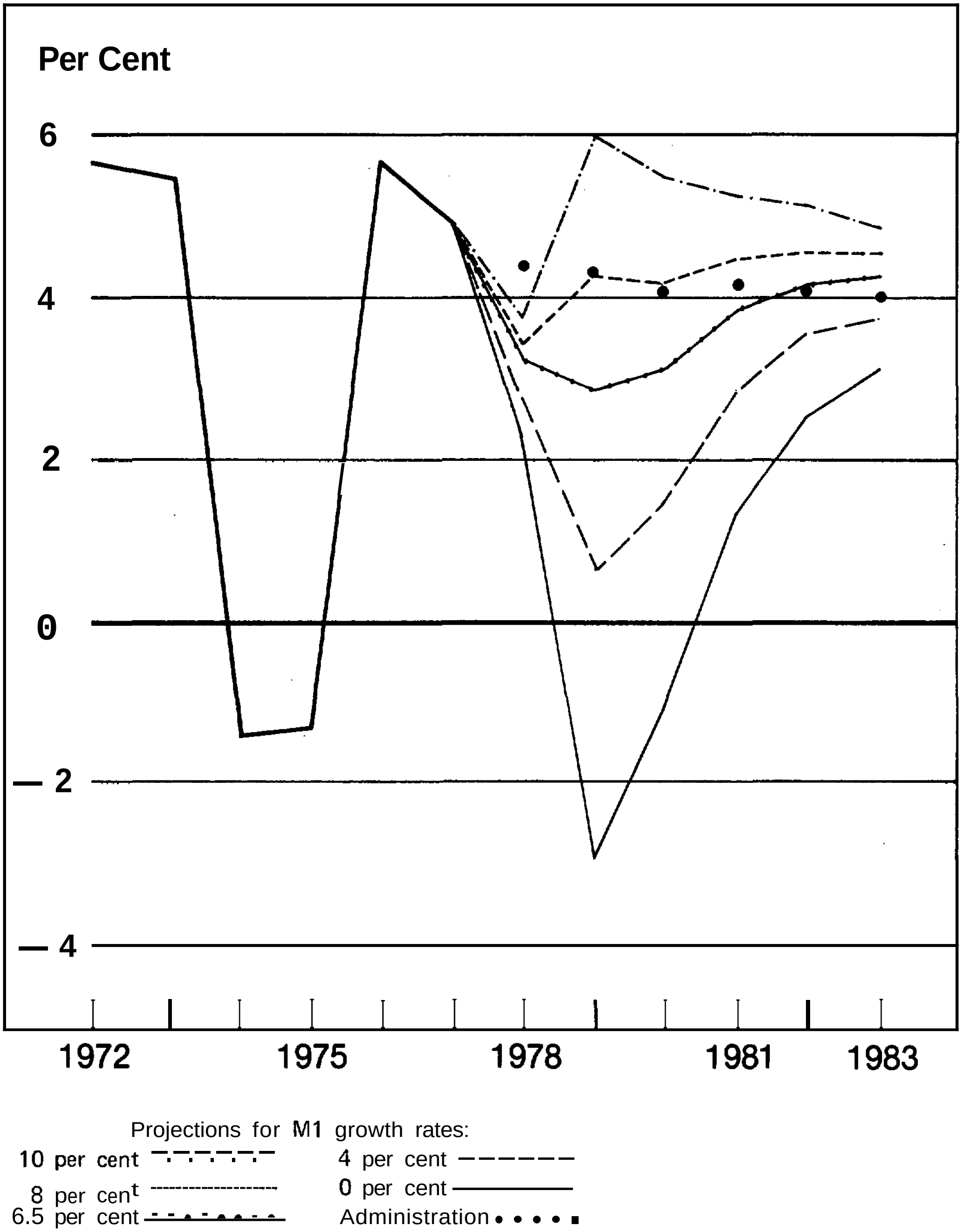


Chart 4
UNEMPLOYMENT RATE PROJECTIONS FOR ALTERNATIVE M1 GROWTH RATES

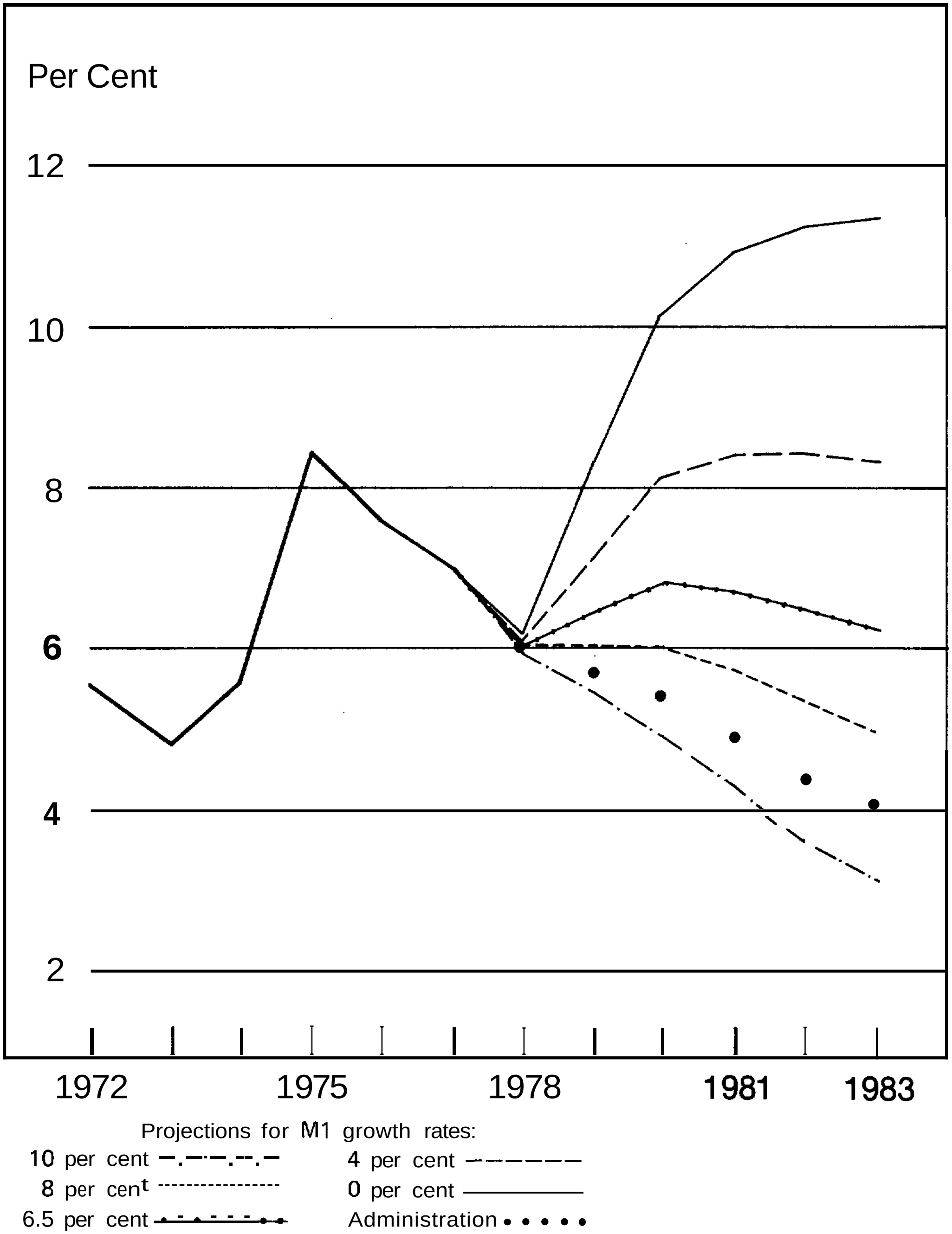
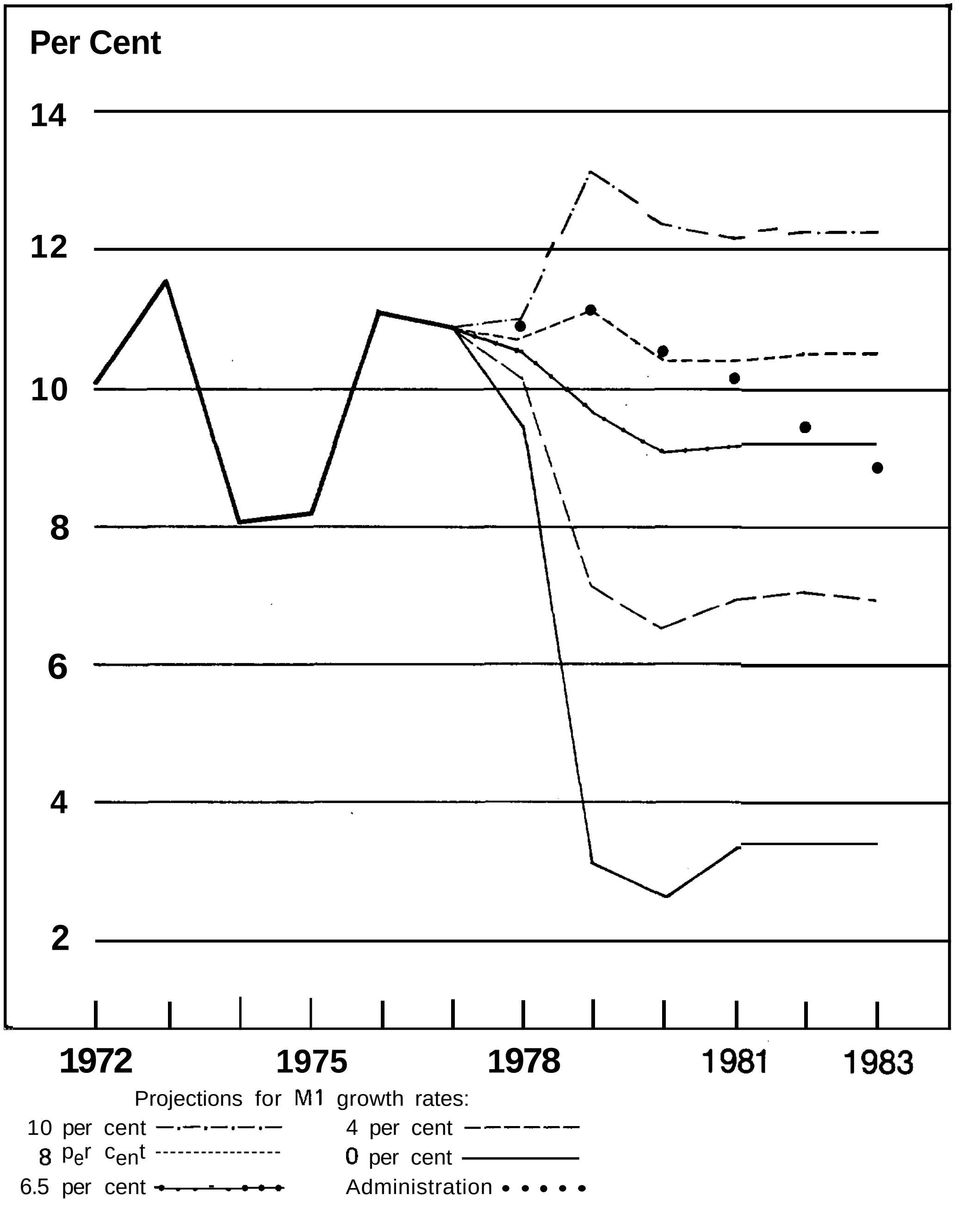


Chart 5
NOMINAL GNP GROWTH RATE PROJECTIONS FOR ALTERNATIVE M1 GROWTH RATES



INFLATION AND UNEMPLOYMENT TRADE-OFFS

The foregoing analysis implies a significant short-run trade-off between the goals of containing inflation and maintaining a low level of unemployment. In 1958 the late A. W. Phillips estimated a negative relationship between the British unemployment rate and wage inflation over nearly a century.[11] Ever since, relationships between inflation and unemployment have been called "Phillips curves." Soon after Phillips' seminal work, Paul Samuelson and Robert Solow[12] were able to identify a Phillips curve in U.S. data, although the simple version of this relationship was not stable 'except for the postwar period through the 1950's.

Economists disagree on whether economic policymakers can depend on a stable trade-off between inflation and unemployment. Some argue that, in the long run. the unemployment rate is not affected by inflation, but is related to the normal dynamics of labor markets. Milton Friedman[13] made such an empirical judgment about the long run in his Nobel lecture in 1976, along lines developed earlier by Friedman and by others such as Edmund Phelps,[14] and Robert Lucas and Leonard Rapping.[15] These economists argue that there is no long-run trade-off between inflation and unemployment. Friedman has also argued that in the 1970's even the short-run trade-off between inflation and unemployment disappeared due to inflation-induced production disincentives and inefficiencies. But whether or not there is a short-run trade-off, it is important to mention that the same short-run trade-offs are not generally available year after year. Though the analysis undertaken for this article supports the view that there is a 'short-run trade-off today, it is not nearly so favorable as a decade ago. What happened to the trade-off in the face of persisting inflation was an upward shift that has raised the inflation rate associated with every unemployment rate.

The nature of the present trade-off is summarized in Chart 6.[16] The line in the chart shows the model estimates of combinations of the unemployment rate and the inflation rate that would occur in 1983 as a result of M1 growing from mid-1978 through 1983 at alternative constant rates of change. For example, a 10 per cent M1 growth rate would result in an unemployment rate of 3.2 per cent and an inflation rate of 7.5 per cent. Lower monetary growth rates would result in lower inflation and higher unemployment. Thus, a zero monetary growth rate would produce an unemployment rate of 11.4 per cent and an inflation rate of 0.3 per cent in 1983.

Chart 6 assumes that monetary policymakers follow a policy of maintaining a constant growth rate in M1. Of course, policymakers may not follow such a policy, and such a policy

11 A. W. Phillips, "The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1862-1957," *Economica*, November 1958, pp. 283-99.

12 Paul A. Samuelson and Robert M. Solow, "Analytic Aspects of Anti-inflation Policy," *American Economic Review. Papers and Proceedings*, May 1960, pp. 177-204.

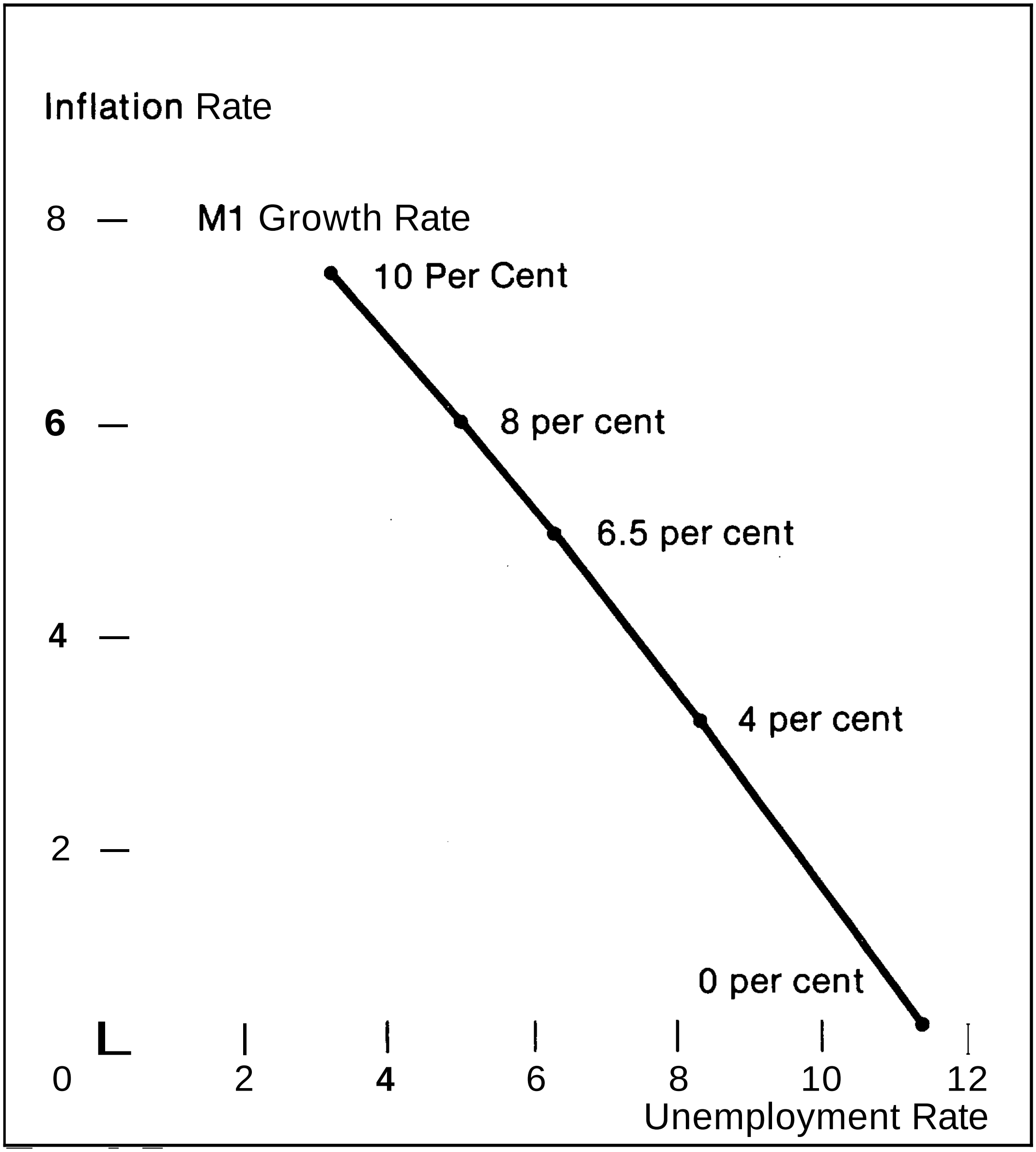
13 Milton Friedman, "Nobel Lecture: Inflation and Unemployment," *Journal of Political Economy*, June 1977, pp. 451-72.

14 Edmund S. Phelps, *Inflation Policy and Unemployment Theory* (New York: W. W. Norton and Co., Inc., 1972).

15 Robert E. Lucas, Jr. and Leonard A. Rapping, "Real Wages, Employment, and Inflation," *Journal of Political Economy*, September/October 1969, pp. 721-54.

16 These are not strictly Phillips curves which would represent the most efficient trade-offs. However, as Chow and Megdal showed, the constant monetary growth trade-offs in the St. Louis model are very close to the most efficient trade-offs. Gregory C. Chow and Sharon B. Megdal, "An Econometric Definition of the Inflation-Unemployment Tradeoff," *American Economic Review*, Vol. 68, No. 3, June 1978, pp. 446-53.

Chart 6
INFLATION AND UNEMPLOYMENT IN 1983 WITH ALTERNATIVE M1 GROWTH RATES
(Amounts in Per Cent)



may not be the most desirable. Some observers have suggested a gradual reduction in the monetary growth rate. For example, Congressman Parren J. Mitchell, chairman of the Subcommittee on Domestic Monetary Policy of the House Banking Committee, proposed bringing the annual monetary growth rate gradually down to 3 per cent and then maintaining it indefinitely at this level.[17] The impact of Congressman Mitchell's proposal on the economy may be analyzed with the econometric model. The analysis indicates that implementing his proposal would cause results similar to an immediate reduction in the monetary growth rate to around 4 per cent. Gradually reducing monetary growth would result in 1983 in an unemployment rate of 8.2 per cent and an inflation rate of 3.4 per cent. Similarly, a steady 4 per cent **M1** growth rate would yield in 1983 an unemployment rate of 8.3 per cent and an inflation rate of 3.2 per cent. However, the lower long-term monetary growth rate of 3 per cent in Congressman Mitchell's proposal implies eventually an inflation rate nearly 1 percentage point lower than would be associated with steady 4 per cent annual monetary growth.

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[17] **Speech to the Graduate School of Banking, Madison, Wisc., August** 21, 1978. **Mindful of costly dynamic adjustments that would need to be made, Congressman Mitchell also proposed selective Federal expenditures to ease the burden of those most likely to experience prolonged layoff.**

CONCLUSION

A small "mainly monetarist" model of the **U.S.** economy was used in this article to evaluate the Carter Administration's economic projections through 1983, published in July 1978. According to the model, which stresses the importance of monetary growth, an **M1** growth rate of about 8 per cent—the growth recorded during the six quarters ending in **mid-1978—would** be needed to achieve the Administration's goals for real GNP in 1983. However, an 8 per cent monetary growth rate would keep inflation from declining by 1983 to the 4.7 per cent projected by the Administration. The model implies that the inflation rate would be 6.0 per cent in 1983 if **M1** grows at the 8 per cent rate. Thus, according to the model, the Administration projections are inconsistent.

The model suggests that a significant reduction in inflation would require a long period of economic slack. By 1983, inflation could be eliminated by reducing **M1** growth to zero. But zero **M1** growth would cause a very substantial decline in real output growth and a rise in unemployment to over 11 per cent. These results are disheartening but not surprising. Any change in a monetary growth rate that the economy has come to expect affects real output and unemployment first (and quickly), and inflation second (and only slowly). Extricating the economy from high built-in inflation is very costly.

APPENDIX
The Model
1953 Q1 to 1978 Q2

Equations:

$$1.\ \dot{Y}_t = \underset{(3.71)}{2.91} + \sum_{i=0}^{5} m_i \dot{M}_{t-i} + \sum_{i=0}^{5} e_i \dot{EF}_{t-i} + \underset{(1.69)}{.03}\dot{EX}_t.$$

$R^2 = .52$
SE = 3.46
DW = 1.97

$$\Sigma m_i = \underset{(4.79)}{.89} \qquad \Sigma e_i = \underset{(.55)}{.04}$$

2. $D \equiv \ln(Y/P^a) - \ln(XF)$.

$$\dot{P}^a_t = \underset{(2.40)}{.88} + \sum_{i=1}^{4} d_i D_{t-i} + \sum_{i=1}^{8} p_i \dot{P}_{t-i} + \sum_{i=1}^{4} w_i \dot{W}_{t-i}. \quad (3)$$

$R^2 = .75$
SE = 1.46
DW = 1.86

$\Sigma d_i = \underset{(.72)}{.05}$ $\quad \Sigma p_i = \underset{(6.72)}{.73}$ $\quad \Sigma w_i = \underset{(2.64)}{.09}$

$$\dot{P}_t = \underset{(.19)}{.05} + \underset{(17.28)}{1.01}\dot{P}^a_t + \underset{(1.00)}{.04}D_t. \quad (4)$$

$R^2 = .76$
SE = 1.37
DW = 1.86

5. $\dot{X} \equiv \dot{Y} - \dot{P}$.

6. $G \equiv (XF - X)/XF$

$$U = \underset{(33.79)}{4.41} + \underset{(1.47)}{.07}G_t + \underset{(5.70)}{.30}G_{t-1} \quad (7)$$

$R^2 = .69$
SE = .29
DW = 1.91
$\rho = .76$

$$R_t = \underset{(.74)}{4.20} + \sum_{i=0}^{4} b_i G_{t-i} + \sum_{i=0}^{6} r_i \dot{P}_{t-i}. \quad (8)$$

$R^2 = .27$
SE = .63
DW = 1.60
$\rho = .995$

$\Sigma b_i = \underset{(4.71)}{.61}$ $\quad \Sigma r_i = \underset{(2.16)}{.38}$

Definitions of Symbols:

Y = GNP.
M = money stock (M1).
EF = high employment Federal Government spending.
EX = exports.
D = demand pressure.
P = GNP deflator.
XF = high employment real GNP.
W = imports deflator.
X = Y/P = real GNP.
G = real output gap.
U = unemployment rate.
R = 4- to 6-month commer'cial paper rate.

t = quarter.
ln = natural logarithm.
• = annual rate of change.
a = anticipated.
Lower case letters = coefficients.
Upper case letters = variables.
R^2 = coefficient of determination..
SE = standard error of estimate.
DW = Durbin-Watson statistic.
ρ = serial correlation coefficient.
t–values are in parentheses.

Automatic Transfers and Monetary Policy

By Scott Winningham

Since November 1, 1978, banks and their customers have been permitted to arrange automatic transfers of funds from personal savings accounts to checking accounts whenever a checking account balance falls below a level previously agreed upon by the bank and customer. The idea to allow automatic transfers is not new. The Board of Governors of the Federal Reserve System originally proposed automatic transfers in 1976 and revived the proposal in February 1978. By May 1, the Federal Reserve System had received a record number of comnients on the proposal, the majority of which were favorable. After. extensive review of the comments, an amended version of the proposal was approved, effective November 1. The Board's action applied only to the approximately 5,600 commercial banks that are members of the Federal Reserve System. However, on May 5, the Federal Deposit Insurance Corporation approved a regulatory change that allows the 8,731 commercial banks and 324 mutual savings banks that it regulates to offer automatic transfers.

Most decisions about the terms of automatic transfers have been left to banks. Banks are allowed to decide such terms as minimum balances, minimum amounts to be transferred, per transfer fees, per check fees, fixed monthly fees, forfeiture of interest, and the specified level of demand deposit balances at which transfers occur. However, automatic transfers can be used only by individuals, not by businesses, government agencies, or nonprofit institutions. Also, a bank must still reserve the right to at least 30 days' notice prior to withdrawal of a savings deposit.

This article examines the monetary policy implications of allowing automatic transfers. The first section considers the effects of automatic transfers on several measures of the money supply--called monetary aggregates— while the second section analyzes the effects of automatic transfers on the Federal Reserve System's ability to control the monetary aggregates. The last section briefly discusses the objectives of monetary policy, the relationships between the monetary aggregates and these policy objectives, and the effects of automatic transfers on these relationships.

THE EFFECTS OF AUTOMATIC TRANSFERS ON THE MONETARY AGGREGATES

Automatic transfers (AT's) may affect the monetary aggregates by affecting the demand and supply factors for the various components of the aggregates. The monetary aggregates considered in this article are usually denoted M1, M2, and M3. M1 consists of currency and demand deposits (checking account balances) held by the nonbank public. M2 is equal to M1 plus time and savings deposits at commercial banks other than large negotiable certificates of deposit at weekly reporting banks. M3 is equal to M2 plus deposits at nonbank thrift institutions. This section first considers the demand effects, then discusses the supply effects, and finally illustrates how estimates may be obtained of the demand and supply effects of AT's on the monetary aggregates.

Demand Effects

AT's may affect M1 by reducing the public's demand for demand deposits. Since demand deposits do not pay interest, one might wonder why individuals hold any demand deposits since most other financial assets do pay interest.[1] The answer, of course, is that checks may be written on demand deposit balances but not, in general, on funds held in other financial assets. In other words, demand deposits are transactions balances while these other assets are not.

Transactions balances are funds that can be used as a medium of exchange. Besides currency, transactions balances include funds in financial institutions with which payments for goods and services can be made directly using checks or check-like instruments. The costs of a transactions balance are any service costs charged by a financial institution plus the interest that is foregone from not holding higher yielding, interest-bearing assets. The benefit of a transactions balance is the convenience.

AT's allow individuals to keep larger amounts in their savings accounts and smaller amounts as transactions balances in their checking accounts. Because savings deposits pay interest while checking accounts do not, AT's may reduce the cost to individuals of maintaining transactions balances because less interest is foregone. Therefore, unless service costs on AT's are prohibitive, AT's induce the public to hold more savings deposit balances and less demand deposit balances.

The extent that savings and demand deposit balances are affected depends largely on the terms that banks establish for AT's. Individuals will shift funds from demand to savings deposit accounts with AT services if shifts increase interest income net of service costs. Abstracting from all terms except fixed and per transfer (or per check) fees, individuals will shift demand deposit funds into savings deposits with AT services if $rB > f + tN$, where $>$ means greater than, r is the monthly interest rate on savings deposits, B is the average balance, f is a monthly fixed fee, t is a per transfer (or per check) fee, and N is the number of automatic transfers (or the number of checks) made in a month.[2]

Banks have established a wide range of different values of the monthly fixed fee, f, and the per transfer (or per check) fee, t. For example, one large New York bank has set f equal to $3.00 and t equal to $0.25. The f and t values established by an Ohio bank holding company for its affiliate banks vary inversely with the sizes of depositors' balances: For deposits up to $500, f is $5.00, and t is $0.20;

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[1] Federally insured commercial banks have been legally prohibited from paying interest on demand deposits since 1933. For background information and a discussion of the current controversy about paying interest on demand deposits, see Bryon Higgins, "Interest Payments on Demand Deposits: Historical Evolution and Current Controversy," Federal Reserve Bank of Kansas City *Monthly Review,* July-August 1977, pp. 3-11.

[2] In the above formula, the interest earned from the savings account is on an after-taxes basis. To the extent that income taxes reduce these earnings, a larger balance would be required to make an AT account profitable.

Table 1
MAXIMUM NUMBER OF PROFITABLE AT'S PER MONTH FOR BANK CUSTOMERS WITH VARIOUS BALANCES

Average Balance	Maximum Number of Profitable AT's Per Month		
	NY Bank	Ohio Holding Company	KC Bank*
$ 100	–	–	2
200	–	–	5
300	–	–	8
400	–	–	11
500	–	2	13
600	–	5	16
700	–	7	19
800	1	9	22
900	3	11	25
1,000	4	17	27
1,500	13	31	41
2,000	21	45	55
2,500	29	89	69

'For this bank the numbers refer to checks, not AT's, per month.

for deposits between $500 and $5,000, f is $1.50 and t varies between $0.20 and zero depending on the size of the account; and for deposits over $5,000, f and t are both zero. Still another combination of f and t has been established by a Kansas City bank: For combined demand .and savings accounts balances less than $5,000, f is zero and t (a per check fee in this case) is $0.15; for balances over $5,000, f and t are zero.

Table 1 shows that the effects of AT's on demand and savings deposits depend on how banks price AT's. The table indicates the maximum number of AT's per month that a bank customer could profitably make under the various pricing schedules cited, using the formula described earlier and assuming the present 5 per cent annual interest rate ceiling on commercial bank savings deposits. With a pricing schedule similar to that of the New York bank, AT's benefit only those households that currently maintain relatively large demand deposit balances. For example, with an average balance of $1,000, monthly interest income is approximately $4.17 (.00417 x $1,000).[3] The monthly service costs for four transfers with this pricing schedule are $4.00 ($3.00 + $0.25 x 4), but for five transfers these costs would be $4.25. Therefore, the maximum number of four profitable AT's per month with this pricing schedule for an average balance of $1,000 suggests that many shifts of funds from demand to savings deposits are unlikely. On the other hand, with the other two pricing schedules, AT's benefit many more demand deposit holders so that more shifts of funds from demand to savings deposits are possible. For example, with the pricing schedule of the Kansas City bank, an average balance of $1,000 would make it profitable for an

3 .00417 is approximately the monthly interest rate associated with an annual rate of 5 per cent.

individual to write up to 27 checks per month since the monthly service costs for 27 checks are $4.05 ($0 + $0.15 x 27), which is less than the $4.17 monthly interest income on $1,000.

AT's may affect M2 and M3 by inducing the public to shift some funds into savings deposits from assets other than demand deposits. For example, deposits at nonbank thrift institutions may shift into commercial bank savings deposits in order to take advantage of banks' AT services. Funds in other assets may also shift into commercial bank savings deposits due to AT's.

In brief, the demand effects of AT's may tend to decrease M1, but may increase M2 or M3. The impact on M1 is probably greater than on M2 or M3, since AT's are likely to induce the largest shifts of funds from demand deposits.

Supply Effects

In addition to affecting individuals' demands for various money supply measures, AT's may also affect the monetary aggregates through the supply side. These supply effects may be either positive or negative, unless offset by the Federal Reserve System. Positive supply effects may occur if individuals shift some of their funds from demand deposits to savings deposits. This reduces banks' required reserves and increases their excess reserves because reserve requirements on savings deposits are lower than those on demand deposits.[4] Banks, in turn, are likely to respond by acquiring more assets and creating more deposits. If the Federal Reserve System supplies a given amount of reserves or base money, the supply effects of AT's given shifts of funds from demand to savings deposits lead to increases in the monetary aggregates. However, if the System absorbs the liberated reserves, these positive supply effects of AT's on the monetary aggregates can be offset.

Negative supply effects may occur if individuals shift some of their funds from nonbank thrift deposits or other assets to savings deposits at commercial banks. This increases banks' required reserves and reduces their excess reserves because nonbank thrift deposits are not subject to reserve requirements.[5] Banks, in turn, are likely to respond by acquiring fewer assets and creating fewer deposits. If the Federal Reserve System supplies a given amount of reserves or base money, the supply effects of AT's given shifts from nonbank thrift deposits and other assets to commercial bank savings deposits lead to decreases in the monetary aggregates. However, if the System supplies additional reserves, these negative supply effects of AT's on the monetary aggregates can be offset.

To summarize, the supply effects of AT's affect each of the monetary aggregates in the same direction. To the extent that AT's induce a flow of funds from demand to savings deposits, the supply effects tend to increase each of the monetary aggregates if not offset by the Federal Reserve System. In this case the supply effects partly offset the demand effects of AT's on M1, but reinforce the demand

[4] For example, the reserve requirement on savings deposits of Federal Reserve member banks is 3 per cent, while the reserve requirement on demand deposits of the largest member banks is 16% per cent. If a customer of one of these large banks were to shift $1,000 from his checking account to his savings account at that bank, the bank's required reserves would decline by (.1625 - .03) x $1,000 = $132.50. Congress has been considering legislation that would establish the same reserve requirement for demand deposits as for savings deposits with an AT service. Obviously, should such a change become effective, there would be no supply effects of a shift from demand to savings deposits.

[5] Although savings and loan associations have liquidity requirements and credit unions are required to set aside a specific percentage of gross income, nonbank thrift institutions do not hold reserves with the Federal Reserve System. It is the quantity of reserves held with the Federal Reserve System that influences the monetary aggregates.

effects of AT's on M2 and M3. To the extent that AT's induce a flow of funds from nonbank thrift deposits and other assets to commercial bank savings deposits, the supply effects of AT's tend to decrease each of the monetary aggregates if not offset by the Federal Reserve System. In this case the supply effects reinforce the demand effects of AT's on M1, but partly offset the demand effects on M2 and M3.[6]

Estimating the Demand and Supply Effects—An Illustration

The demand and supply effects of AT's on the monetary aggregates may be estimated by utilizing the monetary base-multiplier framework. In this framework, each monetary aggregate may be expressed as the product of the monetary base, B, and the corresponding money multiplier, m1, m2, or m3:

$$M1 = Bm1$$
$$M2 = Bm2$$
$$M3 = Bm3$$

The precise relationships between the money multipliers and their determinants are:

$$m1 = (c + d)/(r_d \cdot d + r_s \cdot s + c + e)$$
$$m2 = (c + d + s)/(r_d \cdot d + r_s \cdot s + c + e)$$
$$m3 = (c + d + s + n)/(r_d \cdot d + r_s \cdot s + c + e)$$

The letters in the formulas are defined as follows:

d = ratio of demand deposits to total deposits,
s = ratio of time and savings deposits to total deposits,
n = ratio of nonbank thrift deposits to total deposits = 1 - d - s,
c = ratio of currency held by the public to total deposits,
e = ratio of excess reserves to total deposits,
r_d = fractional reserve requirement on demand deposits, and
r_s = fractional reserve requirement on time and savings deposits.

The multipliers are important because if their components are known or can be predicted, then the Federal Reserve System can influence the monetary aggregates by controlling the monetary base. For example, an increase in the currency or c-ratio reduces the multipliers. If the increase in the c-ratio can be predicted, though, the monetary base can be increased precisely enough to offset the impact of the change in this ratio on any one of the monetary aggregates. However, to the extent that the change in the c-ratio cannot be predicted, the Federal Reserve System cannot determine the level of the monetary base that is consistent with the desired level of any monetary aggregate.

AT's affect the monetary aggregates by affecting the multipliers. Any increase in savings deposits and decreases in demand deposits and nonbank thrift deposits that are induced by AT's imply a larger s-ratio and smaller d- and n-ratios. These changes can be shown to decrease m1, increase m2, and decrease or increase m3. Thus, holding the monetary base constant, these changes in the

[6] Because the supply effects of AT's on the aggregates appear to depend on how the Federal Reserve System reacts, it is useful to review briefly the current procedure for implementing monetary policy. While the Federal Reserve System has in recent years progressively emphasized the behavior of the monetary aggregates in formulating monetary policy, it is still true that the Federal funds rate is the primary day-to-day vehicle of policy used by the System open market account manager. The Federal funds rate objective is the estimate of this interest rate that appears to be consistent with desired short-run growth rates of the monetary aggregates. As the Federal funds rate comes under pressure due to AT's, the immediate response of the account manager may be to absorb or to add enough reserves to hold the funds rate steady. Thus, at least in the short run, the supply effects of AT's may be automatically offset. Ultimately, however, monetary policymakers may estimate to what extent pressure on the funds rate is due to the supply effects of AT's and to what extent it is due to changes in economic conditions that require a different Federal funds rate objective.

Table 2
EXAMPLES OF ESTIMATES OF THE DEMAND AND SUPPLY EFFECTS OF AT'S

	Actual	Demand and Supply Effects	Demand Effects Only
M1*	350.3	337.4	335.0
M2*	840.5	846.4	840.5
M3*	1,429.7	1,439.8	1,429.7
m1	2.676	2.577	2.577
m2	6.420	6.465	6.465
m3	10.921	10.998	10.998
B*	130.915	130.915	129.993
d	.1926	.1811	.1811
s	.3666	.3781	.3781

*In billions of dollars.

s-, d-, and n-ratios decrease **M1**, increase M2, and decrease or increase M3.

Table 2 shows some estimates of the demand and supply effects of **AT's** on the monetary aggregates and money multipliers. These estimates, it should be emphasized, are illustrative in nature and—although the data used are judged to be reasonable—should not be construed as official estimates. The first column contains the actual seasonally adjusted June 1978 values of the monetary aggregates and the d- and s-ratios. The multipliers in the first column are calculated from June 1978 data using the formulas for the multipliers described earlier. The value of the monetary base, B, in column one is the amount which, when multiplied by any one of the calculated money multipliers, yields the corresponding monetary aggregate.[7] For example, M1 = Bm1 = $130.915 billion x 2.676 = $350.3 billion.

The second column of Table 2 contains some estimates of the combined demand and supply effects of AT's on the monetary aggregates and money multipliers. While AT's certainly differ from NOW accounts, estimates of AT effects for purposes of illustration may be obtained from the NOW account experience.[8] In four New England states, an estimated 17 per cent of household demand deposits shifted to NOW accounts in the first year that NOW accounts were offered. Therefore, the d- and s-ratios in the second column have been changed to reflect a 17 per cent decrease in household demand

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7 The values used to calculate the multipliers are as follows: d = .1926, s = .3666, n = .4408, c = .0695, e = .0001, r_d = .09, and r_s = .03. r_d and r_s are approximations. r_d is calculated as the ratio of required reserves behind demand deposits to the demand deposit component of the monetary aggregates. r_s is calculated in a similar manner. The value of the monetary base is also an approximation.

8 NOW accounts differ from AT's in that NOW accounts allow depositors to write drafts—called negotiable orders of withdrawal—on savings balances while AT's simply allow depositors to transfer funds automatically from' savings deposits to demand deposits. Presently, legislation limits NOW accounts to individuals, sole proprietorships, and nonprofit organizations having deposits in depository financial institutions in several northeastern states.

deposits and an equal increase in savings deposits.[9] Since AT's apply only to household demand deposits and since households currently hold about 35 per cent of total deposits, the d-ratio decreases 5.95 (= .17 x .35 x 100) per cent to .1811, and the s-ratio increases to .3781. These changes in the ratios result in a 3.7 per cent decline in the multiplier m1 and, therefore, in M1. Thus, m1 declines to 2.577 and M1 declines to 337.4. The other aggregates and multipliers increase slightly. The relatively large change in M1 is due to the dominance of the negative demand effect of AT's over the positive supply effect. M2 and M3 change little in this experiment because there are no demand effects of AT's on these aggregates, since demand deposits and savings deposits are both included in these aggregates. The small increases in M2 and M3 are due solely to the supply effects of AT's.

The third column of Table 2 shows some illustrative estimates of only the demand effects of AT's on the monetary aggregates and money multipliers. The d- and s-ratios are assumed to change as they did in the second column and, in addition, the Federal Reserve System is assumed to offset the supply effects of the AT's by decreasing the monetary base $922 million.[10] As a result of these assumptions, M1 declines even more than in column 2 (by 4.4 per cent now) and the other two monetary aggregates are unchanged from their actual values given in column 1. M1 declines in column 3 more than in column 2 because the third column assumes that the positive supply effect on M1 is offset. The 4.4 per cent decline represents solely the demand effect. M2 and M3 remain unchanged from their actual values in column 1 because their only reason for increasing in column 2 was the supply effect, which is now offset.

THE EFFECTS OF AUTOMATIC TRANSFERS ON THE FEDERAL RESERVE SYSTEM'S ABILITY TO CONTROL THE MONETARY AGGREGATES

There are two ways in which AT's may affect the Federal Reserve System's ability to control the monetary aggregates. First, AT's may temporarily decrease monetary control by making the structure of deposits more uncertain during the period of transition in which new AT accounts are established. In terms of the formulas given in the previous section, AT's may make it more difficult in the short run for the Federal Reserve System to predict the values of the d-, s-, and n-ratios. The arguments presented in the previous section suggested the likely directions of change that AT's induce in the various types of deposits. However, it is difficult to estimate the magnitudes of these changes. Since a different structure of deposits implies a different relationship among the monetary aggregates, the Federal Reserve System's ability to control any particular aggregate may be temporarily adversely affected by AT's.

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9 This figure agrees with other estimates which suggest that during the first year AT's are offered, banks should expect 16 to 22 per cent of their household demand deposits to shift to savings deposits having AT services. For more information, see the *American Banker,* August 30, 1978, pp. 4-6; September 12, 1978, pp. 1, 15; and September 18, 1978, pp. 1, 19. See also *The Money Manager,* October 16, 1978, p. 28.

10 Since total deposits in June 1978 were $1,336.7 billion, the implied required reserves before AT's are $R = r_d \bullet D + r_s \bullet S = (r_d \bullet d + r_s \bullet s)T = (.09 \times .1926 + .03 \times .3666) \times$ $1,336.7 billion = $37.871 billion, where R is implied required reserves, D is demand deposits, S is time and savings deposits, and T is total deposits. The implied required reserves after AT's are (.09 x .1811 + .03 x .3781) x $1,366.7 billion = $36.949 billion. Thus, AT's reduce required reserves by $922 million in this experiment. The monetary base has therefore been reduced by $922 million in column 3 to reflect the assumption that the Federal Reserve System absorbs these liberated reserves.

Secondly, AT's may affect the Federal Reserve System's ability to control the monetary aggregates by altering the responsiveness of the aggregates to changes in either the monetary base or the money multipliers. The Federal Reserve System's ability to control the monetary aggregates depends on the sizes of the money multipliers. Specifically, the larger the multiplier, the greater the fluctuation in the corresponding monetary aggregate, given unpredictable changes in either the monetary base or the multiplier itself.[11] In turn, the sizes of the multipliers may depend on the demand and supply effects of AT's. For example, if AT's induce a substantial shift of funds from demand deposits to savings deposits, the multiplier m1 may decline substantially, as Table 2 indicates, and the multipliers m2 and m3 may increase slightly. However, if AT's also induce a substantial shift of funds from nonbank thrift deposits to commercial bank savings deposits, the multiplier m2 may increase much more than in Table 2.[12]

AUTOMATIC TRANSFERS, THE MONETARY AGGREGATES, AND THE OBJECTIVES OF MONETARY POLICY

There are several important objectives of monetary policy. Over the years, these objectives have included a sustainable growth in output, a high level of employment, price stability, and a balance in transactions with foreign countries.

The monetary aggregates are related to these policy objectives through a concept called velocity. The income velocity of a monetary aggregate is the ratio of nominal GNP to the monetary aggregate. It measures the average number of times in a given period that each dollar of a monetary aggregate is spent for currently produced goods and services. From this definition of velocity, it follows that the sum of the growth rate of each monetary aggregate and its income velocity equals the rate of growth of nominal GNP which, in turn, can be represented as the sum of the growth rates of an output index and a price index. Thus, if the income velocity of a monetary aggregate is known, the rates of growth of output and prices can be influenced by changing the growth rates of the monetary aggregates. As an illustration, a rate of M1 growth of 5 per cent and income velocity of 2 per cent are consistent with growth rates of 3 per cent in output and 4 per cent in prices. Employment and balance of payments figures can similarly be influenced because they are related to output and prices.[13]

Given expectations of the rate of change in velocity, the Federal Reserve System regularly establishes ranges for the growth rates of the monetary aggregates that appear to be consistent with the desired or expected behavior of output, prices, unemployment, and the

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11 Unpredictable changes in the monetary base can result from changes in such factors as U.S. Treasury deposits in Federal Reserve Banks, Treasury purchases and sales of gold, Federal Reserve Bank float, member bank discount window borrowings, and Treasury cash holdings. Unpredictable changes in the money multipliers can result from changes in such factors as the public's currency holdings and banks' excess reserves. See J. A. Cacy, "Reserve Requirements and Monetary Control," Federal Reserve Bank of Kansas City Monthly Review, May 1976, pp. 3-13; and "Modern Money Mechanics: A Workbook on Deposits, Currency, and Bank Reserves," Federal Reserve Bank of Chicago, for more information on how these factors affect the monetary base and money multipliers.

12 For example, if in addition to a 17 per cent reduction in household demand deposits, 5 per cent of nonbank thrift deposits are assumed to shift into commercial bank savings deposits, then m2 increases 3½ per cent to 6.646. In this case, d = .1811, s = .4001, and n = .4188.

13 For example, Okun's law suggests that each extra percentage point in the unemployment rate is associated with approximately a 3 per cent decrease in output; and the higher are output and/or prices in the United States, the worse our balance of payments is likely to be.

balance of payments. For example, the current ranges for the period from the second quarter of 1978 to the second quarter of 1979 are 4 to *6%* per cent for **M1**, *6%* to 9 per cent for M2, and 7% to 10 per cent for M3.

Since AT's may affect the monetary aggregates, AT's may also affect velocities and the rates of growth of the aggregates that are consistent **with** the objectives of monetary policy. For example, AT's may increase Ml's velocity by decreasing **M1.** Therefore, if the System's ranges for the growth rates of the aggregates were consistent with the monetary policy objectives before the introduction of **AT's,** the range for **M1** might need to be lowered—during any time that AT's increase the growth of **M1's** velocity—to remain consistent with the objectives of monetary policy. Similarly, the ranges for M2 and M3 might need to increase slightly since AT's may decrease their velocities slightly.

There are several ways in which the conduct of monetary policy might be altered to adjust for the possible effects of AT's on the **monetary** aggregates. First, in view of the uncertain effects of AT's on the aggregates, the Federal Reserve System might simply widen the ranges. Second, the System could attempt to estimate the effects of AT's on the aggregates and adjust the ranges accordingly. Third, since the examples of estimates contained in Table 2 suggest that the effects of AT's on M2 and M3 may be much smaller than on **M1,** the System could rely less on **M1** and more on M2 and M3. Finally, the System could define and use a new monetary aggregate that includes savings deposits with AT services as well as assets already included in **M1.** Shifts of funds between demand deposits and savings deposits with AT services would have no demand effect on this new aggregate. Federal Reserve System researchers are now studying a variety of new money supply definitions which account not only for AT's but also for other recent innovations in the payments mechanism." In light of the above and other considerations, the Federal Open Market Committee established at its October meeting the following ranges for the third quarter of 1978 to the third quarter of 1979: for M2, *6%* to 9 per cent, and for M3, 7% to 10 per cent. The Committee expects **M1** to grow within a range of 2 to *6* per cent over this period.

CONCLUSIONS

This article has examined the implications for monetary policy of allowing AT's. One conclusion of the analysis is that the effects of **AT's** on the monetary aggregates depend importantly on how banks price this new service. Specifically, the smaller are the service costs, the greater may be the shifts in deposits and, hence, the greater may be the effects on the monetary aggregates.

AT's have both demand and supply effects on the monetary aggregates. The demand effects of AT's tend to decrease **M1,** but increase M2 and M3. The impact on **M1** is probably greater than the impacts on M2 and M3 since AT's are likely to induce the largest shifts of funds from demand deposits. The supply effects of AT's probably tend to increase each of the monetary aggregates if not offset by the Federal Reserve System.

In addition to affecting the monetary aggregates, AT's may temporarily affect the Federal Reserve System's ability to control the monetary aggregates. There are two ways in which this may happen: first, by making the structure of deposits more uncertain and, second, by altering the responsiveness of the aggregates to changes in either the monetary

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14 For more information on these innovations, see Carl Gambs, "Money—A Changing Concept in a Changing World," Federal Reserve Bank of Kansas City *Monthly* Review. January 1977, pp. 3-12.

base or the money multipliers. The first may tend to diminish the Federal Reserve System's ability to control each monetary aggregate; and the second may tend to increase the ability of the System to control M1, but decrease its ability to control M2.

A final conclusion of this analysis is that AT's may affect the rates of growth of the monetary aggregates that are consistent with the objectives of monetary policy. The conduct of monetary policy could be altered in several ways to correct for this possibility. For example, the ranges for the monetary aggregates could be widened to reflect the uncertain effects of AT's on the aggregates. Alternatively, the effects of AT's on the aggregates could be estimated and the ranges for the aggregates adjusted accordingly. Or, more reliance could be placed on M2 and M3 since AT's may have smaller effects on these aggregates than on M1. Finally, a new aggregate could be defined and used that includes savings deposits with AT services in addition to assets already included in M1. Given the considerable uncertainty about the effects of AT's on the aggregates, more definite statements concerning the operation of monetary policy are not possible.