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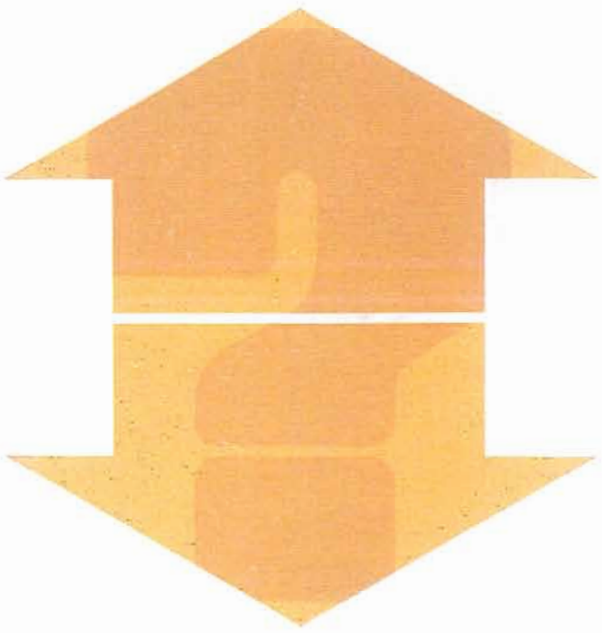

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& Implementing the Monetary Control Act in a Troubled Environment for Thrifts

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Herbert Taylor

. . . Interest rates should move with inflation rates, but perhaps not point for point.

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. . . Thrifts have impacted the implementation of the MCA at the discount window and in merger analysis.

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Interest Rates: How Much Does Expected Inflation Matter?

by Herbert Taylor*

Many business analysts blame today's high interest rates on the public's anticipation of continued high inflation. Policymakers seem to share this view. The Reagan Administration contends that once people realize that its programs will reduce inflation, interest rates will drop. The Federal Reserve argues that its restrictive monetary policy will ultimately lower interest rates by demonstrating the Fed's resolve to maintain noninflationary money growth in the future. What is the nature of the link between interest rates and expected inflation? Is a decline in the expected rate of inflation likely to produce substantial reductions in interest rates?

According to one popular rule of thumb, market interest rates respond point for point to changes in the expected rate of inflation. So if everyone became convinced that inflation would decline from, say, 10 percent to 6 percent next year, interest rates on one-year securities would drop by four percentage points. But many analysts suspect that the relation of inflation expectations to interest rates is not that simple. Some argue that any change in the expected inflation rate works through the Federal income tax structure to change interest rates by even more. Others maintain that business taxes and other economic forces blunt the impact of inflation expectations on interest rates so that the change in interest rates is smaller than the change in the expected inflation rate.

Economists have examined the link between interest rates and expected future inflation using many different methods, and their estimates of interest rates' responsiveness to changes in the expected rate of inflation vary. On balance, though, the evidence suggests that interest rates rise and fall by somewhat less than changes in the expected inflation rate.

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INTEREST RATES HAVE BEEN RISING STEADILY . . .

SOURCE: Average six-month-ahead CPI inflation forecast from the Livingston Surveys, compiled at the Federal Reserve Bank of Philadelphia.

RECENT EXPERIENCE

Interest rates have been rising steadily since the late 1950s. Though both long-term and short-term rates have declined during recessions (see INTEREST RATES . . .), each subsequent expansion has carried them to still higher levels. Economists have often attributed the secular rise in interest rates to rising inflation expectations. Confirming the influence of inflation expectations on interest rates is difficult because the public's expectations are not directly observed. But available data do support a direct relation between interest rates and expected inflation: interest rates have risen in tandem with measures of expected inflation.

One widely used measure of the expected rate of future inflation is provided by Joseph A. Livingston, business columnist for the *Philadelphia Inquirer*. Every June and December, Livingston surveys a group of about 50 economists for their forecasts of inflation. The average of economists' six-month-ahead inflation forecasts shows a close correlation with the average interest rate on six-month Treasury bills for the survey month (see . . . INFLATION EXPECTATIONS). The six-month Treasury bill rate has been more volatile than Livingston's expected inflation measure, but the two have risen together over the last 20 years.[1]

The evidence suggests that changes in inflation expectations are at least partly responsible for movements in interest rates. But economists have used the tools of economic theory and statistical analysis to assess this linkage more precisely. In doing so, they have built upon the work of Irving Fisher, an American economist of the early twentieth century. Fisher clarified the basic link of interest rates to inflation expectations by distinguishing nominal from real rates of interest.[2]

NOMINAL AND REAL RATES

Almost everybody borrows at one time or another. When consumers buy new homes, they borrow the money by taking mortgages.

[1]The simple correlation between the six-month Treasury bill rate and Livingston's six-month-ahead inflation forecast is 0.9.

[2]This discussion of Fisher is based on his book, *The Theory of Interest*, New York: Macmillan, 1930.

. . . ALONG WITH INFLATION EXPECTATIONS*

*Shaded areas indicate recessions.

When a business decides to purchase more modern equipment, it may issue notes or bonds to raise the money. When the Federal government's expenses outrun its tax revenues, the Treasury obtains the funds by selling securities.

Financial instruments such as Treasury bonds, commercial paper, and home mortgages are evidences of loans to the issuers of the securities. The borrower agrees to pay specified amounts of money later in exchange for use of the lender's money today. The nominal, or market, interest rate on these instruments states the rate at which the borrower must pay future dollars to get the current dollars. For instance, a corporation marketing one-year notes with a 15-percent interest rate is agreeing to pay $115 after one year for every $100 that the note-buying public lends it now.

But people are not as concerned about dollars, present or future, as they are about the goods and services those dollars command. Inflation erodes the purchasing power of money. Each percentage point of inflation means one percentage point less in goods and services that lenders will be able to purchase when a loan bearing a particular nominal interest rate matures. Consequently, lenders consider not only an asset's nominal rate of interest, but also the rate of inflation likely to prevail over the loan's term to maturity.

Fisher put the matter succinctly. He said that, in evaluating a loan, people do not consider the nominal rate of interest—the rate at which current and future dollars are exchanged. They consider the expected real rate of interest—the rate at which they expect to exchange current for future *goods and services*. The nominal rate of interest that an asset promises can be decomposed into the real rate of interest lenders expect plus an adjustment for the rate of inflation they expect over the asset's term to maturity:[3]

nominal rate of interest	=	expected real rate of interest	+	expected future rate of inflation

If, for example, everyone expects 10-percent annual inflation, then the corporation's 15-

[3]This breakdown of an instrument's nominal return allows for the impact of inflation on the value of the principal but not on the value of the interest. To be

percent one-year notes carry an expected real interest rate of 5 percent. Both the borrowing business and the lending public view the notes as offering roughly the same opportunity to exchange present for future goods as would notes with a 5-percent nominal interest rate were no inflation expected.

Fisher's argument underlies the view that nominal interest rates adjust point for point to changes in the expected rate of inflation. For when the public revises its inflation expectations, only an identical revision in prevailing nominal interest rates can preserve the expected real interest rate. And financial markets work to preserve the expected real interest rate, *provided* that the revised inflation expectations affect neither the willingness to borrow nor the willingness to lend at that expected real rate.

THE MARKET-CLEARING REAL RATE

The role of the financial markets is to settle on the expected real rate of interest at which the amount that savers are willing to lend is exactly equal to the amount that investors find worthwhile to borrow. Economists call this rate the *market-clearing* expected real rate of interest. The nominal rate of interest at which the loans are actually made, in turn, reflects this market-clearing real rate and the expected rate of inflation. For example, suppose that at an expected real rate of 5 percent savers are willing to lend, and investors are willing to borrow, $400 billion. If inflation is expected to run at 10 percent, the nominal interest rate will settle at 15 percent. This establishes the 5-percent expected real rate at which the $400 billion will be exchanged.

What happens when inflation expectations change? Suppose that the public suddenly anticipates a decline in the future rate of inflation from 10 percent to 9 percent. If the nominal rate stays at 15 percent, the expected real rate of interest on loans jumps from 5 percent to 6 percent. At a 6-percent expected real rate, lenders would want to lend more than $400 billion, but borrowers would want to take down *less* than they did at 5 percent. The excess supply of loanable funds puts downward pressure on the nominal rate of interest. In order to make loans, some potential lenders accepted lower interest rates and nominal rates begin to slip below 15 percent. If the change in inflation expectations has not changed people's willingness to borrow and lend $400 billion at the 5-percent expected real interest rate, then the nominal rate settles at 14 percent. This restores the expected real rate to 5 percent (14 percent minus 9 percent) and eliminates the excess supply of loanable funds. Generally, any change in the expected rate of future inflation would result in an equal change in the current nominal interest rate, *provided the market-clearing expected real interest rate remains the same.*

What complicates the relationship between nominal interest rates and inflation expectations is that when inflation expectations change, the market-clearing expected real interest rate *is not likely to remain unchanged.* People's willingness to borrow and lend at any particular expected real interest rate depends on many factors, such as savers' income and wealth, the potential productivity of investment projects, taxes, and uncertainty. If a change in expected inflation were to alter any of these factors, the expected real rate which at first had equated the supply and demand for loanable funds might no longer do so. The expected real rate would have to change in order to reestablish consistency between the plans of borrowers and lenders.

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precise, a $1 security bearing nominal rate n over a time when the inflation rate is expected to be p^e has an expected real return of r^e where

$$1 + r^e = (1 + n)/(1 + p^e).$$

This can be rearranged to

$$n = r^e + p^e + r^e p^e.$$

Since the product of two rate terms is relatively small, $r^e p^e$ is usually dropped.

Nominal interest rates would then have to adjust both for the change in expected inflation itself and for the movement in the market-clearing expected real rate that it induced. So nominal interest rates would no longer move one for one with changes in the expected inflation rate.

Since Fisher's early work, economists have discerned several channels through which a change in the expected rate of inflation affects the market-clearing expected real rate of interest. They have found that a change in the expected rate of inflation alters economic agents' willingness to borrow and lend at the original expected real rate, both because the change in expectations leads to changes in savers' income and wealth and because of tax laws.[4]

Changes in Income and Wealth. When the public's inflation expectations change, economic factors other than interest rates also adjust. Several economists have investigated how these adjustments could ultimately influence people's income and wealth, thereby affecting the expected real rate of interest.[5] They have shown that if a decrease in the expected rate of inflation were to lower real income or raise real (inflation-adjusted) wealth, the market-clearing expected real interest rate would rise. Nominal rates, therefore, would wind up falling by less than the decrease in expected inflation.

How do these income and wealth effects arise? Initially, a percentage point decline in the expected rate of inflation increases the expected real rate of interest associated with the original nominal rate. Savers are suddenly willing to lend more funds than investors want to borrow. In the financial market example, the nominal interest rate was the only variable that changed. Thus, the nominal interest rate had to decline by a full percentage point to restore the original market-clearing expected real rate and close the gap between the amount of funds demanded and supplied. But a change in inflation expectations also opens up a gap between the volume of goods and services demanded and supplied at the original interest rate. Depending on how the economy adjusts to close this gap, there could be changes in other determinants of borrowing and lending.

When anticipated inflation dips and the

[4] In this section, and throughout the article, the impact of changes in the expected future rate of inflation is discussed without any explanation of what changes people's inflation expectations. Two important issues should be mentioned in this regard.

First, people consider a diverse set of factors when they try to predict future inflation. Among these factors, the expected future course of monetary and fiscal policy is likely to play an important role in people's forecasts. The current stance of government economic policy, in turn, is likely to provide them a strong signal about the future direction of that policy. But the precise linkage between current policy actions and expected future inflation is not examined here.

Second, current policy actions do not affect current interest rates *only* by affecting inflation expectations. Shifts in policy can affect the market-clearing real interest rate, too, by altering the desired amount of private borrowing and lending at any particular real rate of interest. A complete analysis of the impact of monetary and fiscal policy on interest rates requires an analysis of policies' direct effects on interest rates as well as their expectations-related effects. Only the expectations-related changes in nominal rates are discussed here.

[5] The possibility of a wealth effect on expected real rates of interest was demonstrated by Robert A. Mundell, "Inflation and Real Interest," *Journal of Political Economy* 71 (June 1963), pp. 280-283. The conditions under which an income effect could arise have been clearly laid out by Thomas J. Sargent. See Thomas J. Sargent, "Rational Expectations, the Real Rate of Interest, and the Natural Rate of Unemployment," *Brookings Papers on Economic Activity* (1973:3), pp. 429-472, especially pp. 430 and 437-438; and also see "Anticipated Inflation and the Nominal Rate of Interest," *Quarterly Journal of Economics* 86 (May 1972), pp. 212-225, especially pp. 220-225. The process of adjustment of the economy to a change in expected inflation is also discussed in Martin J. Bailey, *National Income and the Price Level: A Study in Macrotheory*, second edition (New York: McGraw-Hill, 1971), especially pp. 74-82.

expected real rate rises at first, households want to increase their net supply of loanable funds; they would do that by economizing on their own purchases of goods and services. At the higher expected real interest rate, businesses want to cut back on their demand for funds, so they trim their expansion plans and, likewise, purchase fewer goods and services. In short, when the expected inflation rate falls, the excess supply of loanable funds at current nominal interest rates is accompanied by an excess supply of both consumption and investment items at current levels of output. Just as the excess supply of loanable funds puts downward pressure on interest rates, the excess supply of goods and services puts downward pressure on the output and prices of those goods and services. Suppliers of goods and services must choose between selling less of their products and lowering the prices they charge for them.[6]

Many economists argue that, at least in the short run, businesses tend to stand their ground on prices and cut their output. Workers' hours are shortened, overtime is eliminated, and if sales decline enough, some workers are laid off. Production facilities are used less intensively as second or third shifts are dropped, and perhaps some plants are shut down completely. As a result, the purchasing power that flows from businesses to households in the form of wages, rents, and profits falls. Faced with a reduction in income and unwilling to reduce current consumption by an equal amount, households reduce saving. In other words, they make smaller amounts of funds available for loans at any expected real rate of interest. Consequently, the expected real rate of interest need not drop *back to its original level* in order to choke off the excess supply of loanable funds. A higher expected real rate of interest now clears the market. Therefore, nominal interest rates decline by less than the drop in the expected inflation rate.

Of course, when faced with a drop in demand for their products, businesses could choose to maintain their output of goods and services by lowering prices or, at least, by reducing the rate at which their prices increase. Indeed, this is the response economists predict more businesses would make in the long run, once they have had a chance to adjust to a less inflationary environment. At that point, the reduction in expected inflation would leave real output, and hence real income, relatively unchanged, so the income effect would be smaller. But there could be a wealth effect on interest rates associated with the decline in actual inflation.

Lower prices for goods and services increase the purchasing power of money and, therefore, may make people already holding money in their portfolios feel substantially wealthier. The greater an individual's wealth, the less incentive he has to accumulate still more by buying securities or making loans. So increased wealth, like decreased income, reduces the supply of loanable funds at any expected real rate of interest. And the reduced supply of funds raises the market-clearing expected real interest rate. If the wealth effect is significant, a decline in the expected rate of inflation would be associated with a rise in the prevailing expected real rate of interest even if real income did not change. So nominal rates still would fall by less than the expected rate of inflation does.

In sum, a decline in the expected rate of inflation, to the extent that it reduces income or raises real wealth, tends to increase the market-clearing expected real rate of interest. With the expected real interest rate rising as the expected inflation rate falls, the nominal

[6]The precise combination in which nominal interest rates, the prices of goods and services, and the output of goods and services adjust to changes in the expected inflation rate also depends on how economic agents decide how much of their funds to hold in the form of money. For either the income or wealth effects to occur, the public's demand for money must be sensitive to nominal interest rates. We assume that this is the case here.

interest rate—the sum of the two—winds up declining less than point for point with expected inflation.

The Tax Angle. In this era of supply-side economics we routinely hear about the complicated maze of economic incentives and disincentives that the Federal tax code creates. So it comes as little surprise that changes in expected inflation work through the tax structure to alter the decisions of borrowers and lenders. But sorting out the role of taxes is no simple task. Different provisions of the tax system have contrary effects on the relation of interest rates to expected inflation. While Federal tax treatment of interest income and expenses tends to amplify the impact of changes in inflation expectations on nominal interest rates, for example, the tax treatment of depreciation on business plant and equipment tends to dampen this impact.

Because interest income is taxed, lenders are concerned about the expected real rate of interest *after taxes*.[7] But when the expected rate of inflation rises, an *equal* increase in the nominal rate preserves only the before-tax expected real rate of interest. That increase will not be sufficient to preserve the expected real rate of interest *after taxes* because part of the increase in the nominal interest income will be taxed away. The nominal rate would have to rise by *more than* any increase in expected inflation to keep the after-tax real rate unchanged. Conversely, when the expected rate of inflation falls, an equal decrease in nominal rates would preserve the lender's expected real rate of interest before taxes. Nominal rates would have to fall by more than the drop in expected inflation to keep the *after-tax* real rate unchanged. In other words, lenders have to lose in interest what they gain in smaller tax liabilities if their expected after-tax real rate is to remain the same when expected inflations falls (see INFLATION AND THE AFTER-TAX REAL RATE OF INTEREST overleaf).

To summarize: taxes on lenders' interest incomes tend to amplify the size of changes in nominal rates associated with changes in expected inflation.[8]

Other tax laws, particularly those concerning depreciation, dampen nominal rates' response to changes in expected inflation, however. Historical cost depreciation rules reduce businesses' incentives to invest and, hence, tend to depress expected real interest rates when the expected rate of inflation rises.

A profit-seeking business undertakes only those investment projects where the after-tax real returns are expected to exceed the after-tax real rate of interest it must pay for financing. Increases in the expected inflation

[7]The importance of the distinction between savers' expected real rate of interest before and after taxes was emphasized by Michael Darby, "The Financial and Tax Effects of Monetary Policy on Interest Rates," *Economic Inquiry* 85 (June 1975), pp. 266-276.

[8]Of course, what the expected real rate and the volume of lending will be when expectations change also depends on how borrowers are affected. But the income tax effects on borrowers complement those on lenders. The interest that lenders count as taxable income, borrowers count as a tax-deductible expense. So if, for example, borrowers and lenders are subject to the same tax rate, the after-tax real rate of interest that lenders earn is equal to the after-tax real interest rate that borrowers pay. In that case, when the expected inflation rate rises, borrowers are willing to pay the more than proportionate increase in nominal rates that lenders require to maintain their original level of lending. When the expected rate of inflation falls, lenders are willing to accept precisely the lower expected real rate that borrowers require to maintain their original level of borrowing. If borrowers and lenders are subject to different tax rates, then, whatever the expected before-tax real rate of interest, each faces a different expected after-tax real rate. Nonetheless, the tax provisions for interest income and expense allow borrowers to pay a higher real rate of interest when expected inflation rises and allow lenders to accept a lower real rate when expected inflation declines.

For a detailed discussion, see Niels Christian Nielson, "Inflation and Taxation," *Journal of Monetary Economics* 7 (1981), pp. 261-270.

rate work through depreciation laws to reduce the after-tax real return expected on each potential investment project (see INFLATION AND DEPRECIATION). That lower expected after-tax return reduces the incentive to finance the acquisition of new plant and equipment by borrowing at any particular expected real rate of interest. And the reduced willingness to borrow puts downward pressure on the market-clearing expected real rate of interest. With the expected inflation rate higher but the prevailing expected real rate lowered by the decreased demand for funds, nominal interest rates wind up rising by less than the expected rate of inflation. Conversely, a decrease in expected inflation raises the after-tax real return on investments through this depreciation channel. This, in turn, increases businesses' willingness to borrow and raises the market-clearing real rate. As a result, nominal interest rates fall by less than the decline in the expected rate of inflation.[9]

[9]Some of the ways in which inflation affects investment via tax rules are discussed by Richard W. Kopcke, "Why Interest Rates Are So Low," *New England Economic Review*, July/August 1980, pp. 24-33.

INFLATION AND THE AFTER-TAX REAL RATE OF INTEREST

Since nominal interest income is taxed, a lender's expected real rate of interest after taxes is roughly

expected real rate of interest after taxes	=	(1 - tax rate)	x	nominal rate of interest	-	expected rate of inflation

where the tax rate is the percentage of his income that he would have to pay in taxes.* Consider the individual earning 15-percent nominal interest on a loan and anticipating 10-percent inflation, so that he expects to earn a 5-percent real rate before taxes. If he is in the 20-percent tax bracket, his expected real return after taxes is 2 percent [=(1 - .2) x 15 percent - 10 percent].

Suppose that his view of the future changes and he expects 11-percent rather than 10-percent inflation. Now a loan bearing a 16-percent nominal interest rate would offer him the same 5-percent expected real rate before taxes but it would provide only 1.8-percent [=(1 - .2) x 16 percent - 11 percent] after taxes. In order to maintain his original 2-percent after-tax real return, the individual would have to make a loan with a 16.25-percent nominal interest rate.

On the other hand, suppose that the individual's inflation expectations fall and he anticipates 9-percent rather than 10-percent inflation. A loan with a 14-percent nominal yield would offer him the same 5-percent expected before-tax real return that a 15-percent nominal yield did previously, but it would offer a higher real return after taxes at 2.2 percent [=(1 - .2) x 14 percent - 9 percent]. In fact, this saver could settle for a loan bearing only a 13.75-percent nominal yield, and still maintain his original expected after-tax real rate of interest at 2 percent [=(1 - .2) x 13.75 percent - 9 percent].

In short, maintaining expected after-tax real interest rates in the face of changing inflation expectations requires more than equal changes in nominal interest rates.

*When deciding on the purchase of an asset, the lender must consider his marginal tax rate, that is, the additional tax liability as a percentage of the additional interest income. How much of his interest income a taxpayer must surrender at the margin depends upon the precise source of the income and his overall income level, among other factors. The present discussion assumes that the saver does not expect inflation to alter his marginal tax rate. In reality, of course, higher inflation raises nominal income and hence pushes people into higher tax brackets. Allowing for so-called bracket creep would only reinforce the argument presented here.

INFLATION AND DEPRECIATION

The firm's net return from an investment project is the increased sales revenue that it generates less the increased production costs it creates. The net real revenues from the project would not be affected by a general inflation; both sale and production costs would rise at the same rate. Theoretically, with a fixed tax rate, real net revenues after taxes would not be affected either; both the portion of net revenue paid in taxes and the portion left after taxes would grow at the rate of inflation. But, in fact, inflation does reduce real net revenues after taxes because the depreciation laws preclude the firm from fully adjusting its production costs for inflation when computing its tax bill.

As a piece of capital—such as a new machine, a new truck, a new plant—is being used, its ability to produce is being run down (depreciated) and, ultimately, will be exhausted. The cost to the firm of using up the capital's stream of productive services is the price it will have to pay to replace the capital when it has worn out completely. But in computing its taxable income, the business is allowed to deduct an amount based on the original purchase price of the capital. If inflation is high over the course of the capital's useful life, its replacement cost will be high relative to its original or historical purchase price, so the taxable income from the project will be overstated and the project's after-tax real return will be cut. If inflation is low, capital's replacement cost will be closer to its historical purchase price and depreciation rules will not distort after-tax real return as much. So, the higher the rate of inflation a business expects, the lower the after-tax real rate of return it expects on any particular project, and, consequently, the lower the expected after-tax real rate of interest it is willing to pay for financing.

In short, historical cost depreciation rules for tax computations tend to push expected inflation and the market-clearing expected interest rate in opposite directions. So depreciation rules, by themselves, imply less than a point-for-point adjustment of nominal rates to changes in expected inflation. On balance, the tax system may, as some argue, foster a more than point-for-point response of nominal rates to changes in expected inflation. Because of depreciation rules, however, the response is not as great as the income tax rules *alone* imply.

HOW MUCH INFLUENCE DO INFLATION EXPECTATIONS HAVE ON INTEREST RATES?

When the public expects a decline in the future rate of inflation, Federal income tax provisions work toward a more than equal reduction in nominal rates. On the other hand, income and wealth effects and the tax laws concerning depreciation work toward less than equal reduction in nominal interest rates. What is the net result? According to most empirical studies, the latter set of forces dominates.

Economists have made many attempts to estimate just how much of an impact changes in the expected inflation rate have on interest rates. Some investigators have found that inflation expectations have a substantial impact. For example, a 1979 study by John Carlson suggests that each percentage point change in the expected rate of inflation alters nominal interest rates by as much as 1.3 percentage points. In a 1975 study, Eugene Fama found that nominal rates respond point for point to changes in inflation expectations. Most often, though, analysts have found that nominal interest rates respond less than point for point to changes in the expected rate of inflation. According to investigations by Tanzi, by Yohe and Karnosky, and by Anderson and others, for example, each percentage-point change in the expected inflation rate generates a change in nominal rates between .8 and .9 of a percentage point. Benjamin Friedman reports in a 1980 study that a percentage-point change in expected inflation

produces as little as a .65 percentage-point change in nominal interest rates. [10]

These findings support the view that when the expected rate of inflation changes, the income, wealth, and depreciation effects of the change dominate the income tax effects, and, as a result, the expected real rate of interest changes in the opposite direction. So when the expected rate of inflation falls, the expected real rate of interest rises at least for a while. The nominal rate, the sum of the expected real interest rate and the expected inflation rate, falls, but not by as much as expected inflation.

CONCLUSION

Everyone would like to see lower interest rates. Both the Administration and the Federal Reserve have attempted to formulate policies which will reduce current inflation and hence people's expectations about future inflation. Lower inflation expectations, it is hoped, will mean lower interest rates.

The path to lower interest rates is not necessarily short or direct. Expectations of high inflation have been building up for 20 years and may not change quickly. Moreover, policy actions do not affect interest rates only by affecting inflation expectations. Monetary and fiscal policy can directly affect the market-clearing real interest rate, too. In fact, many argue that the current mix of fiscal and monetary policies, while intended to lower inflation and inflation expectations over the long run, has driven up market-clearing real interest rates, at least in the short run.

Nonetheless, both economic theory and statistical evidence give reason to believe that interest rates are closely related to inflation expectations. When the expected rate of inflation is revised downward by a percentage point, interest rates should fall by nearly a percentage point. So if the public comes to expect inflation of 5 percent instead of 10 percent—and if other factors do not drive up real interest rates—nominal interest rates should decline by about 4 or 4 1/2 percentage points. Compared to the level of interest rates in 1981 and early 1982, that would be a welcome change.

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[10] References in this section are to:

Paul A. Anderson, Thomas Sargent, and Carol Thistlethwaite, "The Response of Interest Rates to Expected Inflation in the MPS Model," *Journal of Monetary Economics* 1 (1975), pp. 111-115.

John A. Carlson, "Expected Inflation and Interest Rates," *Economic Inquiry* 89 (October 1979), pp. 597-608.

Eugene F. Fama, "Short-Term Interest Rates as Predictions of Inflation," *American Economic Review* 65 (June 1975), pp. 269-282.

Benjamin M. Friedman, "Price Inflation, Portfolio Choice, and Nominal Interest Rates," *American Economic Review* 70 (March 1980), pp. 32-48.

Vito Tanzi, "Inflationary Expectations, Economic Activity, Taxes and Interest Rates," *American Economic Review* 70 (March 1980), pp. 12-21.

William P. Yohe and Denis S. Karnosky, "Interest Rates and Price Level Changes, 1952-1969," *Review*, Federal Reserve Bank of St. Louis, December 1969, pp. 18-39.