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Monetary Policy and Long-Term Real Interest Rates

For many years, the Federal Reserve has relied on M2 as an indicator of current economic conditions. Over the last few years, however, the historical relation between M2 velocity and interest rates has broken down, as velocity has risen sharply while interest rates have fallen. This development has made it difficult to interpret the information in M2. For example, over the last few years, M2 growth often has fallen below its target range. Based on historical relations, the slow growth in M2 would be a sign of serious weakness in the economy. But in this case, although the economy has not been strong, the weakness in M2 mainly reflected the fact that M2 velocity turned out to be higher than expected. In other words, if historical relationships had held, the recent slow growth in M2 would have implied a much weaker economy than actually was observed.

Since it has become more difficult to interpret movements in M2, a variety of other indicators of economic and financial conditions have been explored. For example, Chairman Greenspan has suggested that real interest rates might be a useful indicator of economic conditions. The Federal Reserve System cannot peg real interest rates, because an attempt to do so would run the risk of generating a cumulative inflationary or deflationary process. But movements in real interest rates might provide timely and useful information about economic and financial conditions and thus might provide a useful guidepost for monetary policy makers.

To make this operational, we need to address two sets of issues. The first set concerns how to define a benchmark with which to compare movements in real interest rates. That is, how do we decide whether real rates are unusually high or low? The second set concerns the measurement of real interest rates. Trehan (1993) discusses these issues in terms of short-term real interest rates. This *Weekly Letter* complements his analysis by discussing these issues in terms of long-term interest rates.

Defining a benchmark real interest rate

The first problem is to define a benchmark real interest rate and to determine how and why it varies over time. Chairman Greenspan defines the benchmark real interest rate as the level that, if sustained, would keep the economy at its productive potential over time. This is conceptually similar to Milton Friedman's (1968) natural rate of unemployment, so I will refer to it as the "natural" real interest rate.

The natural real interest rate will vary over time, because the economy is subject to non-monetary shocks that affect its actual and potential output. Furthermore, since it is difficult to track the variation in the economy's productive potential, it may also be difficult to track the natural real rate, especially over short horizons.

To some extent, this difficulty can be mitigated by tracking the long-term, rather than the short-term, natural rate. Long-term real interest rates can be decomposed into two parts. One is the expected real return earned by rolling over short-term bills, and the other is the expected excess return earned by holding long-term bonds. The first component is motivated by the Expectations Hypothesis of the term structure of interest rates. According to this theory, arbitrage between alternative long- and short-term financial investments will ensure that the long-term rate will equal the expected rollover return on short-term bills. However, empirical studies show that there are predictable excess returns on long-term bonds, and this is often interpreted as a manifestation of time-varying risk, since arbitrage would also eliminate risk-adjusted excess returns. Thus the second component can be interpreted as a risk premium.

Both of these components are likely to be less variable over longer holding periods than they are over short holding periods. The first component, the rollover return, is equal to a weighted average of expected future short rates, and the averaging process smooths out much of the variation in short rates. Thus long-horizon rollover returns ought to be less variable than short-horizon rollover returns. Similarly, the long-term risk premium is a weighted average of expected short-term excess holding returns. Again, because of the averaging process, long-term premia ought to be smoother than short-term excess returns. Therefore the long-term natural rate is likely to be less variable than the short-term natural rate.

One problem that remains to be solved is defining the natural risk premium. This is important because much of the variation in long-term real interest rates appears to be due to variation in risk-premia (for example, see Cogley 1993). The problem is that current models of the term structure do not generate empirically plausible risk premia. Specifically, if we assume that financial markets eliminate arbitrage opportunities, then risk-adjusted excess returns should be *unpredictable*. However, when confronted with data, theoretical models of the term structure imply that "risk-adjusted" excess returns are *predictable*, and this is generally interpreted as a sign that the models do not correctly adjust for risk. Without an adequate model of risk, it would be difficult to know what is meant by the natural level of the risk premium. The problem of modeling risk premia remains an active area of research.

Measuring long-term real interest rates

The market real rate of interest is equal to the nominal interest rate minus the expected inflation rate (this is sometimes call the ex *ante* rate). Since market expectations of inflation are not directly observable, the real interest rate also is unobservable. Thus, real interest rates must be estimated. There are several ways to do this, corresponding to different estimates of expected inflation.

One approach is to substitute actual, realized inflation rates for expected inflation. This measure is known as the ex *post* real interest rate. Since ex post real interest rates are based on the actual inflation rate over the holding period, they cannot be computed until the holding period has ended. Thus ex post real interest rates on long-term bonds are available only after long lags. For example, the most recently available ex post 10 year real interest rate is the one for November 1983. Since ex post real rates are not available on a timely basis, they are not likely to be useful for current policy analysis.

Furthermore, at the long end of the maturity spectrum, ex post real rates are not likely to match ex ante real rates closely. The ex ante real interest rate is equal to the ex post real rate plus the error in forecasting inflation over the holding period. Thus the ex post real rate can be regarded as the sum of the true ex ante value plus a measurement error. Since long-term inflation forecast errors are highly correlated over time, there can be persistent differences between ex ante and ex post real interest rates. As a consequence, the measurement error in ex post real interest rates often obscures the true ex ante value, and this makes it difficult to use long-term ex post rates for historical analysis.

A second approach is to estimate expected inflation using survey data on inflation forecasts. Various surveys of long-term inflation expectations are available on a sporadic basis going back to 1979. For example, Figure 1 reports the 10-year real interest rate based on the Hoey survey of 10-year inflation expectations. Survey data have three limitations. First, since respondents may have little at stake when filling in the survey, there is some concern that survey data may not provide an accurate measure of inflation expectations. Second, surveys of long-term inflation forecasts go back only to the late 1970s. Since this period covers only a few business cycles, there may be too little data to learn much about the cyclical properties of long-term real rates. Third, the early surveys have missing observations, which greatly complicates statistical analysis. The Federal Reserve Bank of Philadelphia has begun to collect a survey of long-run inflation forecasts on a regular basis. While this seems like a worthwhile long-run investment, it may take a number of business cycles before there are enough observations to use the data to analyze the cyclical properties of long-term real interest rates.

A third way to measure long-term real interest rates is to estimate them using an econometric model. For example, the model discussed in Cogley (1993) can be used for this purpose. This model estimates long-term real interest rates by forecasting short-term real interest rates and excess holding returns over long time horizons and then discounting them back to the present. The forecasting model includes lagged values of the 3-month Treasury bill rate, the inflation rate, the unemployment rate, and the ex post excess holding return on 10-year Treasury bonds. The model was estimated over the period 1968.Q1 to 1993.Q2, and ex ante forecasts were generated by iterating through every quarter in the sample.

The resulting long-term real rate is shown by the solid line in Figure 2. The shaded areas mark

Figure 1: Real 10-Year Treasury Bond Yield Derived From Hoey Survey of Inflation

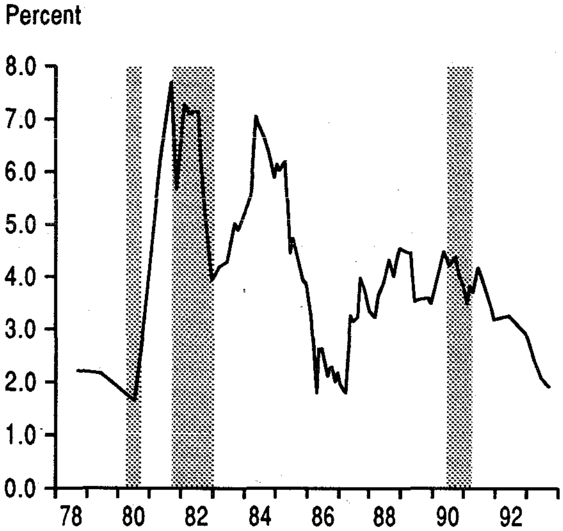
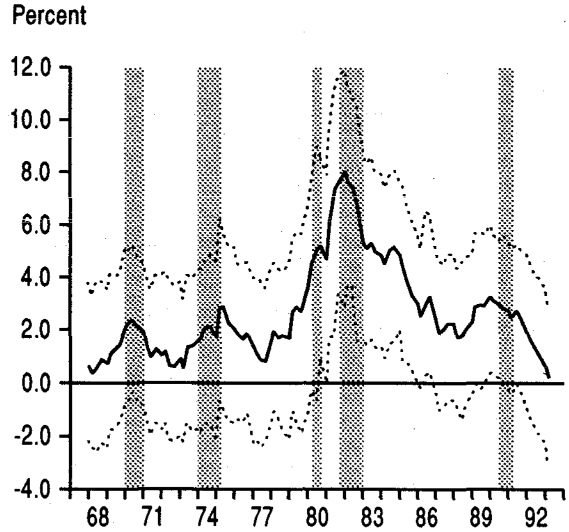


Figure 2: Econometric Estimates of the Long-Term Real Rate



the dates of recessions, as determined by the National Bureau of Economic Research. The long-term real rate appears to be countercyclical, although it does not systematically lead or lag the business cycle. For example, in the 1974–1975 recession, the real rate peaked near the trough of the cycle, while in the 1981–1982 recession it peaked shortly after the downturn.

For our purposes, it is important to try to quantify the uncertainty about this measure of the long-term real rate. This measure is based on estimates of a forecasting model, and errors in estimating the model will translate into errors in measuring the long-term real rate. A Monte Carlo simulation was conducted in order to quantify the degree of uncertainty, and the results are shown by the dotted lines in Figure 2. These mark the margin of error associated with the estimated real rate. Specifically, at any given date, there is a 5 percent chance that the real interest rate could be as high as the upper curve as well as a 5 percent chance that it could be as low as the lower curve. In other words, the figure tells us that there is a 9 in 10 chance that the real rate lies somewhere between the dotted lines. The average distance between the upper and lower margins of error is roughly 6 percent; thus it is difficult to pin down long-term real interest rates with a great deal of precision.

Furthermore, this interval understates the true uncertainty about the long-term real rate because it only accounts for uncertainty in the estimates of the parameters of the forecasting model, not for uncertainty about the model's specification. Presumably, if this were taken into account, the margin of error would be even larger.

Conclusion

Conceptually, it is difficult to define a natural long-term real interest rate because we do not yet have satisfactory models of risk. Empirically, it is difficult to estimate long-term real interest rates because there is a great deal of uncertainty about long-horizon forecasts. Thus, while long-term real interest rates may prove to be a useful indicator of economic and financial conditions, we need to confront a number of difficult issues in order to make this operational.

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