Chapter 7

TREASURY INFLATION-INDEXED SECURITIES

QUENTIN C. CHU, *The University of Memphis, USA*
DEBORAH N. PITTMAN, *Rhodes College, USA*

Abstract

In January 1997, the U.S. Treasury began to issue inflation-indexed securities (TIIS). The new Treasury security protects investors from inflation by linking the principal and coupon payments to the Consumer Price Index (CPI). This paper discusses the background of issuing TIIS and reviews their unique characteristics.

Keywords: treasury inflation-indexed securities; consumer price index; real interest rate; inflation risk premium; phantom income; reference CPI; dutch auction; competitive bidders; noncompetitive bidders; bid-to-cover ratio; Series-I bonds.

Eleven issues of Treasury inflation-indexed securities (TIIS) have been traded in the U.S. market as of December 2003. Inflation-indexed securities are intended to protect investors from inflation by preserving purchasing power. By linking value to the Consumer Price Index (CPI), TIIS provide investors with a ''real'' rate of return. This security can be viewed as one of the safest financial assets due to its minimal exposure to default risk and uncertain inflation.

The fundamental notion behind inflation protection is to preserve the purchasing power of money. Today, inflation protection may be accomplished by linking investment principal to some form of a price index, such as the Consumer Price Index (CPI) in the United States, Canada, the United Kingdom, and Iceland; the Wholesale Price Index (WPI) in Finland, Brazil, and Argentina; and equities and gold in France.

In essence, investors purchasing inflation-indexed securities are storing a basket of goods for future consumption. Fifteen countries, including the United States have issued inflation-indexed securities, starting from the 1940s.[1] Some of the countries had extremely high inflation, such as Mexico and Brazil (114.8 percent and 69.2 percent in the year prior to the introduction of inflation-indexed securities), and others had moderate inflation like Sweden and New Zealand (4.4 percent and 2.8 percent).

The United Kingdom. has the largest and oldest market for inflation-indexed securities. As of 1997, there were £55 billion index-linked gilts outstanding, constituting about 20 percent of all government bonds in the United Kingdom. The United States is the most recent country to issue inflation-indexed securities to the public. The treasury announced its intention to issue inflation-indexed bonds on May 16, 1996. The first U.S. Treasury inflation-indexed securities were $7 billion of 10-year notes issued in January 1997.

There are many motivations for the issue of inflation-indexed securities. First, governments can reduce public financing costs through reducing the interest paid on public debt by the amount of an inflation risk premium. Rates on Treasury

securities are usually taken to represent the nominal risk-free rate, which consists of the real rate plus expected inflation and an inflation risk premium. By linking value to the price index, inflation-indexed securities provide investors with a real rate of interest. This return is guaranteed, whatever the course of inflation. When there is no risk of inflation, the inflation risk premium is reduced, if not eliminated completely. Benninga and Protopapadakis (1983) revised the Fisher equation to incorporate an inflation risk premium.

Second, the issue of inflation-indexed securities is an indication of a government's intention to fight inflation. A government can keep inflation low through its fiscal and monetary policies. According to the Employment Act of 1946, one of the four primary goals of the U.S. federal government is to stabilize prices through a low-inflation rate. Inflation-indexed securities provide a way for the public to evaluate the government's performance in controlling inflation. For a constant level of expected inflation, the wider the yield spread between nominal and real bonds, the higher the inflation risk premium, and presumably lower the public's confidence in the monetary authorities.

Moreover, a government promises investors a real rate of return through the issue of inflation-indexed securities. Any loss of purchasing power due to inflation, which investors experience during the investment period, will be offset by inflation-adjusted coupon payments and principal. In an environment with high inflation, the government's borrowing costs will be high. Reducing borrowing costs provides an incentive for a government to control inflation. The willingness of the government to bear this risk shows its determination to fight inflation.

Inflation-indexed securities also provide a direct measure of expected real interest rates that may help policymakers make economic decisions. According to economic theory, most savings, consumption, and investment decisions depend critically on the expected real rate of interest, the interest rate one earns after adjusting the nominal interest rate for the expected rate of inflation. Real interest rates measure the real growth rate of the economy and the supply and demand for capital in the market.

Before the trading of inflation-indexed securities, there was no security in the United States, which was offering coupon and principal payments linked to inflation, and therefore enabling measurement of the expected real rate. Empirical studies testing the relationship between expected real rates and other macroeconomic variables have relied instead on indirect measures of the expected real rate such as *ex post* real rates estimated by subtracting actual inflation from realized nominal holding-period returns (Pennachi, 1991). Inflation-indexed securities permit the direct study of the real interest rate. Wilcox (1998) includes this as one benefit, which has motivated the Treasury to issue these new securities.

Finally, inflation-indexed securities offer an alternative financial vehicle for portfolio management. Since the returns on nominal bonds are fixed in nominal terms, they provide no hedge against uncertain inflation. Kaul (1987) and Chu et al. (1995) have documented a negative correlation between equity returns and inflation in the United Kingdom as in the case of investors in equity markets, who suffer during periods of unexpected high inflation. Inflation-indexed securities, by linking returns to the movement of a price index, provide a hedge for investors who have a low-risk tolerance for unexpected inflation. Investors most averse to inflation will purchase inflation-indexed securities, and those less sensitive to inflation will purchase the riskier nominal bonds.

The design of the U.S. inflation-indexed securities underwent considerable discussion in determining the linking price index, the cash flow structure, the optimal length of maturity, the auction mechanism, and the amount of issuance. TIIS are auctioned through the Dutch auction method used by other Treasury securities. Participants submit bids in terms of real yields. The highest accepted yield is used to price the newly issued TIIS for all participants (Roll, 1996).

Both principal and coupon payments of TIIS are linked to the monthly nonseasonally adjusted U.S. City Average-All Items Consumer Price Index for All Urban Consumers (CPI-U). The Bureau of Labor Statistics compiles and publishes the CPI independently of the Treasury. The CPI-U is announced monthly. Inflation-indexed securities provide a guarantee to investors that at maturity investors will receive the inflation-adjusted amount or the par value whichever is greater. The coupon payments and the lump-sum payment at maturity are adjusted according to inflation rates. With a fixed coupon rate, the adjustment to a nominal coupon payment is accomplished by multiplying the principal value by one plus the inflation rate between the issuance date and the coupon payment date. Inflation-indexed securities set a floor (par value), an implicit put option, guaranteeing the bond's value will not fall below its face value if the United States experiences cumulative deflation during the entire life of the TIIS, which is a highly unlikely event.

TIIS are eligible for stripping into their principal and interest components in the Treasury's Separate Trading of Registered Interest and Principal of Securities Program. Since March 1999, the U.S. Treasury Department has allowed all TIIS interest components with the same maturity date to be interchangeable (fungible). Fungibility is designed to improve the liquidity of stripped interest components of TIIS, and hence increase demand for the underlying inflation-indexed securities. Other Treasury securities are strippable as well.

Since first issue in 1997, TIIS have constituted only a small portion of total Treasury securities issuance. At the end of 2002, the market capitalization of the TIIS was $140 billion, while the total Treasury market capitalization was $3.1 trillion. There are only 11 issues of TIIS outstanding, with original maturities running from 5 to 30 years. The issuance of TIIS was increased from two to three auctions of 10-year TIIS per year, along with a statement from the U.S. Treasury that they actively intend to promote trading in the 10-year note. Limited issuance prevents full coverage for various investment horizons and constrains trading volume in the new security. TIIS have not been closely followed by financial analysts, nor well understood by the investment public.

Since the inception of the TIIS in 1997, actual inflation has been very low by historical standards, and there has not been strong interest in hedging against inflation. Although the Federal Reserve remains concerned about potential inflation, higher inflation levels have not materialized. In more recent years, the government has been retiring Treasury debt due to government surpluses, which makes significant new issues of TIIS less likely.

One disadvantage of TIIS is the potential for tax liability on phantom income. Although the securities are exempt from state and local taxes, they are subject to federal taxation. Positive accrued inflation compensation, if any, is reportable income, even though the inflation-adjusted principal will not be received until maturity. Some taxable investors may thus hesitate to invest in TIIS, while others with nontaxable accounts such as retirement accounts might find this market attractive. Consequently, investor tax brackets may affect decisions about including TIIS in a portfolio. The emergence of pension funds specializing in TIIS should attract more individual investment in the form of IRA and 401(k) savings, although these investors are more likely to buy and hold.

One feature of the TIIS that impedes its use as a perfect measure of the *ex ante* real rate is the CPI indexing procedure. There is a three-month lag in the CPI indexing system for TIIS. Figure 7.1 indicates how the reference CPI is calculated on May 15, 2000. The reference CPI for May 1, 2000, is the CPI-U for the third-previous calendar month, i.e. the announced CPI for February 2000. The Bureau of Labor Statistics surveys price information for the February CPI between January 15 and February 15, and then announces the February CPI on March 17, 2000. The reference CPI for any other day of May is calculated by linear interpolation between the CPIs of February and March (the CPI for March becomes available on April 14, 2000). Once the March CPI is announced, the

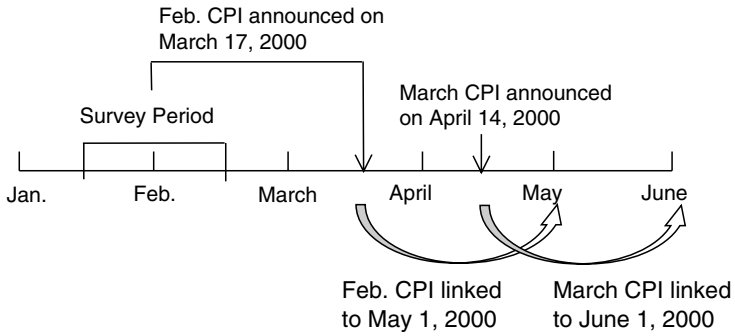

Figure 7.1. Calculation of reference CPI. This figure illustrates the lag effect in indexing the CPI. Due to CPI-U reporting procedures, the reference CPI for May 1, 2000, is linked to the February CPI-U, and the reference CPI for June 1, 2000, is linked to the March CPI-U.

reference CPI for any day in May 2000 is known. The reference CPI for May 15, 2000 can be calculated according to the following formula:

$$\begin{aligned} RCPI_{\text{May15}} &= CPI_{\text{Feb}} + (14/31)\ (CPI_{\text{March}} - CPI_{\text{Feb}}) \\ &= 169.7 + (14/31)(171.1 - 169.7) \\ &= 170.33226, \end{aligned}$$

where *RCPI* represents the reference CPI for a particular day.[2]

The principal value of TIIS on any particular day is determined by multiplying the face value at the issuance by an applicable index ratio. The index ratio is defined as the reference CPI applicable to the calculation date divided by the reference CPI applicable to the original issuing date.

Table 7.1 shows the percentage holdings of TIIS for competitive bidders, noncompetitive bidders, the Federal Reserve, and foreign official institutions. The total dollar amount tendered by competitive bidders is 2.24 times the total dollar amount accepted. The bid-to-cover ratio of 2.24 indicates the intensity of demand for the TIIS.

The first TIIS was issued in January 1997, which offered a real coupon rate of 3.375 percent and 10 years to maturity. The first maturity of TIIS occurred on July 15, 2002. There are eight 10-year TIIS and three 30-year TIIS currently outstanding. Maturities range from 2007 to 2032. Ten-year TIIS original issuances are scheduled in July each year, with a reopening in October and the following January. Each issue has a unique CUSIP number for identification purposes, which is also used in the case of reopening. All 11 issues have been reopened at least once after the original issue date.

Table 7.1. TIIS distribution among investment groupsThe numbers in this table represent auction results of TIIS between October 1998 and July 2001. Information on new issuance and reopening are summarized for the 11 auctions held during this period of time. Amounts are in millions of dollars.

	Tendered		Accepted	
Competitive	153,446	98.13	68,410	95.90
Noncompetitive	601	0.38	601	0.84
Federal Reserve	2,202	1.41	2,202	3.09
Foreign Official Institutions	125	0.08	125	0.18
Total	156,374	100.00[a]	71,338	100.00[a, b]

[a] Numbers are in percentage.
[b] Does not add to 100.00 percent because of rounding.

The average annual return on the 10-year TIIS, since inception in 1997, was 7.5 percent, compared to a return on the 10-year nominal Treasury of 8.9 percent. The comparable annual volatility has been 6.1 percent for the TIIS compared to 8.2 percent for the Treasury. Issue size varies from $5 billion to $8 billion. For all 11 issues, the amounts tendered by the public have been consistently higher than offering amounts. The average daily trading volume of the TIIS was $ 2 billion, compared to $300 billion for the Treasury market.

The U.S. Treasury also issues Series-I Bonds, usually called I-Bonds, whose values are linked to the CPI as well. Unlike TIIS, I-Bonds are designed to target individual investors. The motivation for such a security is to encourage public savings. Investors pay the face value of I-Bonds at the time of purchase. The return on I-Bonds consists of two separate parts: a fixed rate of return, and a variable inflation rate. As inflation rates evolve over time, the value of I-Bonds also varies. Values will be adjusted monthly, while interest is compounded every six months. Interest payments are paid when the bond is cashed. As in the TIIS, there is an implicit put option impounded in I-Bonds that protects investors from deflation.

There are differences between I-Bonds and TIIS. First, I-Bonds are designed for individual investors with long-term commitments. Although investors can cash an I-Bond any time 6 months after issuance, there is a 3-month interest penalty if the bond is cashed within the first 5 years. TIIS, on the other hand, can be traded freely without penalty.

The real rates of return on I-Bonds and TIIS are different. The Treasury announces the fixed rates on I-Bonds every 6 months, along with the rate of inflation. Both the fixed rate and the inflation rate remain effective for only 6 months until the next announcement date. The real coupon rate on a TIIS, however, is determined through an auction mechanism involving all market participants on the original issue date. TIIS principal is linked to the daily reference CPI, and its value can be adjusted daily instead of monthly as in the case of I-Bonds.

The tax treatment of I-Bonds and TIIS is also different. While there is phantom income tax on TIIS, federal income taxes can be deferred for up to 30 years for I-Bonds. If there is early redemption, taxes are levied at the time I-Bonds are cashed. Investors can purchase I-Bonds through retirement accounts, but there is a limit on the amount one can purchase. An investor can purchase up to $30,000 worth of I-Bonds each calendar year, a limit that is not affected by the purchase of other bond series.

NOTES

1. According to the date of introduction of inflation-indexed securities, these countries are Finland, France, Sweden, Israel, Iceland, Brazil, Chile, Colombia, Argentina, the United Kingdom, Australia, Mexico, Canada, New Zealand, and the United States.
2. The U.S. Treasury posts the reference CPI for the following month around the 15th of each month on its web site at http://www.publicdebt.treas.gov.

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