

# ECONOMIC COMMENTARY

Federal Reserve Bank of Cleveland

## Gilt by Association: Uncovering Expected Inflation

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**O**ne unfortunate aspect of life in the United States today is that guesses about inflation really matter. We have to consider expected changes in the cost of living when negotiating our wages. Similarly, we need to think about future inflation when computing both the returns to investing and the cost of borrowing. Explicitly or implicitly, inflation expectations have become an integral part of all our economic decisions.

Errors in estimating inflation can be costly — so costly, in fact, that many analysts think such miscalculations may be a major source of disturbance in the economy. For instance, an unexpected decline in the rate of inflation can temporarily increase the jobless rate: If labor contracts call for wage hikes based on a particular inflation rate, but actual inflation turns out to be lower, layoffs, strikes, or costly contract renegotiations may ensue. In fact, inflation expectations may be the bridge that links changes in the price level to business activity. If so, policymakers need to know how people predict future inflation in order to evaluate how shifts in the inflation trend will impact the economy.

In this *Economic Commentary*, we discuss a number of ways to estimate expected inflation, concentrating on the advantages of using “gilts,” British government bonds indexed for price-level changes. We argue that this market-based measure implies a different — and we believe more accurate —

pattern of expected inflation than either statistical techniques or surveys. Expectations adjusted faster and real interest rates were higher than commonly supposed. Consequently, the effects of many decisions, including fiscal and monetary policy, may need to be reevaluated.

### ■ Estimating Expected Inflation

There are several methods of measuring the expected inflation rate, but each has limitations. Perhaps the most popular measures are based on survey data. One of the most frequently cited of these is the Livingston survey of professional economists. Two other prominent surveys, conducted by the University of Michigan and The Conference Board, track the inflation expectations of households and business executives, respectively.

Though widely used, survey data can be biased. The trader with a hot tip may not want to share it, and the busy executive with a company to run may be too pressed for time to reply.<sup>1</sup> Moreover, surveys rarely weight an individual's stake in predicting inflation accurately. The homeowner looking to refinance a mortgage is given the same weight as a civil servant with an indexed salary.

Econometric models designed to approximate inflationary expectations also have flaws, principally their failure to capture the richness of the expectations process. The myriad of prices that people face in their day-to-day lives, coupled with the

Economists traditionally use surveys and econometric models to measure inflation expectations, but surveys can be biased, and statistical techniques may fail to capture the complexity of individual decisions. In this *Economic Commentary*, the authors suggest a market-based alternative that tracks inflation expectations in the United States by comparing U.S. Treasury bonds with British “gilts,” marketable securities linked to a broad index of retail prices.

complex and idiosyncratic way in which they form judgments about future inflation, raises considerable doubt about the ability of these models to mimic actual expectations.

Because we cannot observe expected inflation directly, it is difficult to test between these alternative measures: Are they bad guesses of people's expectations, or are people's expectations bad guesses of inflation?

Financial markets provide a third and, we argue, more reliable way to determine people's beliefs about future inflation. Market participants have a stake in predicting inflation accurately. They put their money where their mouth is in the sense that a correct call can mean the difference between driving a BMW or a Yugo. The market also weights

players' convictions by their "dollar votes," which reflect the confidence and stake people have in their predictions. Though some traders may be irrational or ill-informed, smarter and more-enlightened investors can profit at their expense. In this sense, the market as a whole produces more rational, better-informed forecasts than its average participants.

Financial markets in the United States do not easily reveal an expected inflation rate, however, since the heavily traded instruments are all based on nominal rates of return.<sup>2</sup> Fortunately, another channel is available. We can look across the Atlantic to England, where some government bonds are indexed for inflation.<sup>3</sup> Below, we compare one of these bonds with U.S. Treasury securities of like maturity in order to determine inflationary expectations in the United States.

#### ■ Using Gilts

In March 1981, the British government began issuing marketable bonds, called gilt-edged securities, or gilts, linked to a broad index of retail prices (the RPI). Both the semiannual coupon and the principal are scaled up by changes in this index, with the currently outstanding set maturing in 1994, 1996, 2001, 2003, 2006, 2009, 2011, 2013, 2016, 2020, and 2024.

Indexed gilts present an opportunity to measure the real interest rate — and hence inflation expectations — in Britain. Then, if arbitrage between the U.S. and British capital markets keeps real interest rates in the two nations equal, these securities may also provide useful information about inflationary expectations in the United States.<sup>4</sup>

Unfortunately, the yield on indexed gilts does not reveal the real interest rate directly. An eight-month lag in indexing, coupled with various tax differences between indexed and nonindexed gilts, makes unraveling this figure a complex procedure (see box).

One inconvenience associated with this procedure is that it rarely uncovers short-term real interest rates. It cannot reveal rates shorter than the next maturing indexed gilt, and the limited number of gilt issues means that this is often several years down the road. Consequently, only longer-term inflation expectations can be measured. On the other hand, this approach does provide a real term structure for long rates.

Once we know the real interest rate, we can simply subtract it from the nominal yield to disclose the expected rate of inflation. But this measure is not perfect, since it fails to account for the inflation premium. If people value the protection against inflation that indexed gilts provide, they will drive up the price and drive down the yield. Hence, the inflation expectation term includes not only true expectations of inflation, but the inflation premium as well.<sup>5</sup>

Using British gilt data to uncover inflation expectations in the United States depends crucially on equal real interest rates in the two countries. Arbitrage promotes such interest parity, but market imperfections, tax differences, and exchange-rate risk work against it.

Some researchers have suggested that real rates do indeed differ across countries, basing their conclusion on two different types of tests. One type looks at ex post real-rate differences, while the other uses estimates of real rates. In both cases, the results are quite sensitive to the assumptions made in setting up the tests. For tests that look at the predictability of ex post real-rate differences, rejecting interest equality statistically does not necessarily mean that the difference between U.S. and British real interest rates is large. For tests that estimate the real rate, the results depend crucially on what we know is an imperfect procedure.<sup>6</sup> Either way, while they introduce a note of caution, these findings still suggest that real interest-rate equality is plausible.

#### DETERMINING REAL INTEREST RATES FROM INDEXED GILTS

The yield on indexed gilts does not directly reveal the real interest rate, since these securities are indexed to the RPI with an eight-month lag. The base for indexation is the RPI eight months before the issue date, with each semiannual coupon scaled up by the increase in the index from the base month to eight months prior to the coupon date. This same lag applies to the principal. A gilt issued in March 1982, for example, is based on the RPI for July 1981. The first coupon, payable in September 1982, is scaled up by the increase in the RPI from July 1981 to January 1982, and the principal, payable in March 1988, is scaled up by the change from July 1981 to July 1987.

The eight-month lag introduces inflation risk into the indexed gilts. The yield on an indexed gilt with one year left to maturity is contaminated with eight months of unknown inflation — a risk borne by investors. However, the lag makes little difference in looking at very long rates.

There is a simple way around this problem. Nonindexed gilts of like maturity exist whose price also depends on the real interest rate and expected inflation, but in very different ways. Essentially, it is a problem of two equations and two unknowns, and we can back the real interest rate out of the market by using both securities.

This procedure is complicated by the fact that the tax treatment differs between indexed and nonindexed gilts, with increases in principal value of the former being counted as a capital gain. Though messy, it is possible to correct for this problem through a detailed comparison of different types of gilts.<sup>a</sup>

a. For one method of correction, see G. Thomas Woodward (footnote 3). We use Woodward's calculation for the real interest rate to construct figures 1 and 2.

FIGURE 1 MEASURES OF EXPECTED AND ACTUAL INFLATION

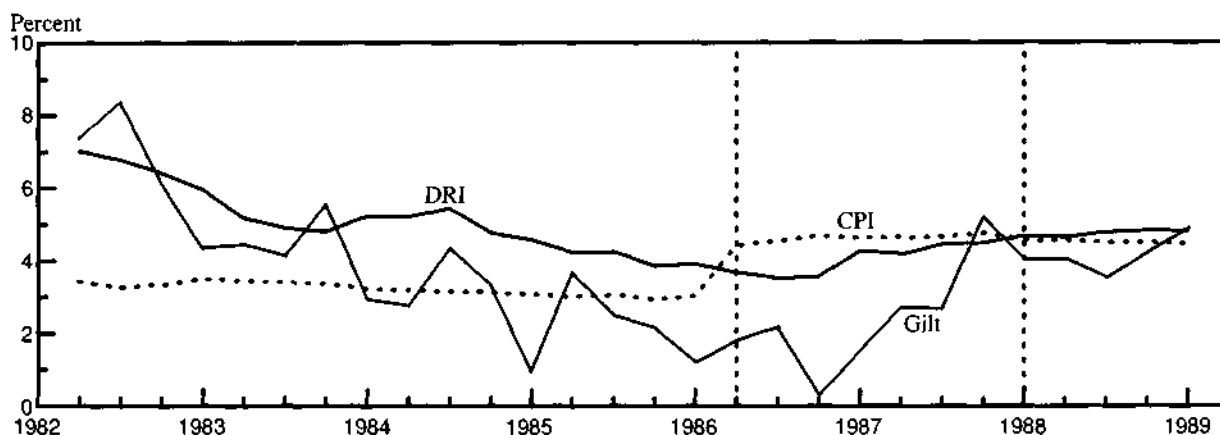
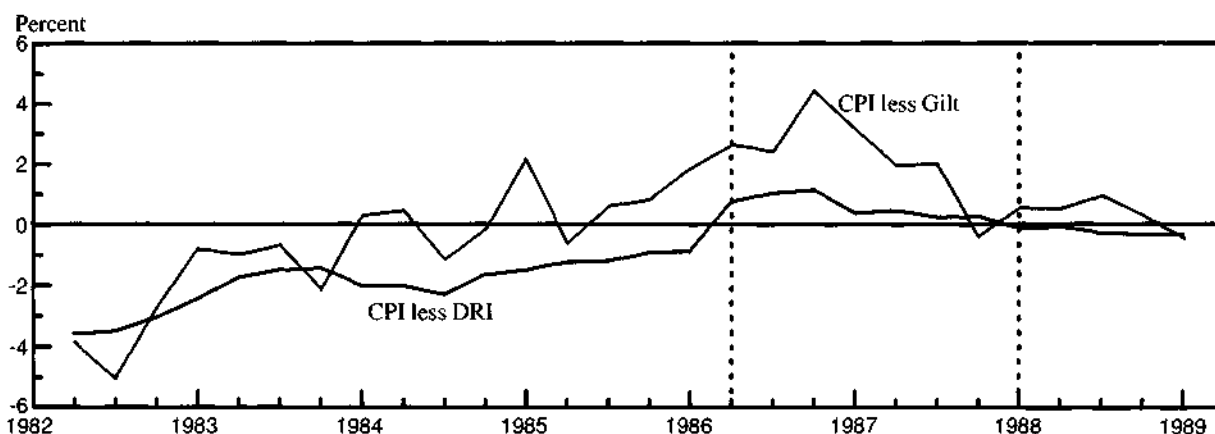


FIGURE 2 DIFFERENCE BETWEEN EXPECTED INFLATION MEASURES AND ACTUAL INFLATION



NOTE: The gilt data are based on the difference between the pretax real interest rate on British indexed gilts and the nominal interest rate on U.S. Treasury bonds issued or traded during the quarters plotted and maturing as follows: 1982:IIQ–1986:IQ issues mature in 1988:IQ; 1986:IIQ–1987:IQ issues mature in 1990:IQ, and 1988:IQ–1989:IQ issues mature in 1992:IQ. The DRI and CPI data are the annualized percentage increases in those series over the same intervals. Dotted lines represent breaks in the maturity dates.

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics; DRI/McGraw-Hill; and G. Thomas Woodward, "The Real Thing" (footnote 3).

To illustrate the gilt measure of expected inflation, figure 1 plots the difference between the British real interest rate and the yield on U.S. Treasury bonds over the 1982–89 period, comparing U.S. bonds and British gilts having the same expiration date. For reference, we also include DRI's model-based prediction of inflation over the same interval.

#### ■ Results

Note that the gilt measure and the DRI forecast follow broadly similar patterns, declining in the early 1980s, leveling off, and then increasing in the closing years of the decade. However, with few exceptions, the gilt measure reveals a lower expected inflation rate, and thus a higher real interest rate, than the forecast generated by the DRI model.<sup>7</sup>

Figure 2 plots the difference between the CPI and both measures of expected inflation. Our hope is that the results suggest the disquieting idea that other standard projections may also substantially mismeasure people's expectations of inflation. We raise this just as a conjecture — gilts do not have a long enough track record to allow for a rigorous test. Nonetheless, we note that the average difference between the gilt measure and the CPI is only *one-fifth* the difference between the DRI forecast and the CPI. Moreover, the gilt measure shows that inflationary expectations converge toward actual inflation rates faster than the model-generated forecasts.

#### ■ Conclusion

Comparing U.S. bonds with British gilts provides an enlightening look at

expected inflation. If, as we suggest, gilts more accurately reflect actual inflation expectations than either econometric models or household surveys, what are the implications for U.S. policymakers?

First, in terms of levels, the gilt measure implies that expected inflation was lower here in the 1980s than commonly supposed. This means that the wage and price changes witnessed during the decade were more reflective of real gains than of inflation expectations. Likewise, when we consider the influence of fiscal and monetary policies, the lower expected inflation reveals more real effects. In particular, it indicates that expected real interest rates were higher during the 1980s than suggested by other measures.

Second, it appears that inflation expectations are adjusted more rapidly than economists believed, underscoring the idea that people understand the inflationary process reasonably well and respond quickly to changes in the stance of monetary policy. This suggests that, over the course of the decade, monetary policy may also have had less of an impact on business activity than previously supposed.

In sum, the British indexed gilt market provides a novel and potentially useful measure of expected inflation. Yet, there's "many a slip 'twixt the cup and the lip": Gilts do not reveal short-term expectations, interest rates may differ between the United States and Britain, and the RPI is not the CPI. Issuing short-maturity indexed bonds in the United States could provide a more direct and more accurate measure. How viable or successful such a market would be, however, is a question for further studies.<sup>8</sup>

#### ■ Footnotes

1. A large body of literature evaluates the "rationality" of these surveys. A particularly good summary and further references can be found in Michael F. Bryan and William T. Gavin, "Comparing Inflation Expectations of Households and Economists: Is a Little Knowledge a Dangerous Thing?" Federal Reserve Bank of Cleveland, *Economic Review*, Quarter 3 1986, pp. 14-19.

2. The nominal rate of return equals the real rate of return plus the expected inflation rate. If we knew the real interest rate, we could easily determine the inflation expectation by calculating the difference between the nominal return and the real return. One excellent paper that uses only nominal rates is Richard H. Jefferis, Jr., "Expectations and the Core Rate of Inflation," Federal Reserve Bank of Cleveland, *Economic Review*, vol. 26, no. 4 (1990 Quarter 4), pp. 13-21.

3. For another view of the British indexed bond market, see G. Thomas Woodward, "The Real Thing: A Dynamic Profile of the Term Structure of Real Interest Rates and Inflation Expectations in the United Kingdom, 1982-89," *Journal of Business*, vol. 63 (July 1990), pp. 373-98; and Gabriel de Kock, "Expected Inflation and Real Interest Rates Based on Index-Linked Bond Prices: The U.K. Experience," Federal Reserve Bank of New York, *Quarterly Review*, vol. 16, no. 3 (Autumn 1991), pp. 47-60. de Kock argues that gilts are poor predictors of inflation, yet despite stacking the deck against this measure (he uses overlapping prediction intervals, employs gilt forecasts of inflation to 1996 as one-year projections, and fails to account for tax effects), he finds that it often outperforms autoregressive models.

4. For a more detailed look at the origins and mechanics of the indexed gilt market, see Roger Bootle, *Index-Linked Gilts: A Practical Investment Guide*. Cambridge, England: Woodhead-Faulkner, 1985.

5. Other methods of determining inflation expectations, including surveys and econometric models, usually have the opposite problem, impounding the inflation premium in the real interest rate. These methods estimate expected inflation so that the unobserved inflation premium is attributed to the real rate.

6. For a thorough review of interest equality, see Frederic S. Mishkin, "Are Real Interest Rates Equal across Countries? An Empirical Investigation of International Parity Conditions," *Journal of Finance*, vol. 39, no. 5 (December 1984), pp. 1345-57.

7. It is not our intention to disparage DRI's prediction of the Consumer Price Index (CPI). Rather, we use this forecast because it is popular, well respected, and readily available.

8. For a prominent and well-argued recent proposal, see Robert L. Hetzel, "Indexed Bonds as an Aid to Monetary Policy," Federal Reserve Bank of Richmond, *Economic Review*, vol. 78, no. 1 (January/February 1992), pp. 13-23. A thorough discussion of many of the issues involved can be found in G. Thomas Woodward, "Should the Treasury Issue Indexed Bonds?" Congressional Research Service Report No. 84-713E, Washington, D.C.: Library of Congress, 1984.

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