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An interest rate-based indicator of monetary policy

Looking back: The use of interest rates in monetary policy

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An interest rate-based indicator of monetary policy

Robert D. Laurent

All policymakers face the problem of determining how changes in the instruments under their control affect the ultimate goals they seek to influence. For the monetary policymaker, or monetary authority, this means that it is necessary to establish how movements in the instruments most directly under its control affect the goals the monetary authority is ultimately interested in influencing. In the United States, the monetary authority, the Federal Reserve, can affect reserve requirements, open market operations, interest rates, and money to influence real income, inflation, and unemployment.

The relationship between the instruments that the Fed controls and the goals of policy has never been known with great accuracy, but the uncertainties recently have been particularly great. Until the 1980s there had been an increasing reliance on money as an indicator that the monetary authority could use to influence the ultimate goals of policy. However, since the early 1980s some of the simple regularities previously believed to exist between money and the goals of policy appear to have deteriorated and the relationship has become more erratic.[1]

This article examines three of the most obvious indicators of monetary policy (two interest rate-based and one monetary aggregate) and then suggests a third interest rate-based indicator of the impact of monetary policy on future real income. All four of these indicators are tested against each other as forecasters of future changes in real income (real GNP). The results indicate that the newly suggested interest rate-based measure—the spread between the long term government bond rate and the federal funds rate—deserves serious consideration as an indicator of the influence of monetary policy on future real GNP. The last section discusses some qualifications to the results, and the implications of an interest rate-based indicator for monetary policy.

The fed funds rate

Monetary policy is implemented through changes in reserves which impact on interest rates. In the first instance, the change in reserves alters the gap between reserves and required reserves and moves the federal funds rate. The change in the federal funds rate transmits the impact of monetary policy to depository institutions. It might seem reasonable, then, that a basic relationship between interest rates and economic activity might be between the federal funds rate and the change in real income.

Figure 1 plots the relationship between the federal funds rate (on a bond equivalent basis) and the level of real GNP. As the figure shows, the level of the federal funds rate behaves over the cycle as would be expected. That is, the rate generally rises before economic activity peaks and falls before economic activity bottoms out. The figure makes it clear, however, that a given level of the federal funds rate may have very different meanings in different economic environments. For example, a *rise* in the federal funds rate to 4.03 percent in 1960 was associated with the economic downturn of 1961 while a *fall* in the federal funds rate to 8.97 percent was associated with the upturn of 1983. This suggests how difficult it is to interpret just the simple level of the federal funds rate as an indicator of monetary policy.

The real fed funds rate

A common adjustment can be applied to the federal funds rate to obtain an indicator

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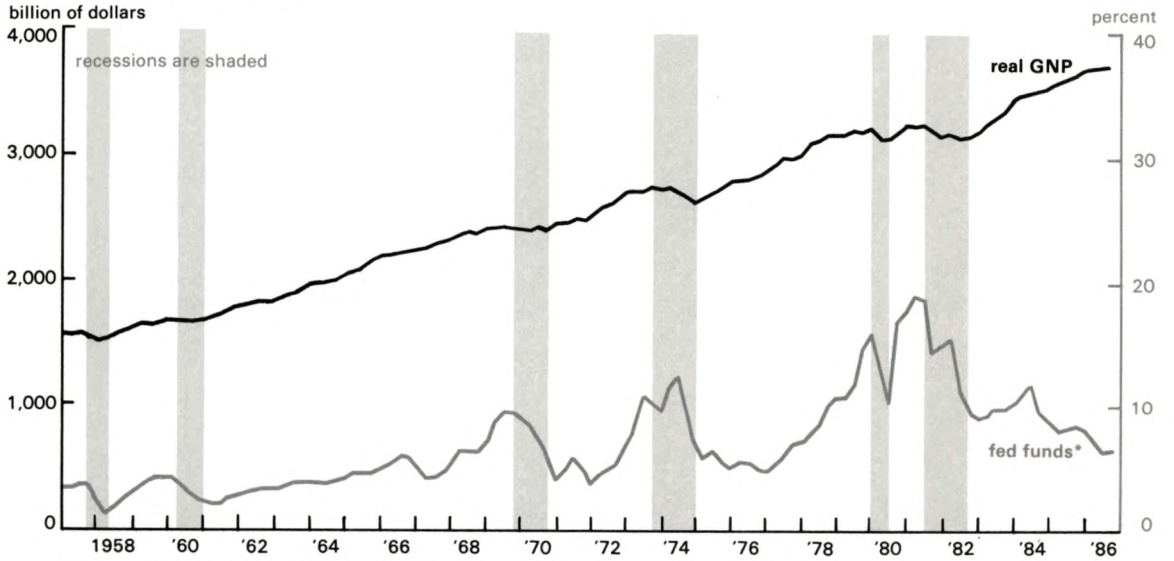
Figure 1
Fed funds rate vs. real GNP



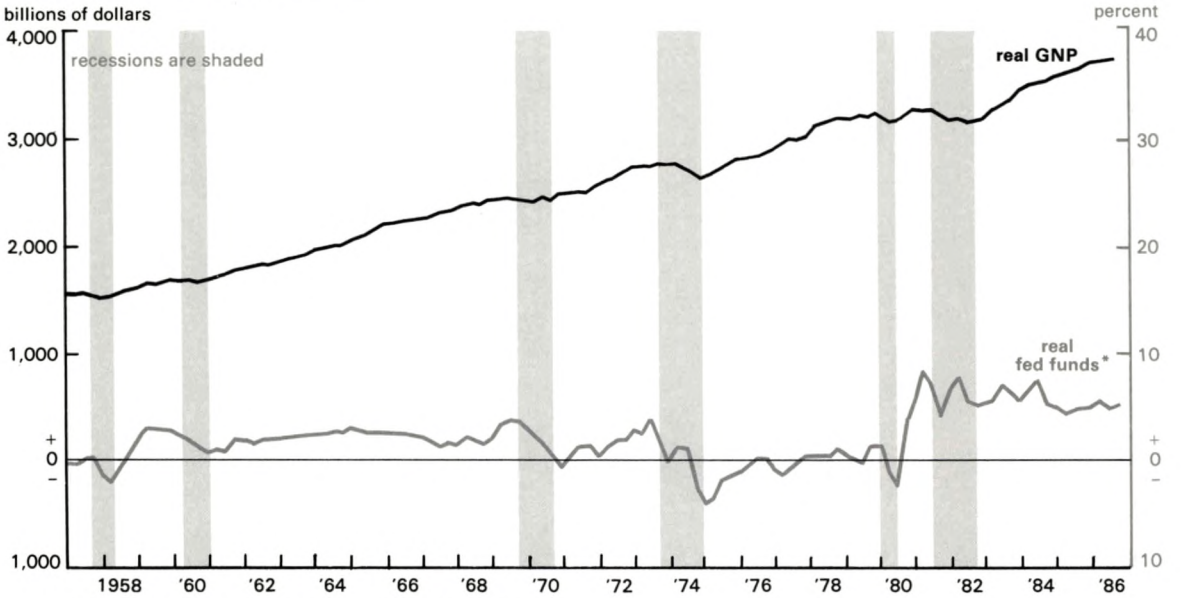
*Fed funds rate is quoted on a bond equivalent basis.

that might be valid across different economic environments. Economists often argue that decisions are based not on mere numbers, or nominal values, but rather on the real values involved. The true cost of credit is not the stated or nominal rate, but rather this rate deflated by the expected rise in prices. As an example, suppose significant inflation is widely expected to occur in the future. Borrowers know that credit allows them to purchase real assets whose prices will appreciate, and that they will repay the lender with depreciated dollars. Lenders are also aware of the situation. Thus lenders demand higher interest rates on loans, and borrowers are willing to pay them. Most importantly, a change in interest rates that results entirely from a change in expected inflation does not change the real cost of credit and is not likely to affect borrowing or economic activity.[2]

Figure 2 plots the level of real GNP and an estimate of the real federal funds rate. The measure of the real federal funds rate used here is approximately equal to the nominal level of the federal funds rate (on a bond equivalent basis) minus the percentage change in the GNP price deflator over the preceding four quarters.[3] This measure implicitly assumes that expectations of future price changes are equal to the behavior of prices over the preceding year. Again, the figure shows that the cyclical behavior of the real rate is as expected. Real rates rise before a peak and fall before a trough in economic activity. Once again, though, it is difficult to use the measure as an indicator of monetary policy across different economic environments because the interpretation of a given real interest rate depends upon the prevailing economic environment. For example, a *rise* to a real interest rate of -0.3 percent in 1979 was followed by a contraction, while a *fall* to a real interest rate of 5.0 percent in 1982 was followed by an expansion.

Indeed, there appear to be extended periods when the "normal" or average equilibrium real interest rate (at least as given by the measure used here) varies substantially. For example, the period from 1958 to 1973 appears to have been one in which the equilibrium or "normal" interest rate was positive but relatively low. This was followed by a period from 1973 to 1979 in which the "normal" real interest rate was very low and perhaps even negative. Finally, there is the period of the 1980s in which real interest rates appear to be at consistently high historical levels.

Figure 2
Real fed funds rate vs. real GNP



*Real fed funds rate is deflated by year-over-year CPI change.

Real M2

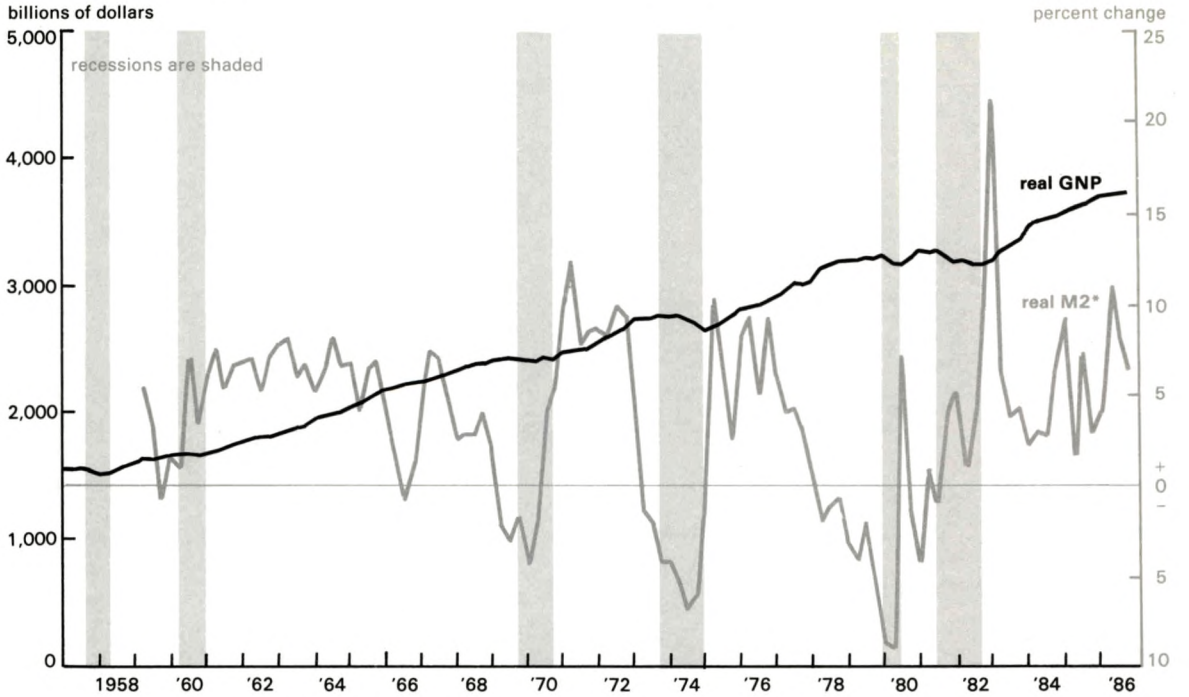
For purposes of comparison, Figure 3 plots the relationship between real economic activity and a measure of the money stock similar to that used in the index of leading economic indicators. The money measure is the percentage change in real M2. This figure is approximately equal to the quarterly percentage change in M2 at an annual rate minus the quarterly percentage change in the consumer price index at an annual rate.[4] This quarterly series roughly approximates the rate of change in the purchasing power of the stock of M2. Once again, the cyclical behavior of this measure roughly corresponds to what would be expected. When growth in the purchasing power of the M2 stock declines, subsequent real economic activity also declines. Conversely, when the purchasing power of M2 increases, real economic activity subsequently increases.

At the beginning of the 1980s when the interest rates on deposits were deregulated, there appears to have been a shift in the relationship between money and income. The effect of deregulation was to make some transaction-type deposits more attractive and cause the public to hold more transactions balances relative to income than it had previously. This increased preference for transactions balances is at least partially responsible for the fact that predictions based on the past history of the relationship between money and income have generally overpredicted the level of real income and inflation in the 1980s.[5] This deterioration in the relationship between money and future income has spurred the search for a more reliable indicator of monetary policy.

"The spread"

An ideal interest rate-based indicator of monetary policy would be immune to contamination by the environment. One possible candidate is suggested by a close examination of the process by which the Fed alters the level of money in the system. The Fed begins by changing the level of reserves in the banking system, which has the effect of moving the federal funds rate. Movements in this rate, which reflects the overnight cost of reserves, cause depository institutions to respond by comparing the new federal funds rate (and expected future federal funds rates) with alternative market re-

Figure 3
Real M2 vs. real GNP



*Annual percent change in M2 is deflated by CPI.

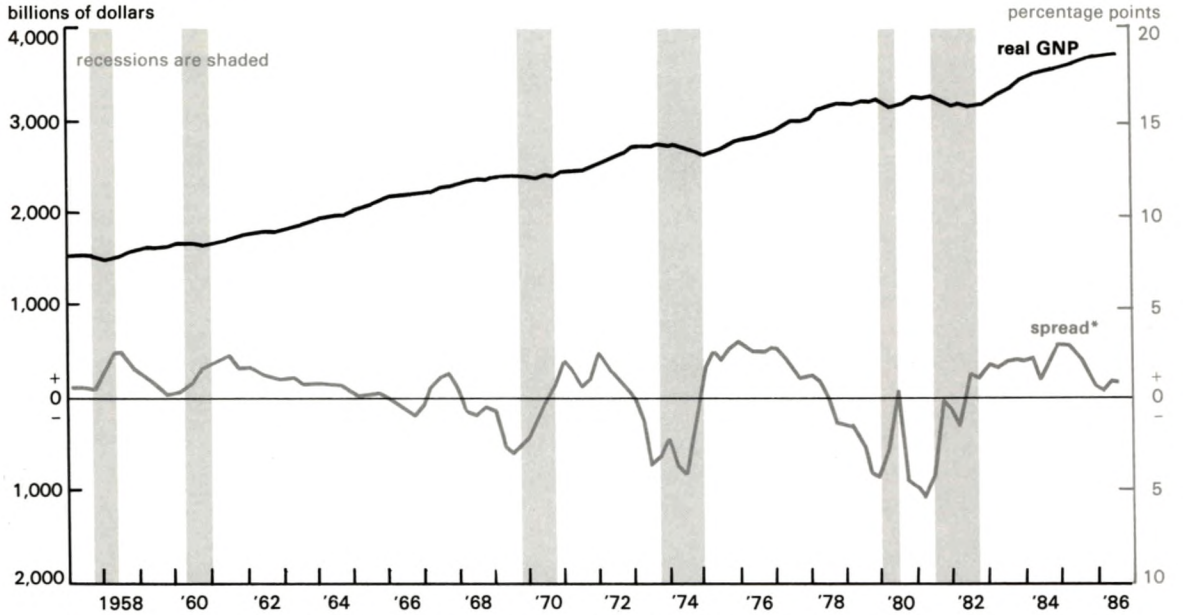
turns available on longer-term securities and loans. If the current federal funds rate drops relative to longer-term rates, depository institutions respond by purchasing securities and making loans, thereby expanding the level of the money stock and stimulating economic activity.[6] While the deregulation of interest rates has affected the relative demand for various components of the monetary aggregates and altered the implications of growth in various aggregates, there is no obvious reason why it should alter the mechanism by which the monetary authority influences the supply of deposits and money or the relationship between interest rates and economic activity. This suggests that the difference (or spread) between some longer-term rate and the federal funds rate, which the Fed directly affects in the conduct of monetary policy, might be a useful indicator of the thrust of monetary policy.

Such a measure has some useful properties. The greater is the rate spread, the more expansionary is monetary policy. Thus, other things being equal, an increase in the federal funds rate is contractionary and a decrease is expansionary. It also indicates that the way to capture the impact of a given federal funds rate across different economic environments is to compare it to longer-maturity interest rates.

The spread also shows, through the money supply mechanism, how a movement in the federal funds rate might not represent a change in monetary policy. Suppose that the monetary authority moved the federal funds rate (and expected future federal funds rates) but that this move was matched by a change in the equilibrium longer-term rate. There would then be no incentive for depository institutions to change their asset holdings or the level of deposits and money. This suggests that a spread between a longer-term rate and the federal funds rate might be superior to the level of an interest rate as an indicator of the thrust of monetary policy.

Another attraction of the spread relative to the level of rates is that it helps to solve a puzzle that occurs when rates move. A movement in the level of rates can be either

Figure 4
The spread vs. real GNP



*Spread between the 20-year Treasury constant maturity and the fed funds rate (bond equivalent basis).

expansionary or contractionary. For example, suppose rates rise because the public's net demand for credit increases. This means that there is either an increase in borrowing (e.g., business sees better investment opportunities) or a reduction in saving (e.g., savers decide to spend more because they are more optimistic about the future). In this case the rise in rates occurs in an expansionary environment. Alternatively, rates can rise because the monetary authority reduces the amount of credit it supplies to the market. This rise in rates occurs in a contractionary environment. Movements in money would be helpful in distinguishing these situations. If the demand for money is disturbed, the spread could help tell which of these situations is causing the rise in rates.

The particular measure of the spread used here is the difference between the longest-term government interest rate available and the federal funds rate. The longest-term interest rate was chosen so as to maximize the contrast between the short-term interest rates, which are strongly affected by monetary policy, and longer-term interest rates, which are most insulated from monetary policy. The longest-maturity government rate available over a sustained recent period was the 20-year constant maturity treasury bond rate. Figure 4 plots the spread between the 20-year bond rate and the federal funds rate (referred to simply as "the spread") and the level of real income. The spread exhibits the cyclical behavior that one would expect, narrowing and usually turning negative before peaks in economic activity. Conversely, the spread turns positive and widens before an upturn in economic activity. Figure 4 seems to indicate that the absolute deviations between the 20-year bond rate and the federal funds rate have been greater in recent years than in the more distant past.

Comparing the four indicators

The figures confirm that all four measures behave in a way that is broadly consistent with expectations based on theory. In order to facilitate comparison, the predictive performance of each measure is quantified by estimating, using ordinary least squares, the relationship between each alternative indicator and subsequent percentage changes in real income. There is wide agreement that the resulting changes in real GNP are temporary and occur with a lag that is commonly thought to average about six to nine months after the monetary

Table 1
Results of regression of percentage change in real GNP on eight lagged terms of each of the four alternative indicators of monetary policy. 1961 II - 1986 IV

	Level of the federal funds rate		Real federal funds rate	
	Coefficient	T value	Coefficient	T value
intercept	6.0964	7.781	3.9468	7.720
lag 1	.2636	.948	.1961	.568
lag 2	−1.5100	−3.459	−1.3926	−2.777
lag 3	.8624	1.911	.8216	1.619
lag 4	−.7358	−1.588	−.7760	−1.523
lag 5	.4451	.961	.6224	1.224
lag 6	−.1333	−.295	−.2203	−.436
lag 7	.3553	.814	.4479	.897
lag 8	.0800	.290	.0034	.010
	−.3727		−.2975	
	RMSE=3.3908 R sq adj = .3234		RMSE=3.8611 R sq adj = .1227	

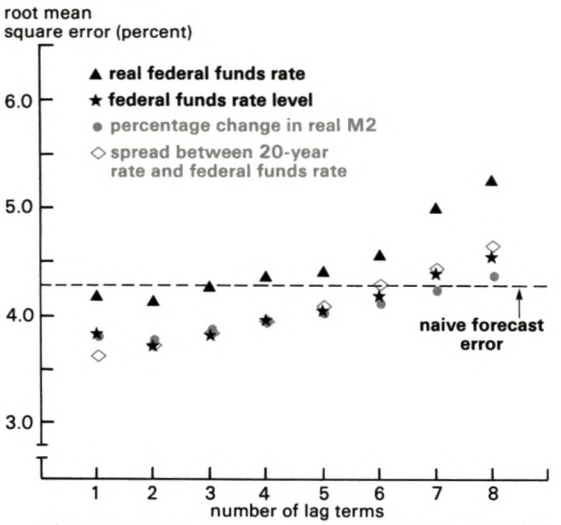
	Spread between the 20-year bond rate and the federal funds rate		Percentage change in real M2	
	Coefficient	T value	Coefficient	T value
intercept	2.9999	8.627	1.1865	2.305
lag 1	.1966	.575	.2529	2.639
lag 2	1.2305	2.619	.1719	1.505
lag 3	−.4356	−.932	.0015	.013
lag 4	.3923	.843	.0975	.854
lag 5	−.2554	−.549	.0175	.152
lag 6	.0787	.169	−.0227	−.200
lag 7	−.1106	−.235	−.0259	−.223
lag 8	.1007	.292	.1011	1.029
	1.1972		.5938	
	RMSE=3.5000 R sq adj = .2791		RMSE=3.5711 R sq adj = .2495	

policy action. To capture this relationship, the quarterly percentage change in real GNP at an annual rate is estimated as a linear function of a constant and the eight previous quarters' data for each of the three interest rate measures and the money measure. The regressions cover the period 1961 II through 1986 IV.[7] The results are given in Table 1 which shows the estimated coefficients of the lagged values of the four alternative indicators. The table also gives a summary measure of the error in the forecast of the percentage change in real GNP for each of the measures. This error is measured by the root mean square error.

The results given in Table 1 confirm quantitatively the direction of the relationships observed in Figures 1 through 4. The negative sums of the values of the coefficients show that increases in the level of the federal funds rate and the real federal funds rate are associated with subsequent decelerations in real income growth. For example, a one percentage point increase in the federal funds rate is associated with a 0.37 percentage point decline in real income after eight quarters. The positive sums of coefficients for both the spread and the rate of growth in real M2 indicate that increases in each of these measures are related to subsequent increases in the rate of growth in real income.

The data in Table 1 indicate that when the four measures are each entered with eight quarterly lag terms, the best explanation (as measured by the root mean square error over the period of estimation) is provided by the level of the federal funds rate. The next best

Figure 5
Forecast errors using only previous data 1964 I through 1986 IV



NOTE: The original forecast uses data from Q2 1961 through Q4 1963.

explanations are provided by the spread between the 20-year bond rate and the federal funds rate, followed by the percentage change in real M2. The poorest explanatory power is offered by the measure of the real federal funds rates.

A major shortcoming of the results reported in Table 1 is that they are explanations, or ex post relationships. That is, they are obtained by looking for the values of the constant and the coefficients for the eight-lag variables that best explain the percentage changes in real GNP after all of the data have been observed. Relationships obtained in this way tend to look somewhat better than they actually are in the sense that the errors are smaller than would be obtained in an actual ex ante forecast.

What is desired is a relationship that would be useful in forecasting future real income. A more realistic measure of how well the alternatives could forecast future changes in real income is obtained by estimating a regression with all the data through the quarter prior to the quarter being forecast and using that regression to forecast the change in real income for the next quarter. After all, this is precisely how any indicator obtained in this study would be used.

This method of forecasting was tried for each alternative for the period 1964 I through 1986 IV. For each, stepwise regressions were used to estimate over the entire period, the best model with one lagged term, the best model with two lagged terms, etc., through eight lagged terms. Each of these eight models, for each of these four alternatives, was estimated using only data through the quarter prior to the quarter whose change in real GNP is being forecast.[8] The results are plotted in Figure 5, which gives the root mean square error for each model.

It can be seen that the best models for each measure involve only one or two lagged terms. Figure 5 also shows that the best model over the period 1964 I through 1986 IV was the one-lagged-term model based on the spread between the 20-year bond rate and the federal funds rate. In order, the next best models were those based on the level of the federal funds rate, the percentage change in real M2, and the level of the real federal funds rate. For purposes of comparison, the chart also plots the errors from a very naive model in which the forecast for next quarter's change in real GNP is equal to the average change in real GNP from 1961 I through the preceding quarter.

The results presented above are for the period 1964 I through 1986 IV. As noted earlier, it is widely believed that the monetary aggregates deteriorated as indicators of the thrust of monetary policy beginning about 1980. It would be interesting to see how the four alternatives compared over the period 1964 through 1979, which excludes the period in which the monetary aggregates are thought to have deteriorated. Table 2 shows the results of the regression estimates for each of the four indicators using all eight lags in each model as was done over the more extended time period in Table 1. Once again, the results indicate that the levels of the real and nominal federal funds rate are negatively related to future growth in real economic activity. Also again, the results indicate that the spread between the 20-year bond rate and the federal funds rate and percentage changes in real M2 are positively related to future changes in real income.

The best models using from one through eight lagged terms are then calculated for each of the four indicators over the period 1961 II through 1979 IV. Each of these is again estimated using only data that would have been available at the time and used to forecast real GNP for each quarter from 1964 I through

Table 2
Results of regression of percentage change in real GNP on eight lagged terms of each of the four alternative indicators of monetary policy. 1961 II - 1979 IV

	Level of the federal funds rate		Real federal funds rate	
	Coefficient	T value	Coefficient	T value
intercept	8.0058	6.679	4.3461	7.733
lag 1	−.1187	−.220	.0233	.042
lag 2	−1.6441	−1.654	−1.2020	−1.416
lag 3	2.0043	1.774	1.0895	1.278
lag 4	−2.3105	−1.961	−1.6680	−1.935
lag 5	1.9328	1.634	1.4049	1.617
lag 6	−1.0094	−.886	−.7944	−.926
lag 7	.4717	.469	.7964	.936
lag 8	−.0755	−.137	−.5647	−1.007
	−.7494		−.9150	
	RMSE=3.3677	R sq adj = .2740	RMSE=3.8248	R sq adj = .0569

	Spread between the 20-year bond rate and the federal funds rate		Percentage change in real M2	
	Coefficient	T value	Coefficient	T value
intercept	2.9661	7.173	1.2299	1.745
lag 1	1.1379	1.780	.4438	2.829
lag 2	.5917	.526	−.1448	−.688
lag 3	−.6741	−.521	.4282	2.105
lag 4	1.1408	.827	−.3998	−1.996
lag 5	−1.4426	−1.041	.3198	1.607
lag 6	1.0057	.769	−.1062	−.557
lag 7	−.4193	−.368	−.0081	−.043
lag 8	.5939	.916	.0992	.669
	1.9340		.6321	
	RMSE=3.3513	R sq adj = .2809	RMSE=3.3300	R sq adj = .2901

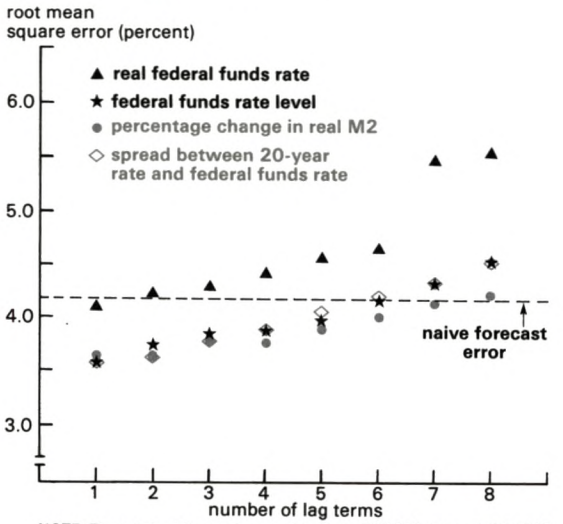
1979 IV. The root mean square errors for the models are plotted in Figure 6. The best predictive model for each of the four alternative indicators contains only one lagged term. The results indicate that a model using the spread does best at predicting future changes in real GNP. A model using this indicator does better than the best model using the level of the federal funds rate, followed in turn by the real M2 model and the real federal funds rate model.

Table 3 shows the forms of the best models for each of the four alternatives and the ex ante errors the models would have produced over each of the two periods. The performance of the spread model is particularly noteworthy because it does best over both periods—even the period ending in 1979 that excludes the time over which the money-income relationship apparently deteriorated. It is important to note that the choice of real M2 was not only based on its similarity to the monetary component of the index of leading indicators. Similar tests to those reported here were run among eight different aggregates and real M2 did better than any other aggregate in forecasting real income over both periods.[9] It follows, then, that the spread does better than any of these other aggregate measures.[10]

Limitations of the results

The results presented above have some interesting implications for the conduct of monetary policy, but before discussing these it is worth noting some limitations concerning the results. The relative performances are obtained using only data available at the time the fore-

Figure 6
Forecast errors using only previous data
1964 I through 1979 IV



NOTE: The original forecast uses data from Q21961 through Q41963.

cast had to be made. Thus, measures of the errors are more realistic than those obtained from an estimation run over all the data. However the results above are still somewhat too optimistic in that the forms of the best models are initially selected using all the data, even though the forecast estimation uses only data that could have been observed at the time of the forecast.[11]

In addition the results are obtained with very simple models. Percentage changes in real GNP are regressed in an ordinary least squares linear regression on from one to eight lagged terms of each of the alternative indicators of monetary policy. It is quite possible that a non-linear form of the relationship, or the addition of more variables, could change the relative rankings of the various indicators. For example, the results using the measure of the real federal funds rate are particularly disappointing. This model barely beats an extremely naive model in either time period. Yet, this is an indicator for which there is substantial theoretical support in economics.[12] Possible explanations for the poor results are that either the year-over-year price changes are not a good proxy for expectations of future price changes or that some other variable should be added to explain what appear to be sustained variations in the equilibrium real rate. The approach taken in this paper is more in the nature of a search for a single component for the index of leading indicators than an attempt to model completely the determination of future real income.

Finally, even the best results presented above give far from accurate forecasts of future real activity. A root mean square error of 3.6 percentage points for the annual growth rate of next quarter's real GNP is hardly the answer to a forecaster's prayer.[13] Nor would errors of this size encourage a policymaker to attempt to actively manipulate real income.

Policy applications

The spread between a long-term bond rate and the federal funds rate forecasts next quarter's real GNP better than the level of the federal funds rate, a measure of the real federal funds rate, or changes in real M2. This is true not only over the last twenty-five years, but also over the sixteen-year period 1964 – 1979 when increasing reliance was being placed on money as an indicator of monetary policy. The performance of the spread between the long-term bond rate and the federal funds rate raises two obvious questions. Can it be used for policy? And, why does it forecast future real economic activity?

The discussion to this point has not considered the ease with which the monetary authority can control the alternative indicators. Controlling the interest rates guides would seem to be easier for the monetary authority than controlling money. For one thing, money is much more difficult to observe, involving as it does readings taken at least a week apart. In addition, money is heavily influenced by seasonal factors that make it difficult to extract the trend in growth. Interest rates, on the other hand, can be observed continuously through market quotes.

Second, the Fed can influence interest rates much more easily than money. The monetary authority actually affects the aggregates through changes it produces in interest rates. The federal funds rate is particularly easy for the monetary authority to control, and the Fed has, in the past, often implemented policy through a target federal funds rate. The real federal funds rate, requiring only an adjustment to incorporate past price changes,

Table 3
The form and predictive performance of the best model of each of the four alternative guides over the two time periods

1964 I - 1986 IV

Naive model	
PCRGNP = GAC	RMSE = 4.2933 percent
Federal funds rate	
PCRGNP = const. + $c_2{}^*ffr_{-2} + c_7{}^*ffr_{-7}$	RMSE = 3.7374 percent
Real federal funds rate	
PCRGNP = const. + $c_2{}^*rffr_{-2} + c_7{}^*rffr_{-7}$	RMSE = 4.1510 percent
Interest rate spread	
PCRGNP = const. + $c_2{}^*r20mffr_{-2}$	RMSE = 3.6059 percent
Percent change in real M2	
PCRGNP = const. + $c_1{}^*pcrM2_{-1} + c_2{}^*pcrM2_{-2}$	RMSE = 3.7822 percent

1964 I - 1979 IV

Naive model	
PCRGNP = GAC	RMSE = 4.1748 percent
Federal funds rate	
PCRGNP = const. + $c_1{}^*ffr_{-1}$	RMSE = 3.5864 percent
Real federal funds rate	
PCRGNP = const. + $c_2{}^*rffr_{-2}$	RMSE = 4.0971 percent
Interest rate spread	
PCRGNP = const. + $c_1{}^*r20mffr_{-1}$	RMSE = 3.5668 percent
Percent change in real M2	
PCRGNP = const. + $c_1{}^*pcrM2_{-1}$	RMSE = 3.6416 percent

PCRGNP	=	Quarterly change in real GNP at an annual percentage rate.
GAC	=	Geometric average growth in real income from 1961 I through the previous quarter.
ffr	=	Federal funds rate (on a bond equivalent basis).
rffr	=	Real federal funds rate, one plus the federal funds rate divided by one plus the percentage change in year-over-year CPI, minus one.
r20mffr	=	Interest rate spread, the 20-year constant maturity treasury bond rate minus the federal funds rate.
pcrM2	=	One plus the percentage change in M2 in the quarter at an annual rate, divided by one plus the percentage change in the CPI over the quarter at an annual rate, minus one.
subscripts	=	The number of lagged quarters.

would be just as easy to control. Controlling the interest rate spread between a long-term bond rate and the federal funds rate would be just slightly more difficult. It would require only monitoring the bond rate while moving the federal funds rate. Since the bond rate will generally move in the same direction as the federal funds rate, but by a smaller amount, the monetary authority can affect the spread through movements in the federal funds rate. This is still much simpler, for the monetary authority, than controlling a money stock measure.

Finally, why does the spread forecast future changes in real income? The spread between the long-term bond rate and the federal funds rate is a rough measure of the steepness of the yield curve. A longer-term interest rate may be viewed as an average of expected shorter-term rates over the same time interval, for both borrowers and lenders of longer-term credit could borrow or lend for the same length of time by consecutively rolling over credit of a shorter maturity. The steeper is the term structure, the more the market expects short-term interest rates to rise in the future. Since

interest rates tend to be positively associated with economic activity, the steeper the yield curve (and the larger the spread between the bond rate and the federal funds rate), the more likely it is that the market expects economic activity to rise in the future. Conversely, a small or even negative spread between the bond rate and the federal funds rate is indicative (other things being equal) of market expectations that the economy will weaken.[14] So one reason why the spread between the long-term bond rate and the federal funds rate is successful may be that it captures market expectations about the economy.

Conclusion

An apparent recent deterioration in the effectiveness of money as an indicator of the thrust of monetary policy has given increased emphasis to the search for a monetary policy indicator. This paper tests three different interest rate-based indicators and a measure of money as forecasters of future changes in real income. The results suggest that the spread between a long-term bond rate and the federal funds rate would have given better forecasts of future changes in real income than the other potential guides, even over the period when increasing emphasis was being placed on money as an indicator of monetary policy. Coupled with the relative ease of controlling the interest rate spread, these results suggest that the interest rate spread deserves consideration as an indicator of the thrust of monetary policy.

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[1] There is an extensive literature dealing with the nature of the policy problem faced by the monetary authority. Typically, these discussions distinguish at least three different entities—an instrument (or target) that the monetary authority can closely control, an indicator that the monetary authority affects through movements in the instrument, and the goals which experience shows are predicted by movements in the indicator. For a more complete description see Saving (1967). In this paper the analysis is basically simplified by assuming that the instrument and indicator are the same. This is equivalent to assuming that the indicator can be controlled like an instrument. The last section of the paper eases this assumption by discussing the actual degree of control over the different indicators considered in the paper.

[2] For an example of an analysis using real rates as an indicator of monetary policy see Hester (1982).

[3] The real rate is actually calculated by using the equation:

$$\text{Real federal funds rate} = \left\{ \frac{(1 + \text{Federal funds rate})}{\left(\dfrac{CPI}{CPI(-4)}\right)} \right\} - 1$$

where Federal funds rate is on a bond equivalent basis
CPI is the consumer price index
and (-4) indicates the value from four quarters ago.

[4] The actual estimate used is:

$$\text{Percentage change in real M2} = \left\{ \frac{M2}{CPI} \cdot \frac{CPI(-1)}{M2(-1)} \right\}^4 - 1$$

where CPI is the consumer price index
M2 is the level of M2
and (-1) indicates the value from the previous quarter.

[5] For a discussion of the deterioration of money as an indicator, see Kopcke (1986), Roth (1987), and Siegel (1986). For a somewhat different view of the relationship, see Christiano (1986).

[6] For a more extensive description of this process see Laurent (1982).

[7] The beginning date is chosen because it is the earliest date on which regressions may be run for all the indicators, given data availability. The ending date is chosen because it is the last date on which the 20-year constant maturity rate is available.

[8] For example, the best one-lagged-term model for the level of the federal funds rate uses the two-quarter lagged term. The best two-term model for the level of the federal funds rate uses the two- and seven-quarter lagged terms. Figure 5 shows that when the one-term model is estimated through each quarter and used to forecast next quarter's real GNP, it produces a root mean square error of 3.82 percent over the period 1964 I through 1986 IV. Figure 5 also shows that the comparable figure for the two-lagged-term model over the same period is 3.74 percent.

[9] The eight different aggregates tested were the real values of (M1-Currency), M1, (M1-Other Checkable Deposits), (M2-Currency), M2, (M2-Other Checkable Deposits), (M3-Currency), and M3. The one exception when another aggregate did better than M2 in forecasting real income

was over the period 1964 I – 1979 IV where M2 minus currency did slightly better than M2 alone.

[10] As noted earlier, the series on the 20-year constant maturity government bond ends at the end of 1986. Since 1977 the longest maturity government bond has been the 30-year bond. Comparing the predictive performance of the spread using alternatively the 20- and 30-year bond over the period that both are available indicates that they are very similar, with the 30-year bond giving slightly superior predictive performance.

[11] Ultimately, the most legitimate test of the predictive power of the models will be performed with data available only after publication of this paper.

[12] For a succinct description of an analysis using movements in the market real rates, see the article by Larry R. Mote in this issue of *Economic Perspectives*.

[13] On the other hand, the results are not inferior to those of other models. For an exposition of other model forecasts see McNees (1986).

[14] It has, in recent times, been assumed that the "normal" term structure of interest rates slopes upward. For some evidence that this assumption may be unwarranted and some of the factors which determine a "normal" slope, see Wood (1983).

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Looking back: The use of interest rates in monetary policy

Larry R. Mote

Historically, short-term interest rates have played an important role in the implementation of monetary policy. This has reflected both a longstanding concern that excessive volatility of interest rates is costly and dangerous and the generally accepted belief that interest rates are a key determinant of the level of economic activity. Although the Federal Reserve never totally ignored the behavior of interest rates, it began to shift its attention to the monetary aggregates beginning in the late 1960s, reaching a peak of interest between 1979 and 1982. Since the fall of 1982, the Federal Reserve has again looked more at interest rates, while attempting to achieve short-run targets for borrowed reserves.

Interest rates have both important advantages and a number of disadvantages as targets or indicators of monetary policy. This article discusses and evaluates these advantages and disadvantages and suggests ways in which the disadvantages—some of which are inherent in the use of interest rates, others the consequence of the particular way in which they have been used—can be overcome.

The role of interest rates in monetary policy

Early postwar monetary policy in the United States after the 1951 Treasury-Federal Reserve Accord that freed the Federal Reserve from its wartime obligation to peg government bond prices has been characterized as "leaning against the wind."[1] Essentially, this policy was to allow interest rates to rise gradually when it was believed desirable to slow the economy's rate of expansion and to let rates fall when a need for stimulus was perceived. Abrupt movements in rates were resisted because of a longstanding fear of "disorderly markets."[2] Although free reserves—excess reserves minus reserves that have been borrowed from the Federal Reserve—were the focus of Federal Open Market Committee (FOMC) policy in the 1950s, it is generally acknowledged that maintaining a target level of free reserves had the effect of stabilizing short-term interest rates.[3] With the adoption of "money market conditions" as the focus of directives in the 1960s, the Federal Reserve moved closer to explicit targeting of short-term interest rates.

Monetary aggregate targeting

During the 1960s the FOMC came under increasing pressure, both internal and external, to reduce its preoccupation with the level of interest rates and pay more attention to controlling the monetary aggregates. Much of the external pressure took the form of evidence and theoretical arguments advanced by economists of the "monetarist" school that purported to demonstrate that restricting the movement of interest rates tended to destabilize economic activity.[4] Internal research by Federal Reserve economists partly confirmed this view.[5]

The conditions under which money would be superior to interest rates as an intermediate target for the purpose of stabilizing income were examined in a 1970 article by William Poole, then at the Board of Governors.[6] He concluded, within the context of his simple model, that money would be superior if the monetary sector of the economy—essentially the demand for money as a function of income and interest rates—were stable and the real sector—i.e., total spending as a function of interest rates—were not.

An enormous amount of research was done on the relative stability of the real sector and the monetary sector in the 1960s and 1970s, beginning with the seminal study by Milton Friedman and David Meiselman for the Commission on Money and Credit in 1963.[7] Most of the studies completed prior to the mid-1970s found the demand for money to be considerably more stable than had been previously believed.[8] This created a strong presumption—albeit one not universally shared—that more attention should be paid to

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the monetary aggregates. The findings of these studies were urged on the Fed for many years as grounds for a shift in emphasis in monetary policy.

The Federal Reserve did gradually move in that direction. The FOMC began to give greater weight to the behavior of the monetary aggregates in the mid-1960s.[9] The first tangible expression of this change was its adoption in 1966 of a "bank credit proviso clause" in the policy directive. This clause called on the Open Market Desk to keep the funds rate within its prescribed range unless the growth rate of bank credit deviated from its own prespecified range. If that occurred, the Desk was to allow the funds rate to deviate from its range and attempt to bring bank credit back to an acceptable growth rate.[10] In 1970, the FOMC replaced bank credit with the narrow money supply, M1, in the proviso clause.

In the 1970s the FOMC continued to experiment with controlling the monetary aggregates, while avoiding any rigid adherence to pre-established targets.[11] However, as inflation accelerated and economic instability became more severe—largely for reasons beyond the Federal Reserve's control—pressures grew to increase the System's accountability for its actions. These pressures culminated in a joint resolution by Congress in 1975 calling on the Federal Reserve to establish and make public specific target ranges for the monetary and credit aggregates.[12] These requirements became law with the passage of the Full Employment and Balanced Growth Act of 1978 (Humphrey-Hawkins Act).[13]

Despite the increased prominence given the monetary aggregates in the 1970s, interest rates continued to play an important role in policy. Even when the Federal Reserve was trying hardest to hit its targets for money, it did so indirectly by influencing interest rates, thereby affecting both the demand for money and the willingness of banks to lend.[14] It was only after inflation had reached double-digit levels in late 1979 that the Federal Reserve, under newly appointed Chairman Paul Volcker, revised its operating procedures to deemphasize short-run control of interest rates in favor of a reserve-based approach designed to achieve better control of money.[15]

A turn toward interest rate targeting

In the fall of 1982, partly because of the poor state of the economy and partly because the reliability of the relationship between money and spending had been impaired by the deregulation of deposit interest rates, the Federal Reserve again revised its operating procedure. It abandoned strict monetary targeting in favor of a borrowed reserves procedure. This procedure created a stronger link between monetary policy and interest rates.[16]

In principle it is difficult to fault the notion that, because the deregulation of interest rates on deposits had impaired the usefulness of the monetary aggregates, monetary policy should, at least temporarily, focus on some alternative measure that is less strongly affected by institutional change.[17] The need for such a strategy in the context of continued financial innovation had been discussed as early as 1975, long before the passage of the Depository Institutions Deregulation and Monetary Control Act of 1980.[18] Many critics, however, expressed strong reservations regarding even a temporary and limited increase in the attention paid to interest rates.[19] Among the dangers seen by these critics were the following: (1) that, for various institutional reasons, increasing reliance on interest rates might lead to a much more expansive policy than would be appropriate; (2) that certain inherent difficulties in interpreting interest rate movements could result in a policy even less desirable than could be achieved by controlling a flawed monetary aggregate; and (3) that political pressures and short-run considerations might lead to the retention of interest rate targeting long after the transition period was over.[20] Dangers (1) and (3) were seen as being compounded by the fact that many influential participants in financial markets view interest rate stability per se as a desirable goal.

The fears of the critics of interest rate targeting have not been realized. Although policy has almost certainly been more expansive than it would have been under monetary targeting, the economy has not yet reached the levels of resource utilization associated with accelerating inflation in the past.[21] Whatever the basic merits of their position, many critics clearly underestimated the impact of deregulation as well as the strength of deflationary

forces in the economy over the past several years.[22] Yet, it is an especially appropriate time to review the problems associated with using interest rates as either an indicator or an intermediate target of monetary policy.

Advantages of interest rate targeting

Observability. Accurate data are available on most nominal rates of interest on an ongoing basis. This contrasts sharply with the monetary aggregates, for which data are available at best with a one-week lag and, even then, subject to substantial revisions. This conclusion must be qualified to the extent that it is the real interest rate—the nominal interest rate adjusted for expected inflation—that is relevant for policy. Because inflation expectations are not directly observable, neither is the real rate of interest, and estimates of it are not clearly more accurate than measures of money.[23]

Controllability. At least in the short run, there is no reason why the Federal Reserve cannot peg nominal interest rates on any financial instrument that it chooses simply by standing ready to supply additional reserves to the banking system as necessary. The Federal Reserve did in fact peg the rates on Treasury bills and bonds during World War II and for several years thereafter.[24] Nonetheless, a number of economists have questioned the ability of the Federal Reserve to control either nominal or real interest rates.[25] Some have even offered empirical evidence purporting to demonstrate that Federal Reserve actions have no effect on interest rates.[26] A few have asserted that the Federal Reserve can affect nominal rates but not real rates. The latter notion seems somewhat confused. If the Federal Reserve lowers nominal interest rates through expansionary open market operations, expectations of inflation would probably increase. Thus, real rates, at least in the short term, would actually fall more than nominal rates.

However, it is true that the Federal Reserve's ability to control interest rates over long periods of time is very limited. Stubborn attempts to maintain rates below their equilibrium levels would result in a rapidly accelerating inflation. The Federal Reserve would end up as the only purchaser of the pegged instrument, thus, in effect, destroying the market it attempted to control. But within the ranges and the periods of time relevant to countercyclical monetary policy, there is little doubt that the Federal Reserve can have significant effects on the level of interest rates.[27]

Impact on spending. There is widespread agreement that interest rates are important in affecting spending behavior, particularly investment, and therefore play an important role in the transmission mechanism by which monetary policy affects the economy.[28]

But, based on the fact that monetarist policy prescriptions typically omit any mention of interest rates, some have attributed to monetarists the view that interest rates have little effect on spending behavior. That this inference is mistaken can be seen quite clearly in the writings of Milton Friedman, who has emphasized the importance of relative price changes, including interest rate changes, in affecting the level of economic activity.[29] What Friedman does argue is that the interest rate effects of a change in the money stock are ephemeral and difficult to observe and that it is extremely difficult to determine the appropriate level at which the interest rate should be set.[30] Consequently, most monetarists would prefer to have policy focus on controlling the money stock and leave the determination of interest rates to market forces.[31]

The nature of the interest rate and the transmission mechanism

The interest rate is the price of credit or, more generally, the price of current consumption in terms of future consumption.[32] In equilibrium, the interest rate is at a level that equates desired public and private saving with desired investment plus government spending. Economists refer to this level of the interest rate as the "natural" rate of interest.[33] It measures the marginal return to investment in real capital, referred to by John Maynard Keynes in the 1930s as the "marginal efficiency of capital."[34] However, because the economy is not always at equilibrium and because the interest rate is a function of monetary as well as real factors—at least in the short run—the market rate of interest prevailing at any time need not equal the natural rate. Indeed, it is by producing a discrepancy between the market rate and the natural rate of interest that mon-

etary policy affects total spending and economic activity.[35]

Suppose that the Federal Reserve wishes to stimulate economic activity. By purchasing government securities in the open market, it immediately drives their prices up and their yields down. Simultaneously, the reserves of the banking system are increased, lowering the federal funds rate and encouraging banks to expand their holdings of earning assets. By a process of substitution, the decline in interest rates on government securities is transmitted to other financial instruments.[36] At some point the yield on financial assets is lowered sufficiently relative to that on real assets—the natural rate—that expenditures on real producers and consumption goods are stimulated.

Because the initial interest rate effect of the expansionary policy—referred to as the "liquidity effect"—is later offset by an increase in the demand for money and credit resulting from the rise in income—the "income effect"—the interest rate may come to rest at a level as high as, or even higher than, the level that prevailed prior to the open market operation.[37] Total spending will be permanently higher, with part of the increase reflecting higher output and part higher prices, depending on the initial level of resource utilization and other factors.

If monetary policy stimulated spending to the point that inflation resulted, and was expected to continue, lenders would require a premium to cover the expected loss in purchasing power of the principal and interest they would be repaid. The resulting effect on the interest rate, often denoted as the "price expectations effect," may take many years to be fully incorporated in the observed, or "nominal" interest rate.[38] By deflating the nominal rate by the expected rate of inflation over the life of the financial instrument—which, in practice, can be extremely difficult to estimate—one obtains the "real," or inflation-adjusted market rate of interest. In equilibrium, with desired saving equal to desired investment and no tendency for income either to rise or to fall from its current level (or growth path), the real market rate would be precisely equal to the natural rate.

Problems in implementing an interest rate targeting policy

While there is broad agreement concerning the general nature of the mechanism by which monetary policy affects the economy,[39] this fact does not get one very far in designing an appropriate interest rate policy. A simple statement of such a policy might be that, if the economy were well above (below) a high employment, noninflationary equilibrium, it would be desirable to move the economy toward such an equilibrium by raising the market rate above (lowering it below) the natural rate. Once this equilibrium was reached, the market rate should be adjusted as necessary to keep it equal to the natural rate.[40]

This prescription for an optimal interest rate policy is deceptively simple. The basic difficulty is that, because the natural rate incorporates expected rates of return on long-lived real assets over their entire economic lives, it is extremely difficult to measure its level at any given time. The implementation of such a policy also poses a number of other problems, some of which are peculiar to interest rate targeting and some of which are shared by a monetary aggregate targeting policy.

Timing and lags

A key problem in conducting any kind of discretionary, countercyclical monetary policy is the existence of lags in the effects of policy actions on the economy. The lags between changes in the money supply and the economy, which Milton Friedman characterized many years ago as "long and variable,"[41] make it difficult to conduct a countercyclical money supply targeting policy. However, recent econometric studies indicate both that the lag from monetary policy actions to income are considerably shorter and somewhat more stable than the lags found by Friedman for money, and that the length of the lag is strongly dependent on the measure of monetary policy.[42]

But shorter and more stable lags are not sufficient to guarantee the success of a discretionary monetary policy. Given the great uncertainty in short-run forecasts of economic activity, a problem emphasized in a recent paper by Allan Meltzer, conscious efforts to stabilize the economy may in fact destabilize it.[43]

Indeed, Friedman has argued that this is the most likely outcome.[44] Again, however, this argument is not peculiar to interest rate-targeting policies, and may apply with even more force to discretionary policies based on controlling the monetary aggregates.

Interpreting the level of rates

The problems just discussed largely have to do with the timing of policy actions. An even more fundamental problem involves the determination of the level of interest rates, or the magnitude of the change in interest rates, required to bring about the desired effects on the economy. Because it is generally agreed that it is real interest rates, rather than nominal rates, that are crucial for affecting spending behavior, it is necessary to be able to measure real rates. To do so, it is necessary to deflate nominal rates by the expected rate of inflation over the life of the particular debt instrument. However, expected rates of inflation are not directly observable and must either be obtained from surveys or inferred from statistical evidence. Either way, there is reason to be skeptical of the resulting estimates.[45]

But, even if it were possible to estimate inflation expectations with great accuracy, it would still be difficult to determine the proper level at which to set the market rate. This is because it is the differential between the market real rate and the natural real rate, not the level of the market rate per se, that determines whether monetary policy is stimulative or contractionary. To know the current thrust of monetary policy, it is necessary to know the current level of the natural rate. Again, it is not an observable magnitude. Although some researchers have made the simplifying assumption that the natural rate is constant, there is no presumption that this is a satisfactory approximation. Indeed, the Swedish economist Knut Wicksell—whose distinction between the market rate and the natural rate is widely accepted today—argued that movements in the natural rate were the key determinant of the business cycle.[46] This was an early form of the current real business cycle theories.

Cumulative effects

Still another serious problem in targeting interest rates is the fact that a small error in setting the level of the market rate can have serious effects on the economy. Suppose that the market rate were pegged at a level below the prevailing natural rate. With some lag, this would stimulate an increase in total spending and income. As Wicksell pointed out at the turn of the century, the increase in income would raise the demand for money and credit, thereby tending to drive up the interest rate. In order to keep the market interest rate at its predetermined level, the central bank would have to accelerate the rate of money growth, again leading to higher income, increased demand for money, and upward pressure on interest rates. Eventually, this process would produce continuously accelerating inflation, requiring ever more rapid growth in money to hold the interest rate down. Wicksell called this sequence of events the "cumulative process." [47] The opposite effect—i.e., deflation accompanied by decelerating money growth—would follow from pegging the market interest rate at too high a level. The essential point is that pegging the market rate consistently above or below the natural rate can be expected to lead to a cumulative departure from equilibrium in the form of either accelerating inflation or accelerating deflation.

A policy of targeting a monetary aggregate does not suffer from this problem. A constant rate of money growth, even if nonoptimal from the standpoint of minimizing fluctuations in income, would not lead to a cumulative departure from equilibrium. If it were set too high (low), it would simply produce a slightly higher (lower) secular rate of inflation. But there is no reason to think that this rate would persistently accelerate or decelerate.[48]

It may be objected that an intelligent interest rate policy would not simply peg the rate at a given level and leave it there regardless of economic developments. Rather, it would adjust the rate as additional information on the state of the economy became available.[49] This is certainly true, and such adaptation was clearly practiced by the Federal Reserve in the past. In every expansion, as the economy expanded and demands for money and credit increased, the Federal Reserve has eventually allowed interest rates to rise to choke off excess demand. Symmetrically, as the economy slowed following the onset of a recession, rates were allowed to fall. Unfortunately, the changes in both directions have occasionally

occurred somewhat later and been somewhat smaller than what, in retrospect, would have been optimal.

In defense of their actions, policymakers have often emphasized that policy, even if not perfect, was "moving in the right direction." But "moving in the right direction" is insufficient if the economy is moving further and further away from the desired equilibrium, as has happened in the past. As rates rose due to expanding demand for credit in a booming economy, the expected rate of return on real investment, the natural rate, often remained above the sluggishly rising market rate. Consequently, the economy continued to expand at too rapid a rate, leading inevitably to accelerating inflation—and subsequent recession.[50]

Historical examples

A few historical examples will serve to illustrate the tendencies just described. The particular episodes chosen were not the only ones to display this behavior, but they are fairly clearcut examples.

Vietnam War expansion. An historical episode in which interest rates were apparently held down too long in an expansion occurred in 1967, 1968, and 1969. After a brief downturn in the first quarter of 1967—billed at the time as a "mini-recession"—the economy resumed expansion, with the rate of real growth exceeding 6 percent by the first quarter of 1968 and rising further to 7 percent in the second quarter. Capacity utilization, which had reached 90 percent in 1966 under the pressure of the buildup for the Vietnam War, was still in excess of 85 percent, and the unemployment rate fell from 3.7 percent in July to 3.3 percent in December. Inflation began to accelerate around the middle of the year.

The federal funds rate, which had fallen from February through October of 1967, rose from 4.6 percent in January 1968 to 6.1 percent in May. However, it then fell through most of the remainder of 1968, reaching 5.8 percent in November. The money supply, which had grown 6.6 percent in 1967, increased 8.0 percent in 1968. Over this same period, inflation, as measured by the Consumer Price Index, accelerated from an annual rate of 4 percent to an annual rate of 5 percent.

Not until December 1968 did the Federal Reserve take decisive action to slow the economy. The federal funds rate was abruptly raised, reaching 8.9 percent by June 1969. But by that time, inflation was running at an annual rate of 7.8 percent. The move toward restraint had come much too late. Statements by policymakers at the time suggest that they may have been misled by the earlier uptick in the federal funds rate into thinking that policy was already sufficiently tight.[51]

The post-oil shock expansion. A more recent example occurred in the later years of the 1975 – 1979 expansion. Plunged into recession by rising oil prices in 1973 and 1974, the economy began to recover in the first quarter of 1975. As is usually the case, the federal funds rate continued to fall for several months into the recession. However, unlike in most other recoveries, the federal funds rate did not bottom out until two years later. The federal funds rate actually declined from an average of 5.8 percent in the first year of the recovery to 5.5 percent in 1977—a year when inflation was already reaccelerating—and then had to be raised sharply to 7.9 percent in 1978, 11.2 percent in 1979, and 13.4 percent in 1980. At the same time, M1 growth accelerated from 5.0 percent in 1975 to 8.3 percent in 1978 before slowing to 7.2 percent in 1979 and 6.4 percent in 1980.

Because the federal funds rate in late 1977 had already risen about 2 percentage points from its January low, the Federal Reserve was under considerable external pressure not to raise rates any further. For example, Charles Schultze, Chairman of the Council of Economic Advisers, sharply criticized the Federal Reserve for being concerned about inflation prematurely.[52] Schultze argued that, with abundant excess capacity in the economy, monetary policy should continue to foster expansion until inflation was clearly accelerating in order, in the jargon of the day, to avoid "aborting the recovery."

The administration had a clear interest in prolonging the expansion, even at the cost of some acceleration in inflation. But advice similar to Schultze's was also forthcoming from academics and private consultants. For example, former Chairman of the Council of Economic Advisers Walter W. Heller testified in July 1977 that "there is no sign that the economy is nearing its capacity nor that it is about to be bedevilled by bottlenecks; ... I hope that he (Federal Reserve Chairman Arthur Burns)

is not implying that this calls for tighter money or higher interest rates. This would be exactly the wrong medicine; ... ."[53] Similarly, economist Ray Fair testified before the Joint Economic Committee that raising the Treasury bill rate would abort the expansion and result in rising unemployment and a budget deficit.[54] In testimony before the Senate Banking Committee, Otto Eckstein questioned whether rates could be raised without creating a "major disturbance."[55] And, as late as March 1978, Rudiger Dornbusch argued against any increase in interest rates and, indeed, for a "considerably easier monetary policy."[56]

In retrospect, it seems clear that interest rates were held down too long. Ultimately, in the fall of 1979 and, more dramatically, in the spring of 1980, the Federal Reserve felt it necessary to push them up abruptly to slow inflation. It should be noted that the sharp rise in interest rates at that time was not all due to monetary policy. It resulted in part from the increase in oil prices following the cut-off of supplies from Iran in 1979 and from the adoption of credit controls in early 1980. Consistent with existing evidence on the length of the lag in the effects of monetary policy, inflation remained high until 1982.[57]

The Great Depression. The classic case of failure to lower rates quickly enough in the face of a weakening economy was in the depression of the 1930s, particularly the years 1929–1933. Although the Fed lowered the discount rate in steps from 6 percent late in 1929 to 1.5 percent in 1931, this was not sufficient to prevent the money supply from falling by a third between 1929 and 1933. Indeed, for international reasons, the Fed actually increased the discount rate to 3.5 percent at the end of 1931. Nonetheless, because the general trend of rates was downward during these years, Federal Reserve officials clearly perceived the policy they were following as one of extreme ease.[58] It was this belief that was largely responsible for the growth of the view that monetary policy is ineffective in combatting a recession and gave rise to the expression "You can't push on a string" as a description of such situations.[59]

These examples spotlight some of the difficulties of pursuing an interest rate policy. They illustrate the tendency of central banks not to move rates sufficiently vigorously to achieve the goal of stabilization. Although the level of market rates has generally moved in the right direction in both expansions and contractions, the behavior of the economy suggests that, more often than not, the market rate has been held below the (unobservable) natural rate too long in expansions and above it too long in contractions.

Political and institutional obstacles

By themselves, the economic problems of lags, limited ability to forecast movements in the economy, and the difficulty of knowing just how much to move rates would make it extremely difficult to conduct an appropriate interest rate targeting policy. However, these problems are compounded by political pressures for low and stable interest rates, together with some reluctance on the part of central bankers to permit large or rapid movements in interest rates.[60] These factors are critical, because rational countercyclical interest rate policy would require the Federal Reserve to act in counterintuitive fashion, vigorously pushing up interest rates when market forces were already causing them to rise and pushing them down when a weak economy was causing them to fall. There have been only a few occasions when the Federal Reserve has actually done this. The pressures, both internal and external, that have prevented the Federal Reserve from pursuing a countercyclical interest rate policy may be classified into two categories: those intended to keep interest rates low at all times and those intended to prevent excessive volatility in rates.

Arguments for keeping rates low

The political pressures tending to inhibit interest rate movements have been anything but symmetrical. There are quite large constituencies favoring low rates, but few forthright advocates of high rates. As noted above, interest rates are simply a particular type of prices. There is broad agreement that prices, if they are to perform their informational and allocative functions, must be free to move in both an upward and a downward direction. Thus, it is interesting to consider why this elementary proposition is often ignored in the case of interest rates.

Distributional effects. In part, the political bias toward low interest rates reflects

a belief that low interest rates favor debtors at the expense of creditors, as well as a widespread belief that debtors are generally poor while lenders tend to be wealthy. Therefore, low interest rates are seen as contributing to a more egalitarian distribution of income. While this is a gross oversimplification of the distributional consequences of the level of interest rates,[61] it is virtually unheard of for a politician in the United States to argue for higher interest rates.

The inflation-unemployment trade-off. Another force operating to keep interest rates down in the post-World War II period has been the perceived trade-off between inflation and unemployment. The contrast between the depression of the 1930s and the prosperity of the war years convinced many Americans that inflation was by far the lesser of the two evils. The general acceptance in the early 1960s of the Phillips Curve, which was initially interpreted as demonstrating the existence of a stable, inverse relationship between the rate of inflation and the rate of unemployment, reinforced the inflationary bias in the political process.[62]

Short-run versus long-run considerations. Experience, together with recent theoretical work, has cast considerable doubt on the usefulness of the Phillips Curve as a guide to policy. Indeed, it has come to be widely accepted that there may be no long-run trade-off between inflation and unemployment to be exploited by policy.[63]

However, there remains considerable evidence that there is a short-term trade-off. To the degree that the desirable effects of monetary expansion—increased output and employment—are realized quickly, while the undesirable effects—inflation—are postponed to the future, there are strong political incentives to pursue such policies. These incentives are compounded by the short planning horizons typical of political processes. Taken together, these factors create enormous political pressures on the Federal Reserve to pursue stimulative monetary policies.

Housing and thrift markets. Another factor producing political pressures on the Federal Reserve to hold interest rates low is a fear of hurting thrift institutions and the housing market. The strong inverse relationship between the level of interest rates and the strength of the housing market is well established. Indeed, housing interests have long been among the most vocal opponents of tight monetary policies.[64]

Arguments against interest rate volatility

The widespread aversion of central bankers and other financial market participants to short-run fluctuations in interest rates is based on a number of considerations, most having to do with the potential effects on the functioning of financial markets. One of these is simply that greater volatility of interest rates implies greater risk for those institutions with which the central bank deals in implementing monetary policy. At the very least, interest rate volatility raises the costs of risk management to such firms, thereby increasing spreads and reducing the liquidity of the market. At worst, it could threaten the survival of some firms. Indeed, some financial market observers see in interest rate instability a possible recurrence of the extensive institutional damage and disruption of credit channels experienced in the 1930s.[65]

Credit market lumpiness. Officials at the Federal Reserve Trading Desk in New York have frequently expressed the view that there is an unavoidable "lumpiness" in the flow of credit demand that would result in unnecessary and costly fluctuations in interest rates in the absence of Federal Reserve smoothing.[66] Because of this, Desk officials have opposed sacrificing interest rate stability to achieve tighter short-run control of the monetary aggregates.[67] In further support of this position they cite a number of studies suggesting that deviations of money growth from its longer-term path that last no longer than one or two quarters have little effect on spending.[68]

Economic instability. Another rationale for smoothing involves the notion that interest rate instability begets economic instability. This idea clearly permeates some statements by Federal Reserve officials during the 1950s and was revived during the period of extreme interest rate volatility in the early 1980s.[69]

Impact on investment. Finally, it has been alleged that interest rate instability, by raising the average risk premium in long-term interest rates, has discouraged investment and resulted in lower economic growth.[70] This issue, too, is largely a product of the volatility of the early 1980s.

Evaluating the arguments

Whatever their source, the pressures on the Federal Reserve to prevent short-run interest rate volatility have been a major obstacle to the implementation of a countercyclical interest rate targeting policy. That the Federal Reserve is fully aware of the problem was emphasized by its adoption of a nonborrowed reserves operating procedure in 1979. One of the touted advantages of the new procedure was that, because it did not require conscious short-term targeting of rates, it would allow interest rates to fluctuate much more than in the past.[71]

Arguments against smoothing

Short-run versus long-run volatility. Perhaps the most fundamental and controversial criticism of short-run smoothing of interest rates is the assertion by some economists that such efforts actually serve to destabilize rates in the longer run.[72] This assertion rests largely on the nature of the lags in the effects of monetary policy. Virtually all empirical studies of the lagged income and price expectations effects of monetary policy on interest rates show that these effects swamp the initial liquidity effect within one or two quarters.[73] Hence, expansionary actions taken today to keep interest rates from rising will have a much stronger upward impact on interest rates in the future. The eventual necessity of taking action to slow inflation will reinforce the lagged income and price expectation effects resulting from the past expansionary actions to push rates far higher than they would have had to go in the absence of short-run smoothing.

The validity of this view of the effects of smoothing depends heavily on the nature of the original disturbances to interest rates that prompted the smoothing. If the smoothing is offsetting random disturbances, then smoothing helps the market. If, on the other hand, interest rate movements signal changes in underlying economic conditions, then smoothing will worsen the final outcome. There is significant evidence that a large portion of interest rate movements indeed reflects changing economic fundamentals. Thus, there is a case to be made that allowing somewhat greater interest rate instability in the short run can reduce instability in the longer run.

The implications of this fact for thrift institutions and the housing market seem particularly compelling. It has clearly been increases in the level of rates by several hundred basis points over the life of the business cycle, rather than the day-to-day or week-to-week fluctuations, that have hurt the thrift and housing industries so badly over the past decade or so.[74]

Effects on stability of income. The notion that interest rate instability implies general economic instability is basically a confused notion, but one that calls for some careful distinctions. As a general rule, price instability resulting from market forces should serve to stabilize output relative to what it otherwise would be. Thus, a fall in commodity prices in the face of a decline in demand will tend to maintain output at a higher level than if prices remained unchanged. Although it is conceivable that price expectations are elastic—in which case changes in price in a particular direction would lead to expectations of further changes in the same direction, causing purchases to be postponed and exacerbating the effects on output—such behavior has never been shown to be more than a theoretical possibility.[75] Similarly, a fall in interest rates due to declining income and credit demand should have some stabilizing effects on income. In each of these cases, movements in prices play an integral role in a self-equilibrating mechanism.

Thus, the key question in determining whether a given movement in prices is stabilizing or destabilizing to income concerns its source. If price decreases result from a decline in demand, they are likely to be stabilizing. If, however, they are arbitrarily imposed by external forces, they will tend to destabilize the economy.[76]

Summary and conclusion

This article has reviewed the Federal Reserve's experience with implementing monetary policy through interest rates with a view toward identifying the problems encountered in that approach. It is clear that these problems are not insignificant.

Yet, it should not be supposed that these problems doom an interest rate targeting policy to failure. Because policymakers are well aware of the shortcomings of earlier interest rate policies, they should be able to avoid the

worst mistakes of the past. Most importantly, the insight yielded by the conceptual solution to the problem of setting the appropriate level of market interest rates—that it is the relationship of the market rate to the natural rate that is critical—has inspired new research designed to improve our ability to conduct a sensible interest rate policy. Although the natural rate remains unobservable, there are a number of economic variables whose behavior provides clues as to where the market rate stands relative to the natural rate. The article by Robert Laurent in this issue of *Economic Perspectives* explores what promises to be a fruitful approach to conducting a monetary policy based on interest rates in a complex and uncertain world.

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[1] In a speech in 1958, Federal Reserve Board Chairman William McChesney Martin described Federal Reserve policy as follows:

> The Federal Reserve System has leaned against the wind whenever it has been clear which way the wind was blowing. In 1957-58, when a decline was underway, we pursued an easy money policy, in order to give whatever assistance an enlarged availability of money could give to alleviating distress and laying the groundwork for recovery.

"Our American Economy," speech before the Executive Club of Chicago, December 12, 1958. Reprinted in U. S. Congress, Joint Economic Committee, Employment, Growth, and Price Levels, Hearings, 86th Cong., 1st Sess., 1960, p. 3385.

[2] The exact meaning of "disorderly markets" is hard to nail down. However, Robert Roosa of the New York Federal Reserve Bank provided a brief description of the factors considered in determining whether a market is disorderly in 1959. It reads, in part:

> The general conception of disorderly market conditions in the Government securities market envisions a situation in which selling "feeds on itself," that is, a situation in which a fall in prices, instead of eliciting an increase in the amount of securities demanded and a decrease in the amount supplied, elicits the reverse—a falling away of bids and a rise in both the number and the size of offerings.

U. S. Congress, Joint Economic Committee, Hearings, *Employment, Growth, and Price Levels,* 86th Cong., 1st Sess., July 27, 1959, p. 1278.

[3] The mechanism by which this occurs is described in detail in Jack M. Guttentag, "The Strategy of Open Market Operations," *Quarterly Journal of Economics,* vol. 80 (February 1966), pp. 1-30.

[4] Allan H. Meltzer argues:

> Misled by the change in market interest rates—or their interpretation of the change—the Federal Reserve permits or forces the stock of money to grow at too high or too low a rate for too long a time. Excessive expansion and contraction of money becomes the main cause of the fluctuations in output and of inflation or deflation.

"Panel: The Role of Money in National Economic Policy," in *Controlling Monetary Aggregates* (Boston: Federal Reserve Bank of Boston, 1969), p. 29.

[5] Some of this research is summarized in Richard G. Davis, "How Much Does Money Matter? A Look at Some Recent Evidence," *Monthly Review,* Federal Reserve Bank of New York (June 1969), pp. 119-131.

[6] William Poole, "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model," *Quarterly Journal of Economics,* vol. 84 (May 1970), pp. 197-216.

[7] Milton Friedman and David Meiselman, "Relative Stability of the Investment Multiplier and Monetary Velocity in the United States, 1897-1958," in *Stabilization Policies,* Commission on Money and Credit (Englewood Cliffs, N. J.: Prentice-Hall, 1963), pp. 165-268.

[8] This was the conclusion of John T. Boorman after surveying the literature up to 1976. "The Evidence on the Demand for Money," in *Current Issues in Monetary Theory and Policy,* ed. by Thomas M. Havrilesky and John T. Boorman (Arlington Heights, Ill.: AHM Publishing Corp., 1976), pp. 315-360.

[9] Stephen H. Axilrod, "Appendix: Monetary Aggregates and Money Market Conditions in Open Market Policy," in *Open Market Policies and Operating Procedures—Staff Studies,* Board of Governors of the Federal Reserve System, July 1974, pp. 191-218. The reluctance with which the FOMC moved in this direction and its reservations about the usefulness of money targeting are readily apparent in Andrew Brimmer, "The Political Economy of Money: Evolution and Impact of Monetarism in the Federal Reserve System," *American Economic Review,* vol. 62 (May 1972), pp. 344-352.

[10] Stephen H. Axilrod, "The FOMC Directive as Structured in the Late 1960's: Theory and Appraisal," in *Open Market Policies and Operating Procedures—Staff Studies,* Board of Governors of the Federal Reserve System, July 1974, pp. 6-7.

[11] Arthur F. Burns, "The Role of the Money Supply in the Conduct of Monetary Policy," Letter to Senator William Proxmire, November 6, 1973.

Reprinted in *Monthly Review,* Federal Reserve Bank of Richmond (December 1973), pp. 2-8.

[12] House Concurrent Resolution 133, adopted March 24, 1975.

[13] The act requires the Administration to set economic goals and the Federal Reserve to report to the Congress twice each year on its plans for monetary policy and how they relate to the Administration's goals.

[14] For a discussion of the shortcomings of this procedure, see Milton Friedman, "Statement on the Conduct of Monetary Policy," in *Second Meeting on the Conduct of Monetary Policy,* Hearings, U. S. Congress, Senate, Committee on Banking, Housing, and Urban Affairs, 94th Cong., 1st Sess., November 6, 1975, pp. 45-47. Also see Raymond E. Lombra and Raymond G. Torto, "The Strategy of Monetary Policy," *Monthly Review,* Federal Reserve Bank of Richmond (September/October 1975), pp. 3-14.

[15] Stephen H. Axilrod and David E. Lindsey, "Federal Reserve System Implementation of Monetary Policy: Analytical Foundations of the New Approach," Proceedings of the American Economic Association, *American Economic Review,* vol. 71 (May 1981), pp. 246-252.

[16] This shift in procedures is described in Henry C. Wallich, "Recent Techniques of Monetary Policy," *Journal of the Midwest Finance* Association, vol. 13 (1984), p. 6.

[17] One such proposal that involves using a combination of money, credit, and interest rate variables is discussed in Benjamin M. Friedman, "Discussion," in *Controlling Monetary Aggregates III,* Conference Series No. 23 (Boston: Federal Reserve Bank of Boston, 1980), pp. 235-240.

[18] The argument for pursuing an interest rate policy during such a transition was made persuasively by Carl M. Gambs in 1975. "Monetary Innovation and Monetary Control," Working Paper No. 50, Federal Home Loan Bank Board, February 18, 1975, pp. 31-33.

[19] See, e.g., Robert H. Rasche, "Comments on Wallich's Analysis of Recent Techniques of Monetary Policy," *Journal of the Midwest Finance Association,* vol. 13 (1984), pp. 13-18.

[20] Some of these dangers were mentioned by Frank Morris, President of the Federal Reserve Bank of Boston, at a conference in 1982. "Defining the Issues," in *Interest Rate Deregulation and Monetary Policy* (San Francisco: Federal Reserve Bank of San Francisco, 1982), pp.13-19.

[21] As of October 1987 the rate of capacity utilization in manufacturing stood at 81.0 percent. During most of the current expansion it has fluctuated between 79 and 80 percent, well within the 78.5-83.6 percent rate of capacity utilization found to be consistent with stable inflation between 1959 and 1983. See Rose McElhattan, "Inflation, Supply Shocks and the Stable- Inflation Rate of Capacity Utilization," *Economic Review,* Federal Reserve Bank of San Francisco (Winter 1985), pp. 45-63.

[22] A prominent example is provided by the forecast given by Milton Friedman early in 1984, in which he predicted that inflation would be at a rate as high as 9 percent by the end of 1984. The actual rate was about 2.5 percent. See Walter Guzzardi, Jr., "The Dire Warnings of Milton Friedman," *Fortune,* March 19, 1984, pp. 28-34.

[23] The difficulties of measuring real rates of interest are analyzed in some detail in W. W. Brown and G. J. Santoni, "Unreal Estimates of the Real Rate of Interest," *Review,* Federal Reserve Bank of St. Louis, vol. 63 (January 1981), pp. 18-26.

[24] In an answer submitted to Congress in 1952, the Board of Governors described its wartime pegging policy:

> ...In order to avoid encouraging the withholding of investment funds in anticipation of higher interest rates, as well as to keep down the cost of borrowing to the Treasury, the decision was reached to finance the war at the level and structure of rates prevailing at the outbreak of war, except for a very slight increase in short-term rates. The rates thus determined for war finance ranged from three-eighths of 1 percent on 91-day Treasury bills to 2-1/2 percent on the longest-term bank-restricted bonds.

"Reply by William McC. Martin, Jr., Chairman of the Board of Governors of the Federal Reserve System," in *Monetary Policy and the Management of the Public Debt,* Part I, Joint Committee Print, U. S. Congress, Joint Committee on the Economic Report, 82d Cong., 2d Sess., February 20, 1952, p. 288.

[25] Actually, only a few economists have questioned the ability of the Federal Reserve to affect the real rate of interest in the short run. See, e.g., G. J. Santoni and Courtenay C. Stone, "The Fed and the Real Rate of Interest," *Review,* Federal Reserve Bank of St. Louis (December 1982), pp. 8-18.

[26] See, e.g., *Ibid.,* pp. 15-18. However, the evidence presented is largely irrelevant, being based primarily on annual data. Even those who believe the Federal Reserve can lower real and nominal rates of interest by accelerating money growth recognize that these effects would be reversed within a year.

Equally important, the simple regressions used to test the relationship between money growth and interest rates fail to take account of the simultaneity problems created by the fact that Federal Reserve policy has often been directed at smoothing interest rate changes arising from exogenous influences.

[27] Following an exhaustive review of several hypotheses regarding the Federal Reserve's ability to affect real rates of interest and the available evidence on these hypotheses, Robert J. Schiller concluded that "none of the hypotheses is likely to be so strictly true as to rule out completely a predictable effect of systematic monetary policy on expected real interest rates." "Can the Fed Control Real Interest Rates?" in *Rational Expectations and Economic Policy*, edited by Stanley Fischer (Chicago: University of Chicago Press, 1980), pp. 117-156.

[28] The evidence is surveyed in Michael J. Hamburger, "The Impact of Monetary Variables: A Survey of Recent Econometric Literature," in *Essays in Domestic and International Finance* (New York: Federal Reserve Bank of New York, 1969), pp. 37-49.

[29] Friedman explains the apparent misconception as follows: "The difference between us and the Keynesians is less in the nature of the process than in the range of assets considered....we regard the market rates stressed by the Keynesians as only a small part of the total spectrum of assets that are relevant." Milton Friedman, "A Theoretical Framework for Monetary Analysis," in *Milton Friedman's Monetary Framework*, edited by Robert J. Gordon (Chicago: University of Chicago Press, 1970), p. 28.

[30] "Clearly, also, as the 'new' money spreads through the economy, any first-round effects will tend to be dissipated....The empirical question is how important the first-round effects are compared to the ultimate effects." Milton Friedman, "Comments on the Critics," in *Milton Friedman's Monetary Framework*, edited by Robert J. Gordon (Chicago: University of Chicago Press, 1970), p. 147.

[31] For example, David Meiselman noted in 1969 that

> ...if we do emphasize monetary policy, and, with it, controlling the stock of money as the principal instrument of indicator of monetary policy, there are certain things that we will have to give up. For example, it means that various attempts to peg or to moderate either one or a wide range of interest rates will have to go by the board.

"Panel: The Role of Money in National Economic Policy," in *Controlling Monetary Aggregates* (Boston: Federal Reserve Bank of Boston, 1969), p. 18.

[32] Paul A. Samuelson, "Money, Interest Rates, and Economic Activity: Their Interrelationships in a Market Economy," in *Monetary Economics: Readings on Current Issues*, edited by William E. Gibson and George G. Kaufman (New York: McGraw-Hill, 1971), pp. 51-61.

[33] The natural rate of interest played a major role in the monetary analysis of the eminent Swedish economist Knut Wicksell. He defined the natural rate as follows: "The rate of *interest at which the demand for loan capital and the supply of savings* exactly agree, and which more or less corresponds to the expected yield on the newly created capital, will then be the normal or natural real rate." *Lectures on Political Economy*, vol. 2 (London: Routledge & Kegan Paul Ltd., 1935), p. 193.

[34] John Maynard Keynes, *The General Theory of Employment, Interest, and Money* (New York: Harcourt, Brace, & World, 1936), p. 135. Keynes argued that there was a different natural rate of interest for every level of employment. He therefore defined the natural rate of interest consistent with full employment as the "neutral" or "optimum" rate of interest. Pp. 242-243.

[35] The process by which this occurs is described in Gail E. Makinen, *Money, the Price Level, and Interest Rates* (Englewood Cliffs, N. J.: Prentice-Hall, 1977), pp. 57-59.

[36] See Samuelson, "Money, Interest Rates, and Economic Activity," pp. 55-60.

[37] These effects are described in Milton Friedman, "Factors Affecting the Level of Interest Rates," in *Proceedings of the 1968 Conference on Savings and Residential Financing* (Chicago: U. S. Savings and Loan League, 1969), pp. 11-27.

[38] This effect is sometimes called the "Fisher effect" after Irving Fisher, who was the first economist to test the effect statistically. See *The Theory of Interest* (New York: Macmillan, 1930), pp. 399-451. An exceptionally clear exposition of the effect is given in Friedman, "Factors Affecting the Level of Interest Rates," pp. 18-23.

[39] According to Milton Friedman, " ...the basic differences among economists are empirical, not theoretical." "A Theoretical Framework for Monetary Analysis," p. 61.

[40] Such a policy is discussed in George Horwich, "A Framework for Monetary Policy," in *Targets and Indicators of Monetary Policy*, edited by Karl Brunner (San Francisco: Chandler Publishing Co., 1969), pp. 124-164.

[41] "The Lag in Effect of Monetary Policy," *Journal of Political Economy,* vol. 49 (October 1961), pp. 447-466.

[42] The evidence was surveyed in Michael J. Hamburger, "The Lag in the Effect of Monetary Policy: A Survey of Recent Literature," in *Monetary Aggregates and Monetary Policy* (New York: Federal Reserve Bank of New York, 1974), pp. 104-113.

[43] Allan H. Meltzer, "Limits of Short-Run Stabilization Policy," presidential address to the Western Economic Association, July 3, 1986.

[44] Milton Friedman, "The Effects of a Full-Employment Policy on Economic Stability: A Formal Analysis," in *Essays in Positive Economics* (Chicago: University of Chicago Press, 1953), pp. 117-132.

[45] Some of the problems in estimating expected rates of inflation are discussed in Patrick J. Lawler, "Are Real Interest Rates Good Measures of Monetary Policy?" *Economic Review,* Federal Reserve Bank of Dallas (July 1982), pp. 1-12.

[46] Knut Wicksell, *Lectures on Political Economy,* vol. II, edited by Lionel Robbins (London: Routledge & Kegan Paul, Ltd., 1935), p. 205.

[47] An updated version of the process has been called the "accelerationist hypothesis." Milton Friedman, "The Role of Monetary Policy," *American Economic Review,* vol. 58 (March 1968), p. 10.

[48] As Milton Friedman argued in his presidential address to the American Economic Association in 1967, " ...it would be better to have a fixed rate that would on the average produce moderate inflation or moderate deflation, provided it was steady, than to suffer the wide and erratic perturbations we have experienced." *Ibid.,* p. 17.

[49] This is recognized by many advocates of interest rate targeting. Thus, Professor James Tobin testified in 1977: "Certainly the Fed can and should make clear that it has no intention of pegging interest rates for extended periods of time. That's not what I am suggesting." *Conduct of Monetary Policy,* Hearings, U. S. Congress, House, Committee on Banking, Finance, and Urban Affairs, 95th Cong., 1st Sess., February 4, 1977, p. 139.

[50] In other words, allowing interest rates to move is not the same thing as allowing them to move promptly and by a sufficient amount to help stabilize the economy. The evolution of U. S. monetary policy following the 1951 Treasury-Federal Reserve Accord, which freed the Federal Reserve from the war-time obligation to peg interest rates on government debt, was described in Henry C. Wallich and Stephen H. Axilrod, "Postwar United States Monetary Policy Appraised," in *United States Monetary Policy,* revised edition, edited by Neil H. Jacoby (New York: Praeger, 1964), pp. 116-154. Wallich and Axilrod argued that monetary policy between World War II and the early 1960s "has by and large been well handled...." (p. 153) But, while emphasizing the Federal Reserve's increased willingness to let interest rates move, they acknowledged that its emphasis on credit conditions "sometimes tends to make policy-makers underestimate the need for more vigorous action in periods when interest-rate declines are being generated by market forces." (p. 149) A much more critical view of postwar monetary policy was provided by Karl Brunner and Allan H. Meltzer, who argued that the Federal Reserve's reliance on free reserves as an indicator of the stance of policy led it to stabilize interest rates at the expense of greater variability in money and income. *An Alternative Approach to the Monetary Mechanism,* Subcommittee Print, Subcommittee on Domestic Finance, Committee on Banking and Currency, U. S. Congress, House of Representatives, 88th Cong., 2d Sess., August 17, 1964, pp. 64-72.

[51] The minutes of the Federal Open Market Committee meeting on May 28, 1968, clearly show that policy was already considered tight; since the preceding meeting policy "had been directed at maintaining firm conditions in the money markets while countering persistent tendencies toward excessive tightness." "Record of Policy Actions of the Federal Open Market Committee," *Federal Reserve Bulletin,* vol. 54 (September 1968), p. 752.

[52] *New York Times,* October 21, 1977, p. 1.

[53] *Conduct of Monetary Policy,* Hearings, U. S. Congress, House, Committee on Banking, Finance, and Urban Affairs, 95th Cong., 1st Sess., July 28, 1977, p. 11.

[54] Cited by Representative Parren J. Mitchell, *Recent Monetary Developments and Future Economic Performance,* Hearing, U.S. Congress, House Subcommittee on Domestic Monetary Policy, Committee on Banking, Finance, and Urban Affairs, 95th Cong., 1st Sess., September 27, 1977, p. 1.

[55] *Second Report on the Conduct of Monetary Policy,* U.S. Congress, Senate, Committee on Banking, Housing, and Urban Affairs, 95th Cong., 2d Sess., May 26, 1978, p. 10.

[56] *Quarterly Hearings on the Conduct of Monetary Policy,* U. S. Congress, House Committee on Banking, Finance, and Urban Affairs, 95th Cong., 2d Sess., March 7, 1978, p. 42.

[57] Inflation slowed only slightly in 1980 and 1981 before falling sharply in 1982. As measured by the percentage change in the Consumer Price Index from December to December, the rate of inflation was 13.3 percent in 1979, 12.4 percent in 1980, 8.9 percent in 1981, and 3.9 percent in 1982. *Economic Report of the President,* February 1983, Table B-55, p. 225.

[58] As Milton Friedman and Anna J. Schwartz noted: "Despite the decline in Federal Reserve credit outstanding, the Board described its policy for the year 1930 as one of 'monetary ease...expressed through the purchase at intervals of additional United States Government securities and in progressive reductions of reserve bank discount and acceptance rates.' " *A Monetary History of the United States, 1857-1960* (Princeton, N. J.: Princeton University Press, 1963), pp. 374-375.

[59] George W. Cloos, "Pushing on a String: Monetary Conditions From the 1937-38 Recession to Pearl Harbor," *Financial Analysts Journal* (January-February 1966), pp. 1-7.

[60] The underlying rationale for this aversion has rarely been clearly articulated. At times it has been based on a confusion of interest rate volatility with general economic instability, at other times on the fear that interest rate instability will destroy the institutions—banks and bond dealers—through which policy is instituted. See Micha Astrachan, "The Costs of Interest Rate Variability," Research Paper No. 7821, Federal Reserve Bank of New York, December 1977.

[61] Alan S. Blinder, *Toward an Economic Theory of Income Distribution* (Cambridge, MA: The MIT Press, 1974).

[62] See, e.g., Allan H. Meltzer, "Is Secular Inflation Likely in the U. S.?" in *Monetary Problems of the Early 1960's,* edited by Paul K. Gatons and Richard S. Wallace (Atlanta: Bureau of Business and Economic Research, Georgia State College, 1967), pp. 29-42.

[63] Thomas M. Humphrey, "Some Recent Developments in Phillips Curve Analysis," *Economic Review,* Federal Reserve Bank of Richmond (January'February 1978), pp. 15-23.

[64] Some fairly typical testimony was provided in 1982 by Michael Sumichrast, Chief Economist of the National Association of Home Builders: "I'd like to simply state that the result of monetary and fiscal policies is obviously very high interest rates. Interest rates kill housing. It's that simple." *Hearings on the Federal Reserve's First Monetary Policy Report for 1982,* U. S. Congress, Senate, Committee on Banking, Housing, and Urban Affairs, 97th Cong., 2d Sess., February 25, 1982, p. 160.

[65] See, e.g., Hyman P. Minsky, "A Theory of Systematic Fragility," in *Financial Crises: Institutions and Markets in a Fragile Environment,* edited by Edward I. Altman and Arnold W. Sametz (New York: John Wiley & Sons, 1977), pp. 138-152.

[66] Paul Meek, *Open Market Operations* (New York: Federal Reserve Bank of New York, 1969), pp. 37-45.

[67] Alan R. Holmes, "Operational Constraints on the Stabilization of Money Supply Growth," in *Controlling Monetary Aggregates* (Boston: Federal Reserve Bank of Boston, 1969), pp. 65-77.

[68] See, e.g., E. Gerald Corrigan, "Income Stabilization and Short-run Variability in Money," *Monthly Review,* Federal Reserve Bank of New York (April 1973), pp. 87-98.

[69] A recent study of the relationship is John A. Tatom, "Interest Rate Variability: Its Link to the Variability of Monetary Growth and Economic Performance," *Review,* Federal Reserve Bank of St. Louis (November 1984), pp. 31-47.

[70] Benjamin M. Friedman, "Federal Reserve Policy, Interest Rate Volatility, and the U. S. Capital Raising Mechanism," *Journal of Money, Credit, and Banking,* vol. 14 (November 1982), pp. 721-745.

[71] Stephen H. Axilrod, "Monetary Policy, Money Supply, and the Federal Reserve's Operating Procedure," in *Central Bank Views on Monetary Targeting* (New York: Federal Reserve Bank of New York, 1982), p. 37.

[72] Many economists accept the conventional view that close short-run control of the money supply would mean highly unstable interest rates. For example, Professor Henry C. Wallich testified in 1968 that "the consequence of a stable money growth rate will be highly unstable interest rates." *Standards for Guiding Monetary Action,* Hearings, U.S. Congress, Joint Economic Committee, 90th Cong., 2d Sess., May 8, 1968, p. 15. Similarly, Jack M. Guttentag wrote in 1966: "The (Federal Reserve) system is convinced, and no evidence has ever been presented to the contrary, that the attempt to control such variables in the short run would accomplish nothing (except to destabilize the market)." "The Strategy of Open Market Operations," *Quarterly Journal of Economics,* vol. 80 (February 1966), p. 13. Many monetarists deny this, arguing that short-term smoothing of interest rates actually destabilizes rates over longer periods. For example, Milton Friedman testified in 1975 as follows: "I believe that the present procedure destabilizes in-

terest rates over periods of more than a few days or a few weeks...rates are stabilized for days or weeks at the cost of letting discrepancies accumulate and having big movements over the months and the years." *Second Meeting on the Conduct of Monetary Policy,* U. S. Congress, Senate, Committee on Banking, Housing, and Urban Affairs, 94th Cong., 1st Sess., November 6, 1975, pp. 39-40. David Laidler provided similar testimony in 1977: "Stability in interest rates over the next few months will be bought at the price of much more instability in the future, because the monetary fluctuations that you are going to have to put up with now to stabilize interest rates are eventually going to come through and cause instability in interest rates." *Recent Monetary Developments and Future Economic Performance,* Hearings, U.S. Congress, House Subcommittee on Domestic Monetary Policy, Committee on Banking, Housing, and Urban Affairs, 95th Cong., 1st Sess., September 27, 1977, p. 71.

[73] See, e.g., William E. Gibson, "Interest Rates and Monetary Policy," *Journal of Political Economy,* vol. 78 (May/June 1970), pp. 431-455.

[74] The average annual six-month commercial paper rate rose from 4.73 percent in 1972 to 10.91 percent in 1979 and to 14.76 percent in 1981. *Economic Report of the President,* January 1987, Table B-68, p. 324.

[75] See Milton Friedman, "Lange on Price Flexibility and Employment: A Methodological Criticism," *American Economic Review,* vol. 36 (September 1946), pp. 613-631.

[76] A concrete example of this is provided by the nonborrowed reserves targeting procedure adopted by the Federal Reserve in 1979 in conjunction with lagged reserve requirements. See Robert D. Laurent, "A Critique of the Federal Reserve's New Operating Procedure," *Staff Memoranda 81-4,* Federal Reserve Bank of Chicago, 1981.

ANNOUNCEMENT

The 24th Annual Conference on Bank Structure and Competition May 11, 12, & 13, 1988

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