

FRBSF ECONOMIC LETTER

Number 2005-25, October 3, 2005

Inflation Expectations: How the Market Speaks

The Federal Reserve wants to know what people think—specifically, the Fed wants to know what people think the future path of inflation is. One reason is that people’s expectations about inflation influence their behavior in the marketplace, and that, in turn, has consequences for future inflation. Being able to forecast future inflation plays a critical role in the Fed’s efforts to meet its mandate of promoting price stability in the U.S. economy.

Estimates of longer-term inflation expectations have been available from various surveys for quite some time. While useful, these survey estimates suffer a bit from the “talk is cheap” problem. What one would like, instead, is evidence that reflects people’s “putting their money where their mouth is.” And, indeed, in recent years, such a source of evidence has emerged, with the introduction of new financial instruments. These market-based estimates represent a bet by market participants on the future course of the economy, usually in terms of certain economic indicators or asset prices, and they have been shown to be better predictors than survey-based estimates.

One of these new financial instruments is the Treasury Inflation-Protected Security, or TIPS, which was introduced by the U.S. Department of Treasury in 1997 as a new class of government debt obligation. The key feature of TIPS is that the payments to investors adjust automatically to compensate for the actual change in the Consumer Price Index (CPI). Conventional Treasury securities, in contrast, do not provide such protection, so investors in those securities protect themselves by demanding nominal interest rates that compensate them for expected inflation as well as for bearing the risk that actual inflation could turn out to differ from their expectations. In principle, having information from both types of Treasury securities allows researchers to separate out the inflation compensation component embedded in nominal interest rates.

This *Economic Letter* discusses the structure of TIPS contracts, the development of the market

in recent years, and the measure of inflation compensation derived from comparing TIPS yields to nominal yields.

How TIPS work

TIPS are one of two types of inflation-protected securities sold by the U.S. Treasury (the other type is Series I savings bonds for small investors). In 1997, the Treasury Department started issuing TIPS that are structured along the lines of the Real Return Bonds issued by the government of Canada. Like conventional Treasury notes and bonds, TIPS make interest payments every six months and a payment of principal when the securities mature. However, unlike conventional Treasury notes and bonds, both the semiannual interest payments and the final redemption payments of TIPS are tied to inflation.

All TIPS are issued by the Treasury using the single-price auction—the same auction used for all of Treasury’s marketable securities. The interest rate on TIPS, which is set at auction, remains fixed throughout the term of the security. To protect against inflation, the Treasury adjusts the principal value of the TIPS using the CPI, published by the Bureau of Labor Statistics. Thus, TIPS are redeemed at maturity at their inflation-adjusted principal or their original par value, whichever is greater. While TIPS pay a fixed rate of interest that is determined at the initial auction, this rate is applied not to the par value of the security but to the inflation-adjusted principal. So, if inflation rises throughout the term of the security, every interest payment will be greater than the previous one. To the extent that both the semiannual interest payments and the final redemption value of TIPS rise and fall with the CPI, the nominal return on TIPS hedges perfectly against inflation.

The market for TIPS has grown steadily and now includes three terms to maturity: 5 years, 10 years, and 20 years. The Treasury auctions 5-year and 20-year TIPS semiannually and 10-year TIPS quarterly. As of 2005, there are about \$200 billion TIPS outstanding, as part of the total \$4 trillion Treasury

marketable securities outstanding. The trading volume of TIPS also has increased gradually but still remains small compared to other Treasury securities; hence, TIPS generally are not as liquid as comparable Treasuries.

Extracting implied inflation expectations from TIPS

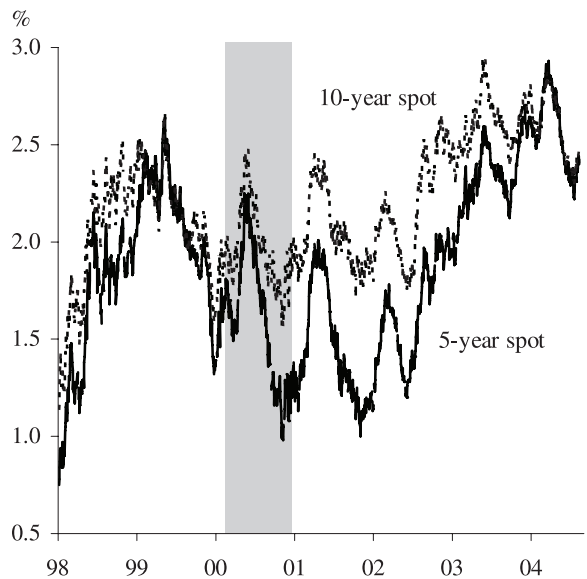
In principle, comparing the yields between conventional Treasury securities and TIPS can provide a useful measure of the market's expectation of future CPI inflation. At a basic level, the yield-to-maturity on a conventional Treasury bond that pays its holder a fixed nominal coupon and principal must compensate the investor for future inflation. Thus, this nominal yield includes two components: the real rate of interest and the inflation compensation over the maturity horizon of the bond. For TIPS, the coupons and principal rise and fall with the CPI, so the yield includes only the real rate of interest. Therefore, the difference, roughly speaking, between the two yields reflects the inflation compensation over that maturity horizon.

This inflation compensation is sometimes referred to as the breakeven inflation rate because, if future inflation were at this rate, the realized returns of holding a conventional Treasury bond and TIPS would be exactly the same. Figure 1 charts the breakeven inflation rate over the next five years by comparing the yield on the 5-year Treasury note to the yield on 5-year TIPS, and the breakeven inflation rate over the next ten years by using the 10-year Treasury note and 10-year TIPS, from 1998 to present.

There are two important caveats in using the breakeven inflation rate to measure inflation expectations. First, the breakeven inflation rate actually measures the compensation that conventional Treasury bondholders receive for expected inflation and for bearing the risk that realized inflation may deviate from expected inflation. The breakeven inflation rate hence has two components: expected inflation and the inflation risk premium. Ideally, one would like to subtract the inflation risk premium from the breakeven inflation rate to obtain a pure measure of inflation expectations. Nevertheless, assuming the inflation risk premium to be fairly stable over a short period of time, the changes in the breakeven inflation rate capture the changes in inflation expectations.

Second, TIPS yields contain a liquidity premium. While the market for TIPS is growing, it is still

Figure 1
1998 to present: Breakeven inflation rates



relatively small compared to the market for conventional Treasuries. Therefore, to the extent that TIPS are less liquid than Treasuries, investors would demand a liquidity premium for holding TIPS over conventional Treasuries. Because the breakeven inflation rate is obtained by comparing the yields on TIPS and similar maturity conventional Treasury bonds, the breakeven rate captures not only the inflation compensation but also the liquidity premium demanded by TIPS investors. In Figure 1, it is quite clear that the breakeven inflation rates exhibit an upward trend. This probably reflects artificially low breakeven rates when TIPS were introduced. At that time, the amount of TIPS outstanding was small and the investor base for TIPS was narrow, so TIPS were not very liquid and their yields likely contained a relatively large liquidity premium to compensate investors for holding TIPS in their portfolio. As the TIPS market has grown, the liquidity premium in TIPS has shrunk, resulting in higher breakeven inflation rates.

Interpretations

The breakeven inflation rate overstates inflation expectations because of the inflation risk premium in Treasury yields, but it understates inflation compensation because of the liquidity premium in TIPS yields. With a more mature TIPS market, and over relatively short time periods, both the inflation risk premium and the liquidity premium are likely to be fairly constant. Thus, the changes in breakeven inflation rates can be interpreted as the market measure of changes in inflation expectations. Estimates of intermediate-term inflation expectations can be

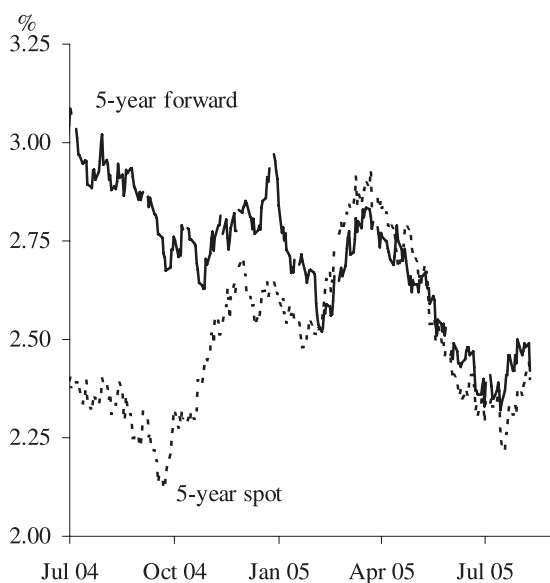
extracted using 5-year TIPS and conventional Treasury securities. To focus on a relatively short recent time period, Figure 2 shows the 5-year breakeven inflation rate since July 2004. Note that this measure of inflation expectations over the next five years has fluctuated between 2% and 3% over the past 12 months. In part, the swings reflect temporary factors, such as movements in energy prices, cyclical factors, and the influences of monetary policy.

Estimates of longer-term inflation expectations can be derived using the forward nominal yields and forward real bond yields. For example, suppose one is interested in inflation expectations for the period from 2010–2015, that is a five-year period beginning five years from now. The forward nominal yield for that period is implied by the 5-year and 10-year nominal yield. The forward real yield is, likewise, implied by the 5-year and 10-year TIPS yield. And comparing the forward nominal yield to the forward TIPS yield implies a forward breakeven inflation rate.

Figure 2 plots the 5-year forward 5-year breakeven inflation rate. It suggests that longer-term inflation expectations have been trending down from about 3% to about 2.5% since the beginning of the current monetary policy tightening cycle. Compared to the spot 5-year forward breakeven rate, it is noteworthy that the forward breakeven inflation rate is more stable. This is because longer-term inflation expectations tend to be less affected by cyclical factors.

One interpretation of this measure of longer-term inflation expectations is that it captures the market's assessment of how well the Federal Reserve promotes price stability in the long run. From that perspective, the decline in this measure—by more than one-half a percentage point over the last 12 months, despite rapidly rising energy prices—suggests that the market views the run-up in energy prices as transitory and that it is confident

Figure 2
July 2004 to present: Breakeven inflation rates



in the Fed's commitment to promoting longer-term price stability.

Conclusions

Given the Federal Reserve's dual mandates, promoting maximum sustainable output and employment and promoting price stability, having credibility in fighting inflation gives the central bank more room to promote economic growth. For example, with longer-term inflation expectations currently seemingly well anchored, the recent run-up in energy prices has not led to widespread fears about future inflation; therefore, the Fed has not had to tighten more aggressively. Nonetheless, the Fed cannot be complacent—the credibility of its commitment to price stability was earned through years of consistent performance, and to maintain that credibility, the Fed will need to continue to earn it. And to gauge its success, the Fed will also continue to pay close attention to longer-term inflation expectations.

Simon Kwan
Vice President

ECONOMIC RESEARCH
FEDERAL RESERVE BANK
OF SAN FRANCISCO

PRESORTED
STANDARD MAIL
U.S. POSTAGE
PAID
PERMIT NO. 752
San Francisco, Calif.

P.O. Box 7702
San Francisco, CA 94120
Address Service Requested

Printed on recycled paper
with soybean inks



Index to Recent Issues of *FRBSF Economic Letter*

DATE	NUMBER	TITLE	AUTHOR
3/11	05-05	Gains in U.S. Productivity: Stopgap Measures or Lasting Change?	Daly/Furlong
4/8	05-06	Financial liberalization: How well has it worked for developing countries?	Aizenman
4/15	05-07	A Tale of Two Monetary Policies: Korea and Japan	Cargill
4/29	05-08	The Long-term Interest Rate Conundrum: Not Unraveled Yet?	Wu
5/20	05-09	Can Monetary Policy Influence Long-term Interest Rates?	Jordà
5/27	05-10	More Life vs. More Goods: Explaining Rising Health Expenditures	Jones
6/3	05-11	Are State R&D Tax Credits Constitutional? An Economic Perspective	Wilson
6/10	05-12	Fiscal and Monetary Policy: Conference Summary	Dennis/Williams
6/17	05-13	IT Investment: Will the Glory Days Ever Return?	Doms
6/24	05-14	Stress Tests: Useful Complements to Financial Risk Models	Lopez
7/15	05-15	Age and Education Effects on the Unemployment Rate	Valletta/Hodges
7/22	05-16	Understanding the Twin Deficits: New Approaches, New Results	Cavallo
7/29	05-17	What If Foreign Governments Diversified Their Reserves?	Valderrama
8/5	05-18	Monetary Policy and Asset Price Bubbles	Rudebusch
8/12	05-19	Does Europe's Path to Monetary Union Provide Lessons for East Asia?	Glick
8/19	05-20	Credit Union Failures and Insurance Fund Losses: 1971-2004	Wilcox
8/26	05-21	Housing Markets and Demographics	Krainer
9/2	05-22	Policymaking on the FOMC: Transparency and Continuity	Yellen
9/9	05-23	A Look at China's New Exchange Rate Regime	Spiegel
9/16	05-24	Why Has Output Become Less Volatile?	Trehan

Opinions expressed in the *Economic Letter* do not necessarily reflect the views of the management of the Federal Reserve Bank of San Francisco or of the Board of Governors of the Federal Reserve System. This publication is edited by Judith Goff, with the assistance of Anita Todd. Permission to reprint portions of articles or whole articles must be obtained in writing. Permission to photocopy is unrestricted. Please send editorial comments and requests for subscriptions, back copies, address changes, and reprint permission to: Public Information Department, Federal Reserve Bank of San Francisco, P.O. Box 7702, San Francisco, CA 94120, phone (415) 974-2163, fax (415) 974-3341, e-mail sf.pubs@sf.frb.org. **The *Economic Letter* and other publications and information are available on our website, <http://www.frbsf.org>.**