

PREDICTING THE RATE OF INFLATION IN 1976

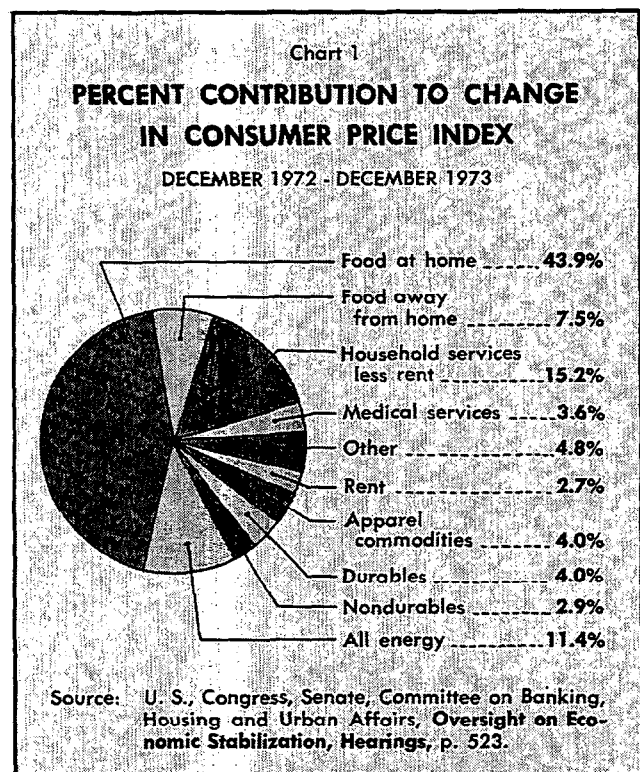
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There is currently much interest in predicting the rate of inflation for 1976. In recent years a number of *ad hoc* explanations of inflation have attributed price rises to special factors prevailing in the economy at the time. According to this approach, inflation is a process whereby the price effects of special factors in one sector of the economy are pushed along to other sectors and spread throughout the economy to affect the general price level. As an alternative, the monetarist view sees inflation as strictly a monetary phenomenon—excessive increases in the money supply induce individuals to increase their spending in an attempt to restore their real money balances to the desired level. In the aggregate, this increased spending forces the general price level upward. The purpose of this article is to explain the monetarist view of inflation, to use this view to evaluate the need for special factors arguments to explain recent inflation, and to evaluate the outlook for prices in 1976.

Although special factors explanations of inflation have existed for many years, such theories have been given much attention in discussions of spiraling prices since 1973.¹ Chart 1 displays the percentage contribution of the major components of the Consumer Price Index (CPI) to the total increase in the CPI. Such a chart is often used as the starting point for a special factors explanation of inflation.² Chart 1 shows that in 1973 food and energy prices accounted for 62.8 percent of the increase in the CPI. The rise in food and energy prices, and by inference a major part of the rise in the CPI, is then commonly accounted for by two special factors: the devaluation of the dollar and international commodity inflation. The first factor, the devaluation of the dollar, is considered inflationary for two reasons. The price of

imported items such as oil is raised directly, and the price of exported items such as grain is raised indirectly via increases in foreign demand for our exports. The second factor, the international commodity inflation, involves rising prices of internationally-traded goods such as oil and grain. Underlying this phenomenon are high levels of world output, poor weather and the resulting below-average harvests, and the OPEC oil cartel. In addition, special factors theories of inflation often attribute inflation to a variety of other causes such as the extent of unused industrial capacity, the unemployment rate, the growth of wages, increases in monopoly power, etc.

Using a special factors approach, if one wants to predict the growth in the CPI he would analyze conditions in various sectors of the economy and aggregate all these forces into an overall inflationary impact. For example, a study of crop forecasts and anticipated demand would reveal the outlook for food prices, a study of the oil sector would reveal the outlook for fuel prices, etc.



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¹ For a survey of pre-World War I special factors theories of inflation and comments on this literature by early economists, see Thomas M. Humphrey, "On Cost-Push Theories of Inflation in the Pre-War Monetary Literature," *Banca Nazionale del Lavoro Quarterly Review* (forthcoming, March 1976).

² The chart is contained in U. S. Congress, Senate, Committee on Banking, Housing and Urban Affairs, *Oversight on Economic Stabilization, Hearings*, John T. Dunlop, statement before the Subcommittee on Production and Stabilization of the Senate Banking, Housing and Urban Affairs Committee, Feb. 6, 1974, p. 523.

An Alternative View The monetarists present an alternative point of view regarding the cause of inflation. This view defines inflation as the change in the rate of exchange, or terms of trade, between dollars and the aggregate basket of goods and services produced. Inflation means that a dollar depreciates when measured in terms of the goods and services for which it will exchange. What is of economic significance to individuals is not simply the number of dollars they hold (their nominal cash balances) but rather the purchasing power of these dollars measured in terms of the aggregate basket of goods and services (their real cash balances). Real cash balances depend on the number of dollars individuals hold *and* the rate of exchange between dollars and the aggregate basket of goods and services. Assuming the total number of dollars all individuals hold is determined by the government, the only way individuals taken collectively have of adjusting to a situation in which their actual holdings of real cash balances are greater than their desired holdings of real cash balances is by a depreciation in terms of dollars in this rate of exchange, that is by inflation.

A single individual will attempt to adjust to such a discrepancy by reducing the nominal amount of his cash balances, that is by increasing his spending rate; however, one person's reduction in nominal cash balances is another person's addition, since the total amount of dollars is fixed for the aggregate of individuals. The result is to increase aggregate spending on the basket of goods and services. The increase in spending in turn causes a general rise in the price level as producers of goods and services raise prices when they find that demand for their products exceeds supply. This rise in the price level reduces actual aggregate real cash balances (the real purchasing power of the nominal money stock) to the desired level. Equilibrium is restored by a depreciation of the dollar against the basket of goods and services.

Why, then, do actual holdings of real cash balances in the aggregate exceed the amount that people desire to hold? To explain this phenomenon, the monetarists employ the empirical generalization that changes in desired real cash balances occur only gradually or as a result of the consequences of an earlier change in money balances from the supply side. For example, estimates by individuals of their long-term income are assumed to be a significant determinant of their demand for real cash balances, but factors highly variable in the short run, such as money market interest rates, are not assumed to be significant determinants. The implication then is that

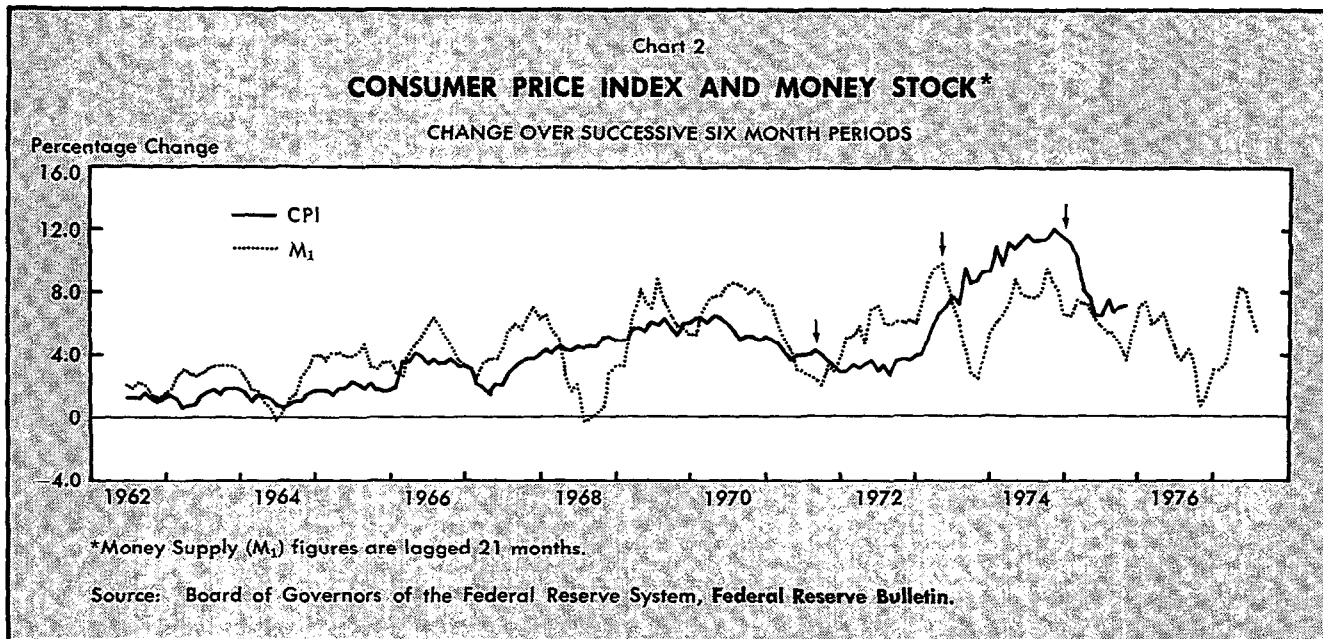
large fluctuations from one year to the next in the rate of inflation derive from the supply side. They derive from large fluctuations in the supply of nominal money.

Some Theoretical Considerations A critical question separating those who rely on special factors explanations of inflation and those who do not is whether an increase in a particular price can lead to a rise in the general price level.

While recognizing that *in the short run* an increase in the relative price of a key input such as oil could lead to a temporary increase in the general price level, critics of special factors explanations of inflation see an equilibrating mechanism at work in the long run. They argue that individuals, because of their wealth, the amount of uncertainty in the world, etc. want to hold in the aggregate a given amount of money measured in terms of its purchasing power. A price rise for a particular commodity will cause actual real cash balances to be less than desired real cash balances as the weighted average of all prices rises initially. Individuals will then hold less money in real terms than they desire and will reduce their expenditures until prices of other goods subsequently fall enough to offset the original rise in the price level, and equality is restored between actual and desired real cash balances.³

The special factors and monetarist explanations of inflation also imply a different impact on prices of an increase in exports. Some proponents of special factors theories of inflation argue that, in general, high levels of grain exports are inflationary. Increased exports entail reduced amounts of grain available domestically, higher grain prices, and a higher average price level. However, unless grain exports are subsidized by the government, grain is exported by sellers who do so only because they are able to exchange it for goods that have more value to them than the grain. Exchanging grain exports for more highly valued imports makes people as a whole wealthier; therefore, they desire to hold greater real cash balances. For a given nominal quantity of money the price level must fall, and grain exports are deflationary, not inflationary. As a matter of general theory, therefore, it is invalid to link domestic inflation causally with increased exports.

³ A slightly more sophisticated theory wherein changes in relative prices lead to a general price rise involves the assumption of an accommodative monetary policy. If in the adjustment to changes in relative prices unemployment is created, a central bank committed to a policy of full employment would be induced to expand the money supply at a faster pace. In this case a change in an individual price leads to a general price rise via accommodative monetary policy.



Money affects prices only with a long lag. As the rate of growth of money increases, individuals find that their real cash balances exceed the desired level; however, it takes time for them to realize that the increase is permanent and not a temporary fluctuation. Individuals then try to reduce their cash balances by spending more. Producers at first reduce their inventories rather than raise prices, since they do not know if the increased demand is permanent or only temporary. Given the persistence of increased demand, employers try to increase production. As the demand for productive resources increases, the prices of these resources increase. Labor will work longer hours only if their wage rates are increased, for example. Employers then raise prices in response to increased costs, and finally the CPI rises. The whole process is lengthened by the existence of contracts in nominal terms, both explicit and implicit, which are renegotiated only infrequently. Incidentally, the time sequence of the above series of events explains the popular appeal of cost- or wage-push theories of inflation. Employers appear to raise prices, and cause inflation, in response to rising wages and other costs.

Money Growth and Prices How well has monetary growth explained inflation recently in the United States? Chart 2 shows the percentage rate of change of the consumer price index and of the money supply lagged 21 months. Changes for both series are on an annual basis, and money is the sum of currency in circulation and demand deposits (M_1). The series are smoothed by using successive percentage changes

between the value for the current month and the value for six months previous.⁴

In order to determine the number of months to lag money (M_1) in Chart 2, the percentage changes in the CPI and M_1 were correlated for the period from January 1955 to August 1971, with the latter lagged at values ranging from 12 to 30 months. The lag of 21 months was chosen as the correlations rose and then fell as the lag progressed from 12 to 30 with 21 as the peak value.

Percentage changes in M_1 have a higher trend value than those in the CPI. From 1952 to 1970 the average annual rate of change in the CPI was 2.1 percent. Keeping the 21-month lag of Chart 2 for the period that corresponds to 1952 to 1970, the average annual rate of change in M_1 was 2.8 percent. The trend value for M_1 is then 0.7 percentage points above the CPI for this period. The CPI is also a more stable series than the M_1 series.

The behavior of the money supply affects the behavior of prices over a period of many years and with a variable lag, so that the CPI and M_1 as shown in Chart 2 are not expected to move together; nevertheless, from June 1962 to August 1971 their movements are similar. There is one significant drop in the money series that does not correspond to a fall in the CPI. This decline reaches a trough in July 1968 and reflects the lowering of the rate of growth

⁴ For the CPI we use $2 \times [\ln \text{CPI}(0) - \ln \text{CPI}(-6)]$ where \ln is the natural logarithm and the values in parentheses, the 0 and -6, refer to the values of the CPI that occurred in the current month and six months earlier. The factor 2 converts the percentage change to an annual basis. The values for M_1 are calculated similarly, then lagged by 21 months.

of money in 1966. The rate of growth in the percentage changes of the CPI, however, does diminish in this period.

Recent Experience Proponents of special factors theories of inflation argue that the rate of change in the CPI that began in 1973 cannot be explained satisfactorily as a monetary phenomenon. How well does the money stock series predict the price series, particularly the rise in the CPI beginning in the spring of 1973? In examining this question, it is useful to refer to the two consecutive 20-month periods starting in August 1971, the date when wage and price controls were instituted. These two periods are marked by downward-pointing arrows in Chart 2.

As illustrated in the chart, there is a 20-month period from August 1971 to April 1973 when the rate of change of the CPI is lower than would be predicted given the underlying pressure on prices represented by lagged rates of change of the money supply.⁵ The rate of change of the CPI for this period is 3.7 percent; the rate of change of M_1 lagged 21 months is 6.0 percent.⁶ (The percentages are on an annual basis.) As the trend rate of growth of lagged M_1 exceeds that of the CPI by 0.7 percent for the period 1952 to 1970, a simple way of predicting the rate of growth of the CPI is to take the rate of growth of M_1 lagged 21 months and subtract 0.7 percent from it. For the 20-month period from August 1971 to April 1973 the actual rate of growth of the CPI then fell short of the predicted rate of growth by 1.6 percentage points, i.e.,

$$3.7 - (6.0 - 0.7) = -1.6.$$

This result suggests that initially the wage and price controls did succeed in making the CPI rise more slowly than it would have risen in the absence of controls. Contracts in nominal terms contain implicit assumptions about future rates of inflation, and a lowering of inflationary expectations will temporarily cause the prices negotiated in contracts to be lower than otherwise. Also, 47.7 percent of the items in the CPI were covered by controls in Phase II (November 14, 1971, to January 11, 1973). The prices of these items must have risen more slowly than in the absence of controls. Finally, the price behavior in the uncontrolled sector is not independent of price behavior in the controlled sector. As an

⁵ The period actually includes 21 months. The reference to 20 months refers to the number of monthly percentage changes in this period.

⁶ The calculations use a six-month average of the CPI ending in August 1971 for the initial observation and ending in April 1973 for the final observation. M_1 is calculated similarly except that the values precede those of the CPI by 21 months.

illustration, consider a statement from a representative of the grocery industry made in hearings before Congress on whether to extend controls after their scheduled expiration date, April 1974:

... in Phase II, the Price Commission was able to control prices effectively for bread and other baked goods by limiting the prices of the three largest firms in the industry. These firms were precluded from implementing *any* cost justified price increases because their profit margins would have exceeded the level of their margins during an arbitrarily selected base period. Smaller bakers, on the other hand, with reduced profits, when not constrained by the profit margin test, were permitted to pass on their increased costs under price control regulations. They were, however, in reality, simply unable to raise their prices to recover increased costs because if they did their products would be more costly to consumers than the controlled larger firms, and they would have been chased off the grocery store shelves. As a result, many smaller bakers have been subjected to severe and critical financial hardships, resulting in numerous closings.⁷

The above quotation suggests that controls on prices in one part of the economy may retard price rises in the exempted part of the economy, but only temporarily. In the case referred to above, some firms in the exempted sector were driven out of business. More generally, however, prices must be driven up in the exempted sector by enough more than they would have been in the absence of controls to cause the average price level for the entire output of the economy, exempt and nonexempt, to reduce real cash balances to the level desired by individuals. This reasoning suggests that over the long run price controls could not have been expected to slow the rate of inflation. Furthermore, it suggests that a period when the growth rate of the CPI has been reduced by the imposition of price controls will be followed by a period of more rapid than normal growth in the CPI. If this compensatory rise in the CPI plus lagged rates of growth of money account for the bulge in prices in 1973 and 1974, then one can explain inflation even in recent times in terms of monetary phenomena, and there is no need for recourse in the explanation to special factors.

For the 20-month period starting April 1973 and ending December 1974, the rate of growth in the CPI is 10.6 percent. The corresponding rate of growth of lagged M_1 for this period is 6.8 percent.⁸ Was the excess of price growth over lagged M_1 growth

⁷ U. S., Congress, Senate, Committee on Banking, Housing and Urban Affairs, *Oversight on Economic Stabilization, Hearings*, George W. Koch, statement before the Subcommittee on Production and Stabilization of the Senate Banking, Housing and Urban Affairs Committee, p. 390.

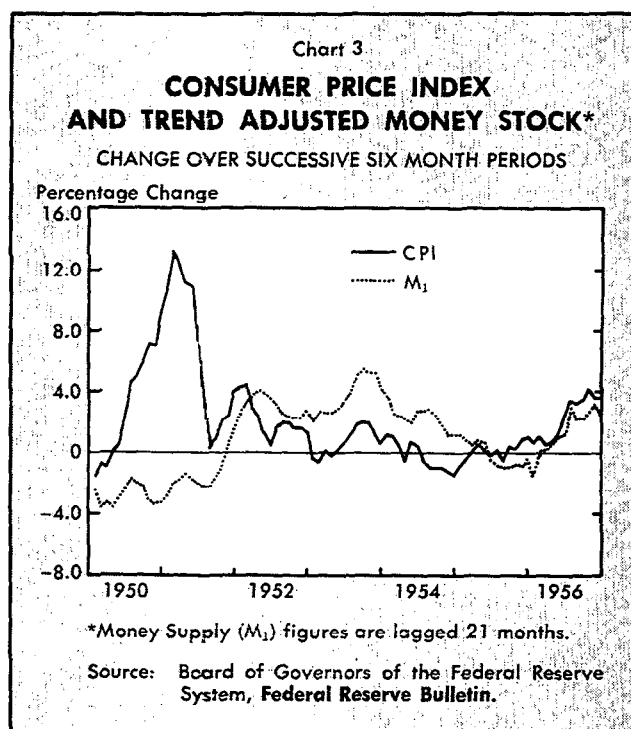
⁸ The computation is performed as before with the base observation being the previous final observation and the new final observation being the six-month average ending December 1974. Again, the percentages are on an annual basis, and the percentage change in M_1 referred to below is calculated similarly using values 21 months earlier.

more than could be expected with a monetary explanation of inflation?

One method of predicting the expected rate of price rise is to adjust the growth rate of lagged M_1 for (1) the difference in trend rates of growth between M_1 and the CPI and (2) the shortfall of the actual rise in the CPI from the predicted rise in the CPI in the period of price controls. The difference in trend growth rates of M_1 and CPI is 0.7 percent. The shortfall of the actual from the predicted rise in the CPI in the preceding period, as calculated above, was 1.6 percent. Adding these to the 6.8 percent lagged M_1 growth rate ($6.8 - 0.7 + 1.6$), the predicted growth rate for the CPI in the period from April 1973 to December 1974 is 7.7 percent. As the actual rate of growth in the CPI was 10.6 percent, the actual value was greater than the predicted value by 2.9 percentage points. As a percentage of the actual rate of inflation, the prediction error is 27 percent.

The question now becomes (1) whether an error of this magnitude is large enough to justify looking for a special factors explanation as opposed to a monetarist explanation of inflation on the grounds that new forces are present or (2) whether given the length and variability of the lags involved an error of this magnitude is what could be expected from past experience. This question might be approached by calculating discrepancies between actual and predicted rates of inflation as a percentage of the actual rate of inflation for the three preceding 20-month periods and comparing those errors with the above error. Again predicting the rate of growth of the CPI using lagged, trend adjusted growth in M_1 , these errors are calculated to be -25, 30, and -10 percent for the periods August 1966 to April 1968, April 1968 to December 1969, and December 1969 to August 1971, respectively. The errors are comparable to the error for the 1973-1974 period.

Furthermore, there have been periods in the past when the rate of growth of the CPI has significantly exceeded that of the lagged money supply. Chart 3 is for the period January 1950 to December 1956 and is calculated in exactly the same way as Chart 2, except that the M_1 series is lowered by 0.7 percent so that it may be used to predict the CPI series directly without adjusting for differing trends. As shown in Chart 3, during the Korean War period prices rose significantly faster than would be indicated by lagged rates of growth of M_1 . Individuals expected a re-



currence of the inflation of World War II and an erosion in the value of their cash balances. There was, therefore, a decrease in the demand for real cash balances, an increase in aggregate spending, and a rise in the price level. It is interesting to note that while the actual rate of growth of the CPI was greater than the predicted growth during the Korean War for the reasons just mentioned, this discrepancy was offset in the period following the War by a rate of growth of the CPI below the predicted growth.

For the period of the price bulge in 1973 and 1974, the actual exceeded the predicted rate of growth of the CPI by 2.9 percentage points. There have been periods other than wartime when errors of similar magnitude occurred. For the 20-month period January 1957 to September 1958, making predictions as before, the actual rate of growth of the CPI was 2.4 percentage points above the predicted rate. It is interesting to note that special factors theories of inflation, in particular cost-push inflation caused by unions, were especially popular during this period.

Some final general observations are useful. There are reasons for expecting that the actual would exceed the predicted changes in the CPI for the 1973-1974 period even after adjusting for the retardation in the growth of the CPI caused by the initial imposition of wage and price controls in the earlier period. Before April 1974, the date wage and price controls expired, businessmen thought that controls might be extended. After April 1974, businessmen

thought the controls might be reimposed. As allowable price increases under controls depend on base prices, businessmen probably kept prices up instead of lowering them or raised them more than they might have ordinarily as a way of not getting caught with a low base price. Second, the real cash balances people desire to hold depend on the cost of holding the balances. Inflation is a cost or tax on these balances, since in order to maintain real balances at a given level the individual must add to his nominal cash balances every year to compensate for their depreciation in value. In response to the increase in the rate of inflation starting in the last half of 1972, caused by previous high rates of growth in M_1 , people may have tried to reduce their real cash balances relative to previous holdings. Such an attempt would cause an overshooting in prices for a while, or put otherwise, for a while lagged money stock data would temporarily under-predict prices. Finally, a monetarist explanation of inflation suggests that the rapid price rises of 1973 and 1974 were unsustainable. Over a long period of time, the rate of rise of prices must be in line with the rate of growth of the money supply. The period considered ends December 1974. A decrease in the rate of change of the CPI after that date is shown in Chart 2.

The forecasts presented in the following section are those of the author and in no way represent the views of the Federal Reserve Bank of Richmond.

Predicting Price Movements This type of analysis does not disprove special factors explanations of inflation or show the superiority of monetary theories of inflation. It does suggest, however, that in the recent past it has been reasonable to use lagged rates of growth of money to predict prices and that the last few years do not represent a departure from past experience in this respect.

Table I

PREDICTED RATES OF CHANGE IN THE CPI

April 1976	6.2
May 1976	4.6
June 1976	3.3
July 1976	2.9
August 1976	<u>3.6</u>
Average	4.1

Table I shows rates of change in the CPI for next year that are predicted using the very simple technique of extrapolating from past rates of growth of the money stock suggested above. The figures are rates of change of the CPI on an annual basis for the six-month period ending with the date shown. They are the actual annualized percentage rates of change of M_1 for the corresponding six-month period 21 months earlier minus 0.7 percent. The figures may be read off Chart 2 by lowering the M_1 series 0.7 percent. As the M_1 series is more erratic than the CPI series, probably the average figure of 4.1 percent is a better predictor of price behavior this year.

This article has developed the monetarist explanation of inflation. It has also presented a simple method of forecasting inflation based on the observed lags between rates of change of money and prices. The lags, as shown, are not only long but also variable. The actual rate of inflation may be significantly above or below 4.1 percent in 1976. If the overshooting effect described above did occur in 1973-1974, its actual rate of growth may be lower as the reverse process occurs this year. In any case, this monetarist forecast may be compared with those using different frameworks as the events unfold over the coming months.