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## **Inflation-Indexed Securities: Description and Market Experience**

by  
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# INFLATION-INDEXED SECURITIES

## Executive Summary

### Background

Inflation is a serious threat to the economic security of anyone who lives on a fixed income or relies on a fixed stock of assets. Many older people are exposed to inflation because they rely on savings or pensions to supplement the inflation-adjusted benefit provided by Social Security. Inflation may also harm other classes of savers, such as anyone saving for a downpayment on a house or for education.

An inflation-indexed security is a form of savings that is designed to protect both the investment principal and the income stream (interest) against erosion from inflation. Although a number of private firms have issued inflation-linked corporate debt, the primary source of inflation-indexed investments is the federal government, which has issued these securities since January 1997. Government marketable inflation-indexed securities currently come in two maturities: 10-year notes and 30-year bonds.

The government also issues U.S. inflation-indexed Savings Bonds (“I-Bonds”), which enjoy tax advantages but cannot be sold to other investors. All government inflation-indexed securities are indexed to the Consumer Price Index for All Urban Consumers (“CPI-U”), which is issued monthly by the Bureau of Labor Statistics.

Apart from inflation-indexed notes and bonds, there is a minuscule market for inflation-indexed annuities in the United States. Such annuities would be helpful, however, if part (or all) of Social Security’s defined benefit were replaced with a system of individual accounts. The current Social Security benefit resembles an inflation-indexed annuity because it is indexed to the CPI. Over the years, this has shielded Social Security beneficiaries from inflationary bouts, such as occurred in the 1970s. Many proposals for individual accounts would require individuals to annuitize at least part of their account balances upon retirement, to ensure that they don’t outlive their savings, and perhaps also to prevent some people from spending the account balance in the first years of retirement. Yet the absence of inflation-indexed annuities, at least in the current market, means that individual account holders would not be able to shield their retirement income from inflation.

### Purpose

This Issue Paper aims to show why the market for inflation-indexed securities has been slow to develop since the securities were introduced in 1997. The market remains fairly illiquid, in the sense that it may be difficult to find a buyer or a seller for a large block of the securities without moving market prices downward or upward. In theory, however, inflation-indexed securities should appeal to small and large investors alike, because they offer protection against inflation, and also because they add diversity to an investment portfolio. This report focuses primarily on

small investors. It explores why small investors have not been attracted to inflation-indexed securities, despite their potential advantages.

## **Methodology**

This report provides a detailed description and analysis of the available government data on purchases of inflation-indexed securities by individuals and large institutional investors. The government data lack detail in important respects, however, so they provide only a rough indication of who ultimately buys these financial instruments.

A variety of explanations is explored as to why small investors have not, to date, been attracted to inflation-indexed securities. The experience of inflation-indexed mutual funds and annuities is also discussed. Recent academic work is cited on the subject of why inflation-indexed annuities have failed to attract buyers.

## **Principal Findings**

Individual interest in marketable Treasury inflation-indexed securities would appear to be weak, based on recent Treasury auction results and an examination of the Treasury DIRECT database. To date, small savers' participation in mutual funds based on inflation-indexed bonds has been disappointing. Additionally, the market for inflation-indexed annuities remains minuscule. Inflation-indexed savings bonds have attracted somewhat more interest from individuals.

At least at the initial government auction, however, marketable inflation-indexed securities have been distributed to a broader spectrum of investors than have conventional Treasury notes and bonds. It would appear that banks, pension funds, and investment funds are buying a relatively large percentage of each auction of inflation-indexed securities, as compared to the shares of these groups in the (much larger) initial auctions of conventional securities. An important caveat, however, is that there are no available data on sales that occur after the initial auction.

The fact that investors are charging one or more "risk premia" for inflation-indexed securities is demonstrated indirectly, by comparing the returns on conventional bonds with the returns on inflation-indexed bonds. A comparison of returns on real and nominal bonds produces a measure of inflation expectations that is implausibly low. By implication, the real yield on inflation-indexed securities must be higher than the real yield in the economy. This is likely due to the incorporation of one or more risk premia into the yield on inflation-indexed securities. In particular, it is widely believed that investors are demanding a "liquidity" risk premium to compensate for expected difficulties they might encounter if they needed to sell the securities. Investors may also be charging a risk premium because they doubt the government's commitment to these securities, given the expectation of continued reductions in the public debt, leading to concerns over the depth and liquidity of the market for conventional Treasury securities.

## **Conclusion**

Low trading volume and evidence of illiquidity are consistent with the observation that inflation-indexed securities are “buy-and-hold” instruments among both individual and institutional investors. In other words, investors such as banks and pension funds are buying inflation-indexed notes and bonds so that they can benefit from inflation protection. Unlike speculators, these buy-and-hold investors do not seek to sell at the next profitable opportunity. To this extent, the securities have accomplished their intended mission of providing inflation protection, even if total demand remains low.

The single biggest reason why individuals have not been buying inflation-indexed securities is probably the recent performance of the stock market. Over the past few years, stocks have offered prospects for a far higher return than inflation-indexed securities have, as academic analysis has shown. A second explanation may be that inflation has receded in people’s minds as a source of concern. Finally, marketable inflation-indexed bonds are complex in structure, which may deter some individuals and firms from purchasing them.

## Introduction

In January 1997, the U.S. government introduced inflation-indexed securities in the form of 5- and 10-year notes and 30-year bonds. The new securities are designed to protect from inflation the value of both investment principal and interest. In 1998, the government extended inflation indexation to its popular U.S. Savings Bond program by launching “I-Bonds.”<sup>1</sup>

Inflation-indexed securities (IIS) are designed to help combat a chief threat to the economic security of anyone who lives on a fixed income: inflation, which eats away at the purchasing power of any asset or fixed income stream. Many different individuals may be exposed to the risks of inflation. A young couple saving for a down payment on a house, or for a child’s education, may find that its savings are not keeping up with inflation. Retirees may be exposed to inflation over a long period of time, because a man retiring at age 65 today can expect to live another 16 years and a woman another 19 years.

The eroding effects of inflation can be measured by comparing the “real” (i.e., adjusted for inflation) and the “nominal” (not adjusted) dollar values of a particular basket of goods and services. Even if the quality and quantity of goods and services remain the same (that is, the real value of the basket stays the same), inflation causes the total amount of dollars needed to buy the same basket to rise over time (that is, the nominal value of the basket rises). For people living on a partially fixed income, as do many older people, the problem is that the nominal amount of savings or income does not rise over time to keep up with inflation.

<b>Inflation Rate:</b>	<b>3%</b>	<b>5%</b>	<b>7%</b>	<b>10%</b>
<b>Year</b>				
<b>1</b>	\$97.00	\$95.00	\$93.00	\$90.00
<b>2</b>	\$94.09	\$90.25	\$86.49	\$81.00
<b>3</b>	\$91.27	\$85.74	\$80.44	\$72.90
<b>4</b>	\$88.53	\$81.45	\$74.81	\$65.61
<b>5</b>	\$85.87	\$77.38	\$69.57	\$59.05
<b>10</b>	\$73.74	\$59.87	\$48.40	\$34.87
<b>15</b>	\$63.33	\$46.33	\$33.67	\$20.59
<b>20</b>	\$54.38	\$35.85	\$23.42	\$12.16

Table 1 shows the declining real value of a savings balance or income stream worth \$100. Initially, \$100 would be able to buy exactly \$100 dollars in goods in services. If inflation were running at 7 percent annually, however, as it did frequently between 1974 and 1981, the same \$100 dollars in income or savings would be able to buy only three-quarters of the initial basket of

<sup>1</sup> For technical terms, see the Appendix, “Background on Interest-Bearing Securities.”

goods and services, or about \$75 worth in *real* terms, after only four years. At 7 percent annual inflation, after 10 years the \$100 in savings could buy only half of the original basket and, after 20 years, only one-quarter of the same market basket. Even in an environment of low 3 percent inflation, such as we experienced in 1996, the real purchasing power of \$100 would fall by one quarter after 10 years, and by over one-third after 15 years. The same speed of erosion in purchasing power would apply equally to \$100 in savings as to a payment stream of \$100 per year.

Thus, inflation is an acute problem for individuals who plan, or are forced, to lean heavily on their savings to finance retirement. Inflation is also a problem for retirees who rely significantly on pension incomes that are not indexed to inflation, pensions that adjust for inflation with a significant lag, or pensions that place a cap on the amount of inflation adjustment. Some part of retirees' income is shielded from inflation, however, because the current Social Security benefit is adjusted so as to keep pace with inflation.

IIS are designed to protect the real purchasing power of savings, including retirement savings, against erosion from inflation. Both the principal value and the interest income keep pace with inflation, as will be described below.

Any proposal to reform Social Security by creating individual accounts should address the potential impact of inflation on the accounts. Some of these proposals would require that the accounts be annuitized upon retirement. Currently, the private market for inflation-indexed annuities is not well developed. Thus, a system of individual accounts might not be able to protect retirees' income from inflation, in a manner comparable to the protection now offered by the current Social Security system. The state of the market for inflation-indexed annuities, and other ways in which individuals might be able to protect their retirement income against inflation, will be discussed in this paper.

This paper explores the market history of IIS, including: (1) the extent to which individuals have begun to save through these securities; (2) why they have commanded such high real rates of return to date; and (3) whether their availability has enabled the private sector to issue its own inflation-indexed instruments, such as annuities that are indexed to inflation.<sup>2</sup>

## **How Inflation-Indexed Securities Work**

The federal government offers two types of inflation-indexed securities: marketable IIS and non-marketable U.S. Savings Bonds, also known as "I-Bonds." The principal difference between them has to do with whether or not an investor can sell them to other investors. For both types of

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<sup>2</sup> The data do not permit, however, an analysis of whether individual holdings of these securities represent net new saving or a diversification of existing assets (accomplished by shifting away from other forms of savings, such as stocks or bonds). Diversification of savings into a new instrument would be welcome, as it reduces an individual's exposure to any single risk.

securities, the index for measuring the inflation rate is the non-seasonally adjusted Consumer Price Index for All Urban Consumers (CPI-U).<sup>3</sup>

**Marketable inflation-indexed securities.** The first type of inflation-indexed instruments are “marketable” securities, which the government offers through regularly scheduled auctions. Marketability means that investors can trade them on the secondary market.<sup>4</sup> Their price and yield are determined by private investors, first through bidding in the initial auction of the security, and then through the process of buying and selling the security on the secondary market.<sup>5</sup> Marketable securities have been sold in three original maturity lengths: 5- and 10-year notes, and 30-year bonds. Treasury discontinued the 5-year IIS after two auctions in 1997.

Marketable IIS resemble conventional government notes and bonds, except they are structured so that the principal amount is adjusted for inflation using the non-seasonally adjusted CPI-U. Because the principal amount is indexed to the CPI-U, the value of the principal rises in “nominal” terms with inflation, but it remains the same in “real” terms.<sup>6</sup> This preserves the “real” purchasing power of the investment principal.

The interest payments from the security, which are known as “coupon payments,” are also adjusted for inflation. Like other government notes and bonds, IIS carry an annual “coupon rate” that is fixed until the security matures and is determined by private investors through the auction process. Unlike other government instruments, which carry a “nominal” coupon rate, the coupon rate for IIS is a “real” interest rate.<sup>7</sup>

IIS further resemble conventional government securities in that coupon payments are made semiannually, and the amount of each semiannual coupon payment is determined by multiplying half of the fixed coupon rate times the principal amount of the security. For a conventional

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<sup>3</sup> Technical descriptions of marketable IIS and I-Bonds are available at [www.publicdebt.treas.gov/](http://www.publicdebt.treas.gov/).

<sup>4</sup> Marketable government securities are first distributed at auction, when the government sells them to investors who have submitted winning auction bids. If the first investor sells a marketable government security again, the sale generally takes place on what is known as the “secondary market.” The secondary market consists of brokers, dealers, speculators, and investors.

<sup>5</sup> For a general description of fixed-income securities, how their prices and yields change, and the auction process, see the Appendix.

<sup>6</sup> An investor does not have to calculate the inflation-adjusted values on a daily basis. It is necessary to make these calculations, however, when the investor wants to sell the security, or if the investor wishes to verify the Treasury’s calculations of coupon payments or value at maturity. Adjusting the principal amount of the security for inflation is achieved by multiplying the principal (or “par”) value of the security when it was first auctioned by an “index ratio.” The numerator of the index ratio is the CPI-U for the day on which the inflation-adjustment calculation is made. The denominator is the CPI-U on the date that the security was first auctioned. Because the CPI-U is reported on a monthly basis, it may be necessary to interpolate between two consecutive months to determine the numerator that applies to any single day in the month. Treasury’s Bureau of Public Debt publishes the daily index ratios on its web site at [www.publicdebt.treas.gov/sec/sec.htm/](http://www.publicdebt.treas.gov/sec/sec.htm/).

<sup>7</sup> A nominal interest rate represents a combination of the real interest rate that prevails in the economy, plus expected future inflation rates, plus various risk premia, as will be explained later in the text. The standard Fisher equation relates the nominal rate to the real rate:

$$(1 + \text{nominal rate}) = (1 + \text{real rate}) * (1 + \text{expected inflation})$$

government security, the principal amount of the security never changes; hence, the amount of the coupon payment never changes in nominal terms. Recall, however, that the principal amount of an IIS is adjusted for inflation. When the fixed real coupon rate is applied to the rising inflation-adjusted principal, the value of the coupon payment rises in nominal terms, but it remains constant in real terms. Thus, both the principal and the semiannual coupon payments are protected from erosion by inflation. The interest income on all U.S. Treasury securities is exempt from state and local income taxation.

Government fixed-income securities and IIS are also distinguished by another rate, known as the “yield” of a particular security. For any coupon-bearing security, the yield to maturity is the sum of two parts (the capital gains on the security, plus the stream of semiannual coupon payments over the term remaining until maturity) divided by the principal amount. The capital gains represent the difference between the price at which the bond or note is purchased and the price at which it is sold or redeemed.

The yield is determined through the initial auction process and in subsequent trading. As in all other Treasury auctions of notes and bonds, competitive auction participants bid on the yield (not on the coupon rate) of the security. Auction participants express their desired yield to three decimal places (fractions are not allowed). IIS auctions differ from those for conventional securities, in that participants bid on a *real* yield, not a nominal one. As in most other government auctions, the Treasury ranks the yield bids in ascending order, and selects the single yield that is sufficient to sell the entire volume of securities offered at this auction.

For example, in a recent auction of IIS, a yield of 3.899 percent was sufficient to sell \$7 billion in 30-year bonds. Auction participants who tendered bids for yields below 3.899 percent were awarded the full amount of their bid. Those who bid higher yields, such as 4.5 percent, did not get any securities. Participants who bid exactly 3.899 percent were awarded 24 percent of their bid amount, because this degree of prorating was sufficient to sell the entire auction amount of \$7 billion.

At the conclusion of the auction, Treasury converts the winning yield into the fixed real “coupon rate” that the security will bear until maturity. This coupon rate is expressed in annual terms and is rounded to the nearest increment of 0.125 percent (equivalent to increments of 1/8 of one percent). All winning auction participants pay a settlement price that is based on the highest winning yield.

Thus, in the auction described above, the coupon rate was set at 3.875 percent, after rounding down to the nearest 0.125 percent increment. The settlement price was \$99.578. This means that auction winners had to give the government \$99.578 for every multiple of \$100 worth of principal or “par” value of IIS purchased.<sup>8</sup> The below-par settlement price produces capital gains equal to the difference between \$99.578 paid at the auction and \$100 in principal received when the bond matures. When these capital gains are added to the stream of 3.875 percent coupon payments

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<sup>8</sup> The deviation between settlement and principal values occurs in many government auctions. It results from the fact that the security’s coupon rate must be expressed in increments of 1/8, but the winning yield from an auction does not always occur in such increments.

from the security, the resulting yield to maturity is exactly 3.899 percent -- the winning auction yield.

If the first owner of this bond decides to sell it, he or she will do so on the secondary market of traders and investors. The bond's yield and price will likely change further in response to changes in the general levels of inflation and interest rates.<sup>9</sup> For example, if real interest rates in the economy rise above 3.899 percent, then the price of the outstanding bond mentioned above may fall on the secondary market in order to find a buyer. This fall in price results in additional capital gains at maturity, therefore increasing the bond's attractiveness to potential buyers. Conversely, if real interest rates rise, then the secondary market price of the bond may rise. Remember that yield to maturity is a function of coupon payments, capital gains, and time left to maturity. If the price on the outstanding bond falls sufficiently, its yield to maturity will rise until it equals the higher yield of other financial instruments in the economy, in this hypothetical example of a general rise in interest rates. A bond with a low coupon rate and high capital gains can be as attractive to potential buyers as is a bond with a higher coupon rate and low capital gains. In the example above, if the original bondholder refuses to drop the price, then he or she will not find any buyers. Potential investors would have no trouble finding alternative investments with a comparable risk but higher yields.

If we wish to take a rough reading of what investors believe to be the real interest rate in the economy, the yield on an IIS may be an appropriate measure. The coupon rate is not appropriate, because it was fixed for life at auction. Additionally, the coupon rate is expressed in increments of 1/8, which could differ from the winning yield bid by auction participants.

***Inflation-Indexed U.S. Savings Bonds.*** The second type of IIS is non-marketable: it cannot be sold to other investors and must be redeemed directly from the government. This is a type of U.S. Savings Bond known as the "I-Bond," offered through the federal government's savings bond program. I-Bonds earn interest until redemption, or for up to 30 years. The interest on all government savings bonds, including I-Bonds, is exempt from state and local income taxes. Federal taxes can be deferred until encashment.

The federal government, not the private market, determines the interest rate on I-Bonds. The I-Bond earnings rate is a combination of two separate rates: a fixed real interest rate that remains the same through the life of the bond and an inflation rate that changes twice a year. Both rates are announced by the government.<sup>10</sup> In July 2000, the total earnings rate (real interest rate plus

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<sup>9</sup> A bond's yield changes through the mechanism of changes in its market price. A bond's yield to maturity is a combination of capital gains and coupon payments. The coupon payments cannot change because they are fixed for the life of the security. But capital gains can and do change when the price of a bond changes. (The mechanics of bond price and yield movements are similar for IIS and conventional Treasury bonds, and are discussed in more detail in the Appendix.)

<sup>10</sup> Twice a year, the government announces the fixed real rate of return, which will apply until maturity, for all I-Bonds issued during the following six-month period. The fixed real rate for I-Bond issues is determined by the Treasury and is based on estimates of the real rate of interest in the economy, with some reference to the real interest rate on marketable IIS. Also twice a year, Treasury announces a semiannual inflation rate that applies to earnings on all outstanding I-Bonds for the following six-month period. This inflation rate is derived from an average of changes in the Consumer Price Index for all Urban Consumers (CPI-U) over a previous six-month period.

inflation rate) for I-Bonds was 7.49 percent, compared to a nominal yield of 5.73 percent on conventional government savings bonds.

### **Inflation-Indexed Securities as Savings Vehicles**

As a rationale for issuing IIS, the government argued that inflation-protected savings vehicles might attract net new savings, adding to the stock of national savings. This is because individuals who were concerned about inflation had not been able to obtain such protection in the marketplace before the government launched this program in January 1997.

In addition, the government argued that IIS would allow small investors to diversify their portfolios, because the securities' price performance is inversely correlated with other nominal financial instruments. That is, IIS are expected to rise in market value during periods of accelerating inflation (because the principal is indexed to inflation) -- unlike conventional bonds, which fall in price as a result of rising nominal interest rates. Diversification is a desirable quality in a saver's portfolio of investments because it reduces exposure to any single source of risk.

In one respect, marketable IIS may be riskier than conventional interest-bearing Treasury securities are. That is because, for a given move in the real interest rate, the market price of marketable IIS may be more volatile than that of conventional bonds of the same maturity. This potential price volatility stems from the fact that the nominal coupon and principal values grow with inflation, so that a large portion of the income stream from inflation-indexed bonds is back loaded.<sup>11</sup> The result of a change in the bond's market price would be a capital gain or loss to the bondholder. As a result, marketable IIS, which are available in 10- and 30-year maturities, may not be appropriate for investors who might have to sell them before maturity and are averse to taking risks. Many retirees may fall into this category.

By contrast, holders of I-Bonds do not face the risk of capital gains or losses before maturity, because federal regulations prohibit a secondary market in I-Bonds. Instead, I-Bond holders can redeem them before maturity with the government, at a price that reflects the accrued interest and principal amounts, which are adjusted for inflation up to the date of redemption. The redemption price of I-Bonds is not vulnerable to changes in the general level of interest rates in the economy.<sup>12</sup>

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<sup>11</sup> See the Appendix for a description of the theoretical concept of "duration." From January to December 1997, their first year of issuance, IIS actually had a lower price volatility than conventional securities did. See Roger Anderson, "The U.S. Experience," in *Handbook of Inflation-Indexed Bonds*, Brynjolfsson and Fabozzi (eds.), (New Hope PA, 1999).

<sup>12</sup> Deflation (falling price levels) is not a threat to the investment principal or income from an inflation-indexed bond that is held to maturity. It is theoretically possible, although unlikely, that an extended period of serious deflation could cause the inflation-adjusted principal value of an I-Bond or marketable IIS to fall below the nominal value of the original investment. For this to happen, deflation would have to be so bad that it exceeded the positive real coupon rate on the security. Even in these circumstances, the investor would not be worse off in real terms, because the IIS structure preserves the real purchasing power of the investment.

Even though real purchasing power would not be threatened, the government guarantees that when a marketable IIS matures, the government will never pay back principal at less than its original nominal value. The

Both marketable IIS and I-Bonds do carry some risk with respect to the calculation of the inflation adjustment. First, for both instruments, there is a lag between measuring inflation and making the inflation adjustment to the investment. If inflation were very high, someone who wished to sell or redeem her investment could find that its real value had fallen because the nominal value did not reflect very recent inflation.

Additionally, there are some uncertainties as to how the federal Bureau of Labor Statistics (BLS) will calculate the CPI-U in the future. The BLS is constantly studying its CPI-U calculations with an eye to improving measurement. The agency also makes periodic technical improvements to the calculation of the CPI-U, as new theory and technology permit.

A remaining risk concerns the creditworthiness of the federal government. Although the federal government has never defaulted to date, it appeared close to doing so in 1995, when Congress and the President could not agree to extend the debt ceiling.

Each individual investor must weigh these risks. TIAA-CREF, which offers an “inflation-linked bond account,” identified the following characteristics of individuals who might want to invest in the TIAA-CREF account. These individuals:

- have a limited ability to replace retirement savings or income lost to inflation spikes or steady erosion;
- have relatively few assets outside their retirement accounts; and
- are concerned about the future of Social Security because its benefits represent a source of inflation-protected income.<sup>13</sup>

IIS were designed to be attractive to small investors and savers. I-Bonds are available in denominations as low as \$50 dollars. Individuals can arrange to make regular I-Bond purchases through payroll savings plans, or they can ask Treasury to make regular deductions from their bank accounts through the EasySaver program (available online). The marketable IIS were given a minimum denomination of \$1000, and they were made available through Treasury DIRECT (see footnote 22), so that investors can bypass brokers or other intermediaries, and purchase directly from the federal government.

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government also guarantees that the nominal value of an I-Bond will never fall below the highest nominal value that it has attained, including all upward adjustments during earlier periods of inflation. These guarantees would prevent the nominal value of the investment from falling in some circumstances, producing a corresponding rise in its real value. This means that the holder of I-Bonds or marketable IIS could actually stand to make capital gains, in real (but not nominal) terms, on an investment during periods of deflation.

The inflation-adjusted principal of marketable IIS could conceivably fall below par on the secondary market, because the government guarantee on marketable IIS applies only to redemption at maturity. It is unclear how the secondary market would price the guarantee of par value at maturity.

<sup>13</sup> P. Brett Hammond, “Using Inflation-Indexed Securities for Retirement Savings and Income: The TIAA-CREF Experience,” in *Handbook of Inflation-Indexed Bonds*, Brynjolfsson and Fabozzi (eds.), (New Hope PA, 1999).

## What Real Yields Are Implied by Inflation-Indexed Securities?

Many academic and government analysts welcomed the IIS, because they have the potential to provide the first true window into real interest rates in the economy. Some observers believed that IIS could become a useful tool for the Federal Reserve Board in its deliberations. This is because the private sector determines the real interest rates on marketable IIS, through the laws of supply and demand at the initial auction and in subsequent trading on the secondary market. Previously, there had been no way to measure real interest rates directly.<sup>14</sup>

Unfortunately, marketable IIS have failed to live up to these expectations, at least at this writing. Marketable IIS have carried what is generally regarded as a high real yield, as compared to conventional academic estimates of real interest rates. This section will examine the track record of the IIS' real interest rates. The following section will offer some explanations for the high observed real yields, including the widely credited argument that IIS rates are affected by low market demand.

Those who seek to know marketable IIS' real yield would do best to look at the yield to maturity on these instruments, and not at their coupon rates. As noted earlier, the coupon rate of a given marketable security is set at auction and is fixed for the life of that security. By contrast, a marketable bond's yield changes with the level of interest rates in the general economy.

Ideally, we could compare the real yield from inflation-indexed Treasuries directly against a "true" measure of the real yield in the economy. We cannot observe the real yield in the economy, however. Instead, we can compare the supposed "real" yield carried by marketable IIS to the nominal yield on conventional Treasuries of similar maturities. This comparison will give us an implied measure of inflation expectations, which we can then analyze for credibility.

Table 2 shows the inflation expectations, in the second column from the right, that are implied by comparing the nominal yield on conventional Treasuries to the real yield on marketable IIS. We can interpret the numbers in this table by referring to a standard yield curve identity: the overall interest rate over a period of many years is simply the arithmetic average of the annual interest rates during the period (i.e., the sum of all the annual rates during the period, divided by the number of years in the period), at least with continuous compounding. We will ignore the January 1997 implied inflation rate of about 3 percent, because that auction was an anomaly, the first ever of IIS, with unusually high participation from interested bidders.

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<sup>14</sup> The benchmark interest rates in the economy (such as the federal funds rate and the rates on conventional Treasury notes and bonds) are all nominal rates. This means, as indicated in footnote 7, that they incorporate a combination of the real interest rate and a measure of expected future inflation. To estimate real interest rates, analysts had to resort to starting with a nominal interest rate and reducing it by a measure of market participants' inflation expectations. Obviously, such expectations are themselves difficult to pin down.

**Table 2**  
**IIS Auction Results**

<b>Auction Date</b>	<b>Maturity</b>	<b>Yield at Auction (%)</b>	<b>Yield on Comparable Conventional Treasury<sup>(a)</sup> (%)</b>	<b>Implied Expected Annual Inflation Rate<sup>(b)</sup> (%)</b>	<b>CPI-U over Previous Year<sup>(c)</sup> (%)</b>
<i><b>Inflation-Indexed Notes (5- and 10-year)</b></i>					
1/9/97	10 yrs.	3.449	6.63	3.07	3.044
7/9/97	5 yrs.	3.744	6.15	2.32	2.223
1/8/98	10 yrs.	3.730	5.49	1.70	1.571
1/6/99	10 yrs.	3.898	4.73	0.80	1.671
1/12/00	10 yrs.	4.338	6.72	2.28	2.678
<i><b>Inflation-Indexed Bonds (30-year)</b></i>					
4/7/98	30 yrs.	3.740	5.90	2.08	1.436
4/8/99	30 yrs.	3.899	5.51	1.55	2.277

<sup>(a)</sup> Source: Treasury Department's Constant Maturity Yield Curves for 1/29/97, 7/9/97, 1/8/98, 4/8/98, 1/6/99, and 4/7/99. A **yield curve** plots the yields to maturity (at closing time on the date that the yield curve is plotted) for various maturities of Treasury securities. The yields-to-maturity are plotted on the vertical axis, and the maturities are plotted on the horizontal axis.

<sup>(b)</sup> Calculated using the Fisher identity: nominal interest rate = (1 + real interest rate) \* (1 + inflation rate) - 1. Analysts frequently simplify this calculation, as follows: nominal interest rate = real interest rate + inflation rate. While the second calculation is quicker and can be done in one's head, it neglects the cross-term (the inflation rate times the real interest rate). The cross-term can make a significant difference when inflation is high, but when inflation is low this is less important and the quicker calculation can be used as an approximation with more confidence.

<sup>(c)</sup> Source: Bureau of Labor Statistics.

Specifically, the figures in Table 2 imply that in January 1999, the markets expected inflation to run at 0.8 percent annually over the next ten years. In April 1999, the markets expected inflation to average 1.55 percent annually over the next 30 years. By this calculation, market participants in 1999 expected that future inflation would be even lower than actual CPI performance over the previous year.

Few observers believe that inflation will remain this low over the coming decades, even though inflation rates have been low recently. We can compare the results of our quick calculation with a survey of inflation expectations, conducted by the Federal Reserve Bank of Philadelphia. This survey polls well-known professional forecasters about their inflation expectations for the next ten years. On the dates that ten-year IIS were auctioned, the 10-year inflation expectations were: 3.00 percent in January 1997; 2.60 percent in January 1998; and 2.30 percent in January 1999.<sup>15</sup> These figures are higher than our results.

The unreasonably low inflation expectations implied by our quick calculation suggest that there must be something peculiar about the figures that we used. In particular, the "real" yield from the inflation indexed securities, which was used to make the calculations, may be higher than the true real interest rate in the economy.

<sup>15</sup> Federal Reserve Bank of Philadelphia, "Survey of Professional Forecasters," historical data at [www.phil.frb.org/](http://www.phil.frb.org/).

## Why Are Real Yields on IIS So High?

One explanation for unexpectedly high yields may lie in the fact that investors perceive certain risks to holding marketable IIS. Therefore, the government has to offer a higher yield on these instruments in order to attract investors. This extra component of yield is known as a “risk premium.”

It is generally accepted that the nominal interest rate is a combination of the real interest rate, investors’ expectations about future inflation, and a risk premium or premia.<sup>16</sup> Similarly, we can expect that a real yield will incorporate not only investors’ estimates of the real yield in the economy, but also one or more risk premia. (As noted earlier, the real yield does not incorporate expectations about future inflation.)

The risk premium represents a sort of “insurance” of extra yield that investors require as a cushion against the risk of capital losses due to a drop in the price of a bond. Investors may charge a risk premium -- i.e., additional yield -- for any of a number of considerations that could change the price of a bond. These include the possibility of changes to a debt issuer’s ability to make good on the loan. For a nominal bond, investors may also charge a risk premium against the possibility that inflation will be higher than the inflation expectations that have been built into the bond’s nominal, fixed coupon rate.<sup>17</sup>

In the case of marketable IIS, investors may be charging a “liquidity risk premium” in order to insure against the greater “liquidity risk” of indexed securities as compared with nominal Treasury securities. Liquidity risk is the risk that an investor will not be able to find a buyer, at a fair price, on short notice. In these circumstances, the seller might have to offer the bond at “firesale” prices in order to attract a buyer, and might suffer capital losses. To insure against this possibility,

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<sup>16</sup> We can rewrite the Fisher equation for nominal interest rates in order to incorporate the inflation risk premium, as follows:

$$(1 + \text{nominal interest rate}) = (1 + \text{real interest rate}) * (1 + \text{inflation expectations}) * (1 + \text{risk premium}).$$

<sup>17</sup> The “inflation risk premium” is intended to offer a cushion against the possibility that actual future inflation might exceed expectations. If this happened, future nominal interest rates would rise more than expected, and the market price of outstanding bonds would fall, causing capital losses for bondholders. The inflation risk premium is designed to offer a cushion against this possibility.

One of the government’s principal arguments in issuing IIS was that the program would save taxpayers money by capturing the inflation risk premium. In other words, the government, as a borrower, would not have to pay that extra component of yield that represents the inflation risk premium. Risk premia are difficult to measure, because we cannot observe directly any of the components of nominal interest rates -- real yield, inflation expectations, or the different risk premia. Various attempts to measure the “inflation risk premium” have estimated it at between 0.4 percent and 1 percent, depending on the maturity of the bond and the time period under study. (See Hammond, Fairbanks and Durham, “Understanding the Inflation-Risk Premium” in *Handbook of Inflation Indexed Bonds*, Brynholfsson and Fabozzi (eds.), (New Hope PA, 1999.)

Although it is shouldering the risk of higher inflation, the government argues that it has not increased the risk of higher interest payments on public debt. On the contrary, the government argues that it can bear inflation risk better than individuals can for two reasons: (1) the government’s sources of revenue (e.g., taxes) are largely linked to inflation; and (2) the government can spread inflation risk over a much longer time period than can any individual investor. Inflation-linked debt may also impose self-discipline on the government by discouraging inflationary policies.

investors may demand a higher yield, which incorporates a premium for liquidity risk, before they are willing to purchase the security.

The market for IIS is indeed fairly illiquid, and the volume of trading is low, relative to conventional government notes and bonds. An investor who wishes to sell \$50 million in IIS may find that it takes all morning to find a buyer or buyers, and that the sale must be conducted at a price lower than those that were quoted before the \$50 million was put on the block. By contrast, the market for conventional Treasury securities is a liquid one: an investor can buy or sell \$100 million within 30 to 40 seconds, and the trade is not likely to move market prices off their earlier level.

Low trading volume would be consistent with the observation that IIS appear to be more of a “buy-and-hold” instrument than conventional Treasuries are. In other words, investors are buying IIS in order to hold on to them, so they can benefit from inflation protection. These buy-and-hold investors do not seek to sell at the next profitable opportunity, when the price of the security has moved in a favorable direction. (This buy-and-hold characteristic will be discussed later in the paper.) Nor are marketable IIS used for financing in an extensive repurchase agreement (“repo”) market such as exists for conventional Treasuries,<sup>18</sup> although a small repo market for IIS has developed.

#### **Text Box 1**

##### **DEBT IN THE ERA OF BUDGET SURPLUSES**

During fiscal year 1999, the government paid down the privately held marketable debt by an estimated \$100 billion. The Clinton Administration has projected that its proposals for reducing the debt will result in the lowest level of publicly-held debt as a percentage of Gross Domestic Product (GDP) since World War I. Because of a reduced need to borrow, the Treasury Department has already made several adjustments to its market borrowing program. Treasury has, over the past 18 months, discontinued issuing new 3-year notes, and reduced the frequency of 52-week and 1-year bill, 5-year note, and 30-year bond auctions. Treasury has announced that it will auction 30-year IIS only one time per year, down from two per year. Treasury has also announced that it will reduce the auction sizes for most maturities, including those for IIS. The auction size of IIS, which was \$8 billion in most auctions during 1998, was reduced to \$7 billion in most 1999 auctions, and reduced again to \$6 billion in January 2000.

If the government succeeds in reducing publicly held debt, there will be many macroeconomic benefits, such as lower interest rates. This would also present a happy challenge: how to maintain a deep and liquid market for Treasury securities, meaning that investors know they can sell Treasuries quickly and at a fair price. The government does not want to rely on a strategy of reducing the size of new auctions indefinitely, because the new issues would become small and illiquid. If that happened, investors would charge a “liquidity premium” as part of the price of lending the government money. One of Treasury’s key debt management functions is to prevent such a situation, in order to minimize the government’s borrowing costs and save taxpayer dollars. Another problem with low liquidity is that Treasury securities serve as the benchmark for many other markets, such as adjustable rate mortgages that are priced as a “spread” over Treasuries (i.e., an amount in excess of Treasury yields). If Treasury yields and prices were affected by liquidity problems, this could have broad repercussions in financial markets. In August 1999, a committee of private sector advisors to the Treasury Department pointed out that liquidity in the Treasury market was already deteriorating. These advisors noted that a shortage of recently issued securities could save Treasury money in the short run, because demand would raise bond prices and lower yields; however, these benefits would be outweighed by the long-run costs of loss of liquidity and the potential loss of benchmark status.

In order to address these concerns, Treasury has announced a policy of buying back some outstanding debt, and of increasing the frequency with which it reopens other debt issues. Treasury conducted the first debt buyback on March 9, 2000, for \$1 billion in par value. The reopening and buyback proposals are described in the Appendix.

Two other risk factors could cause investors to charge the government “risk premia” that would increase the yield on IIS. First, they may be charging a “political risk premium” to insure against the risk that the U.S. Treasury might discontinue issuing the security altogether. A number of observers have questioned Treasury’s commitment to IIS, given their poor track record with respect to liquidity and the competing need to address declining liquidity in benchmark conventional Treasuries, owing to recent budget surpluses (see Text Box 1).

Second, investors may be concerned that the BLS will somehow change the CPI-U to the detriment of holders of inflation-indexed bonds. This risk has been dubbed “Boskin risk,” after the principal author of a 1996 report concluding that the annual change in the CPI was overstated by as much as 1 percent.<sup>19</sup> Market observers disagree on the extent to which Boskin risk is a factor in the high yields of IIS, given that the BLS has already incorporated a good proportion of the technical changes to the CPI that had been suggested by observers and its own analysts.

Thus, it is possible that investors are demanding a relatively high yield from IIS, in order to compensate for a number of perceived risks associated with this new and controversial instrument. In these circumstances, the yield on IIS cannot be interpreted as a true “real interest rate.”

### **Are Small Savers Buying Inflation-Indexed Securities?**

The high yields on IIS may offer an opportunity for savers who hold them to maturity. Inflation has been low in recent years, but the prudent investor might view this as an opportunity to buy inflation insurance now while at the same time locking in high real rates.

The evidence is that I-Bonds, at least, are starting to catch on with small savers since the I-Bond program was launched in 1998. The same cannot be said for marketable IIS, whether purchased directly from the Treasury Department, or indirectly through mutual funds.

Over \$430 million in Series I-Bonds was issued during the first year of the program, which ended on August 31, 1999. The U.S. Treasury is pleased with these results. During the first six months of the I-Bond program, the average bond sold was more than \$850, more than 8 times the average purchase amount for regular savings bonds. This may imply that assets are being shifted from existing accounts to I-Bond accounts, chasing the relatively higher yields on the latter. That is, some of the investment in I-Bonds may not constitute “new” savings.

The evidence to date is that, at least at auction, marketable IIS are distributed to a broader spectrum of investors than conventional, nominal Treasuries are (see Chart 1).

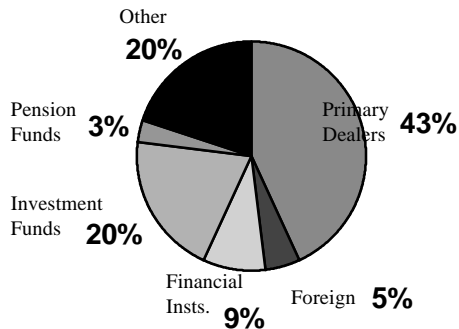
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<sup>19</sup> Michael J. Boskin, Chairman; Ellen R. Dulberger; Zvi Griliches; Robert J. Gordon; Dale Jorgensen, *Toward a More Accurate Measure of the Cost of Living: Final Report to the Senate Finance Committee from the Advisory Commission To Study the Consumer Price Index*, December 4, 1996,

**Chart 1**  
**Distribution of Auction Awards**

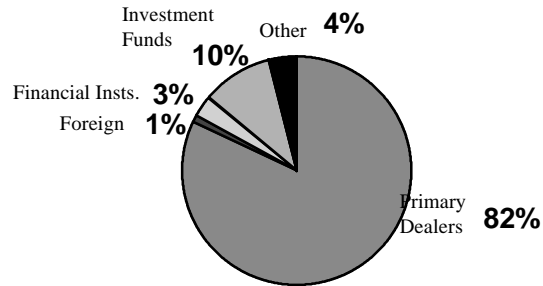
**10-Year Inflation-Indexed Note**

*1/99, 7/99, & 1/00 Auctions*



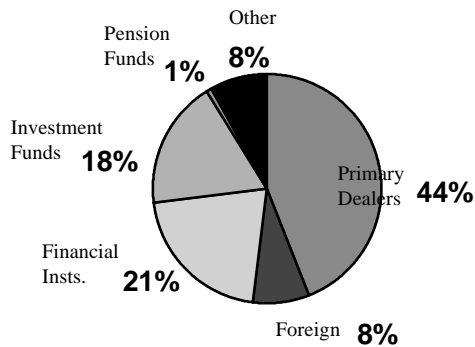
**10-Year Fixed-Rate Note**

*1/99, 7/99, & 1/00 Auctions*



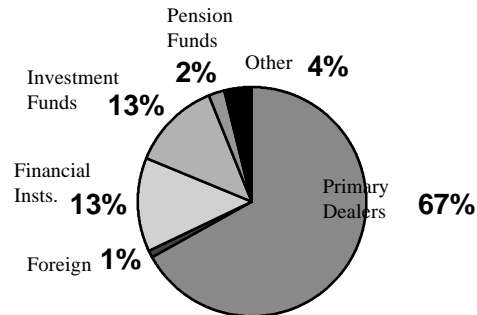
**30-Year Inflation-Indexed Bond**

*7/98, 4/99, & 10/99 Auctions*



**30-Year Fixed-Rate Bond**

*11/98, 2/99, & 8/99 Auctions*



Source: Treasury Department, Quarterly Refunding Charts.

Primary Dealers: about 30 dealers in government securities that are selected by the Federal Reserve Bank of New York. They are expected to make markets in the full range of U.S. Government securities, to participate meaningfully in Treasury auctions, to facilitate the Federal Reserve's open market operations, and to provide the Federal Reserve with information.

Financial Institutions: nonprimary dealers, depository institutions, and insurance companies.

Investment Funds: investment managers, mutual funds, and hedge funds.

Other: individuals, nonfinancial companies, and other financial companies.

The primary dealers have been buying under half of each auction of IIS, compared to their usual share of two-thirds to three-quarters of the much larger auctions of nominal Treasuries of the same maturities. Note that these auction results do not provide any information on subsequent sales of IIS, or who the ultimate holders might be.

These results give tentative support to a conclusion that the demand for IIS is customer driven, rather than trader driven. In other words, customers such as banks, pension funds, investment funds, and individuals appear to be buying a relatively large percentage of each auction of IIS in order to hold on to them in their portfolios. The primary motive of these buy-and-hold customers is probably to achieve the inflation protection afforded by IIS.

By contrast, securities traders buy Treasury bonds in order to sell at the next profitable opportunity, making their profit from changes in the price of the bonds. Inflation protection is a secondary consideration for the traders. In addition, there is a large market for repurchase agreements, or “repos,” involving conventional Treasury securities, but the repo market for IIS is not well developed. Thus, the dealers’ demand for inflation-indexed Treasuries may be driven more by their in-house sales desks than by their trading desks.<sup>20</sup>

Investment funds (a category that includes investment managers and mutual funds) and foreign investors are buying a larger share of the (albeit smaller) auction issuance of IIS. The use of IIS in mutual funds is discussed below. It is likely that some U.S. investment funds and foreign investors are using their auction winnings to pursue purchasing power parity strategies involving the currencies of countries that also issue inflation-linked securities -- mainly Australia, Canada, and the U.K.<sup>21</sup> Pension funds from these countries have also participated in the auctions.

The Treasury data, which come from the initial auctions, do not shed any light on a key question: do the auction winners sell their allotments on the secondary market and, if so, to whom? There is some additional evidence on this issue, although it is far from complete.<sup>22</sup>

Anecdotal evidence on the holdings of large firms can be gleaned only from talking to market participants. This anecdotal evidence suggests that perhaps half of all outstanding IIS end up in the hands of a dozen or so large firms. Some of these may be pension firms. These large firms

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<sup>20</sup> Roger Anderson, “The U.S. Experience,” in *Handbook of Inflation Indexed Bonds*, Brynholfsson and Fabozzi (eds.) (New Hope PA, 1999).

<sup>21</sup> According to the theory of purchasing power parity, the exchange rate between two countries should be the same as the ratio of the price levels of the countries -- at least over the long run. A portfolio of investments consisting of the IIS of two countries can be used to speculate on movements in the exchange rate between the countries.

<sup>22</sup> Treasury’s electronic systems carry little detail on who holds Treasury securities. To understand how Treasury securities are held, it is necessary to know that 99.84 percent of them are held in so-called “book-entry” form. “Book-entry” securities exist as computer records on the books of Treasury, banks, and broker-dealers.

There are two electronic book-entry systems in which one can hold Treasury securities: TRADES and Treasury DIRECT. The TRADES system, which is also known as the “commercial” book-entry system, accounts for over 97 percent of outstanding marketable debt. TRADES is a tiered system: Treasury looks to the Federal Reserve to act as its fiscal agent, and in turn the Federal Reserve maintains electronic records for the large financial institutions that act as securities intermediaries or custodians for investors. These large institutions maintain their own electronic records to identify their customers’ holdings; Treasury cannot access this information. The Treasury DIRECT electronic system can provide us with more detail on individual holdings; however, it accounts for only about 2 percent of outstanding marketable debt. The Treasury DIRECT system allows investors who do not intend to trade their marketable securities to buy them directly from Treasury at auction, thus avoiding the need to pay commissions to banks or government securities dealers. The accounts are managed by Treasury’s Bureau of the Public Debt, which is able to analyze the data -- for example, to determine a breakout between holdings of conventional and inflation-indexed securities.

are unlikely to be dealers, who have difficulty making a profit by trading in an illiquid market. The theory that dealers do not hold large quantities of IIS is supported by the dealers' relatively low participation in IIS auctions, compared with their participation in the auctions of conventional Treasury securities.

The evidence on the issue that interests us, whether individuals are holding marketable IIS, is more solid but still incomplete. Evidence on small saver holdings comes from three sources:

- auction data on noncompetitive bids;
- individual holdings directly with the Treasury through Treasury DIRECT; and
- the size of mutual funds that are dedicated to inflation protection, and TIAA-CREF's inflation-linked bond account.

Noncompetitive bids submitted to Treasury auctions are a very rough proxy for small investor participation in the auctions.<sup>23</sup> Most large institutional investors do not bid noncompetitively because of the \$5 million ceiling that limits the size of these bids, and because of a prohibition on bidding in both the competitive and noncompetitive parts of the same auction. The figures for noncompetitive bids may, however, include bids for under \$5 million from small firms and businesses seeking to hedge inflation risk. Individuals cannot be separated out from the statistics on noncompetitive bids. Neither the U.S. Treasury nor its Bureau of Public Debt collects information on the identity of noncompetitive bidders, beyond names and the relevant account information.

Since the IIS program was launched in January 1997, \$623 million has been awarded to noncompetitive bidders. That this is a relatively small amount can be seen in the fact that it represents only half of one percent of the \$98 billion auctioned since IIS were launched. By contrast, noncompetitive bids have amounted to as much as 5 to 7 percent of the auctions of conventional Treasury securities, where a much greater total amount is auctioned. The figure of \$623 million for noncompetitive bids in IIS auctions also seems small compared to other vehicles for individual savings. For example, \$180 billion in government savings bonds was outstanding on September 30, 1999. Bear in mind also that the figure of \$623 million includes noncompetitive bids tendered by small firms.

Another source of information on holdings of marketable IIS by small savers is the Treasury DIRECT electronic system (see footnote 22). Treasury DIRECT is geared toward small savers

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<sup>23</sup> There are two types of bids in all Treasury auctions: competitive and noncompetitive. Competitive bids amount to over 95 percent of auctions of conventional Treasury securities.

To make a competitive bid, the investor submits a tender specifying a yield expressed to three decimal places (no fractions allowed), and the dollar-amount principal of the security that is desired. The Treasury determines the single lowest yield that will be sufficient to sell the entire announced amount of the security being auctioned. If the yield bid falls at or below the market-clearing yield, the investor will be awarded the security.

Individuals generally choose to bid non-competitively. In a non-competitive bid, the investor specifies the desired dollar value of securities but does not specify a desired yield. Instead, he or she agrees to accept the yield that is determined by the auction. In return, he or she is guaranteed a security because Treasury awards all non-competitive bids at the winning auction yield. Non-competitive bidders may not bid more than \$5 million in a given note or bond auction.

who do not wish to trade their holdings of Treasuries. As of early October 1999, small savers held only \$133 million worth of marketable IIS through Treasury DIRECT, according to the Bureau of Public Debt. By comparison, individuals' total holdings of all types of government securities through Treasury DIRECT were over \$84 billion in October 1999.<sup>24</sup>

### **Small Investor Purchases of Mutual Funds Based on Inflation-Indexed Securities**

Individuals can reduce the complexity of inflation-indexed instruments by holding them through a mutual fund. At this writing, three inflation-linked mutual funds specialize in offering protection against inflation, plus interest income. These funds, offered by PIMCO, Brown Brothers Harriman, and American Century, invest primarily in U.S. IIS. In addition, TIAA-CREF offers an "Inflation-Linked Bond Account," a variable annuity available to savers as well as annuitants.

Note, however, that all mutual funds and variable annuities are marked to market (repriced at their current fair market value) each business day, and this rule is equally applicable to inflation-linked funds. The latter are therefore subject to daily price volatility from changes in the real interest rate, and they cannot guarantee that they will outpace inflation. This is in contrast to an inflation-indexed bond that is held to maturity and consequently has none of the price volatility associated with selling before maturity.

Taken together, the evidence from mutual funds points to fairly weak demand for inflation protection from individuals. The three funds cited above, plus the TIAA-CREF variable annuity account, collectively held about \$218 million in assets at this writing. The CREF annuity accounted alone accounted for about \$135 million of this amount. It must be said that \$218 million is a very small amount in relation to total individual holdings in mutual funds and annuities. This figure is also a small fraction of the total \$92 billion in outstanding issuance of marketable inflation-indexed Treasuries.

The TIAA-CREF annuity account has attracted a respectable, if not stellar, amount of investment when compared to other TIAA-CREF funds.<sup>25</sup> TIAA-CREF has made strong efforts to educate its members about the perils of inflation.

### **What Explains Small Savers' Low Investment in Inflation-Indexed Securities?**

One reason that small investors do not appear to be investing heavily in IIS may be that the dwindling threat of inflation in recent years has reduced their vigilance against the effects of

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<sup>24</sup> Noncompetitive bids for IIS that were made through the intermediary of a broker, or submitted through a Federal Reserve bank, are not generally measured in either the Treasury DIRECT figures or the figures on noncompetitive bids in the auction. Such individual holdings would be held in the TRADES electronic system, not in Treasury DIRECT. As noted, Treasury cannot access detailed information about small savers in the TRADES electronic system. The information on individual savers may grow, however, as increasing numbers of intermediaries are having customers' small competitive and noncompetitive awards delivered in Treasury DIRECT.

<sup>25</sup> At the end of September 1999, some of TIAA-CREF's mutual funds had net invested assets as follows: \$429.4 million for the Growth and Income fund; \$510.3 million for the Growth and Equity fund; and \$210.4 million for the Managed Allocation fund. \$870.7 was invested in the variable annuity Stock Index Account.

inflation. Also, small investors tend to prefer bills and notes with maturities out to five years; Treasury discontinued 5-year IIS after two auctions in 1997.

Additionally, IIS are more complex than regular bonds are, requiring some difficult calculations to verify that one is getting a fair price (see footnote 6). Although the price volatility of IIS makes them unsuitable for people who might have to sell them before maturity (as noted on page 6), it is unlikely that individuals fully understand this characteristic.

Individual investors may also be put off by the fact that taxes are due each year on the previous year's inflation adjustment to the principal of the note or bond -- even though that inflation adjustment will not be received until maturity, when the principal itself is returned to the investor. An individual investor can sidestep this tax obligation by holding IIS in an IRA or 401(k), or by buying I-Bonds instead.

Finally, the strong performance of the stock market, especially in recent years, has not only produced higher nominal returns than those of IIS, but it has also produced higher real returns than IIS have. As Table 2 showed, the real yields on IIS at auction have ranged between about 3.4 percent and about 3.9 percent during the three years since inception. By contrast, the real annual return (capital gains and dividends) on stocks averaged about 7 percent from 1900 to 1995, and this rate was used by the 1994-1996 Advisory Council on Social Security to evaluate alternative proposals.<sup>26</sup> In a 1999 analysis of a Clinton Administration proposal to invest 15 percent of the OASDI trust funds into equities, the Social Security Administration assumed that future investments in equities would earn real annual returns of 6.75 percent.<sup>27</sup>

While high real returns in the current stock market might dampen interest in IIS, this does not mean that they are a bad deal. Most investors understand that stock market returns are highly volatile. Moreover, the strong stock market performance of recent years is no guarantee that high total real returns will continue into the future. Hence, diversification is a welcome quality in most portfolios, even for many that are highly tilted toward equities. Investors who continue to hold stocks and conventional bonds for diversification purposes should find IIS attractive for some of the same reasons. It has been argued that the returns to a derived series for U.S. inflation-indexed bonds would have been negatively correlated with the returns to both stocks and conventional bonds over the past 40 years.<sup>28</sup> Others have found that a one percentage point increase in the rate of unexpected inflation is associated with a decline of more than one percent in bond and stock values.<sup>29</sup> Thus, during periods of unexpected inflation, one would expect the returns to IIS

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<sup>26</sup> Joel Dickson, "Analysis of Financial Conditions Surrounding Individual Accounts," in *Report of the 1994-1996 Advisory Council on Social Security*, volume II, page 484.

<sup>27</sup> Stephen C. Goss, "Long-Range OASDI Financial Effects of the President's Proposal for Strengthening Social Security," Memorandum to Harry C. Ballantyne, Chief Actuary, Social Security Administration, dated January 26, 1999.

<sup>28</sup> Dalio, Raymond T. and Daniel S. Bernstein, "Shifting the Efficient Frontier with Inflation-Indexed Bonds," in Brynholfsson and Fazio (eds.), *Handbook of Inflation Indexed Bonds* (New Hope PA: 1999).

<sup>29</sup> Brown, Jeffrey R., Olivia S. Mitchell, and James M. Poterba, "The Role of Real Annuities and Indexed Bonds in an Individual Accounts Retirement Program," National Bureau of Economic Research, Working Paper No. 7005, March 1999.

to move in the opposite direction of returns to stocks and bonds. This adds diversity to an investor's portfolio.

### **Private sector Inflation-Linked Instruments**

One of the government's goals, when it launched IIS in 1997, was to encourage the private sector to develop new varieties of inflation-indexed financial instruments. The government specifically cited inflation-indexed annuities as a desirable innovation.

During the 1970s, the private sector did make a few failed attempts to offer price-level adjusted mortgages, or "PLAMs." PLAMs did not take off, and the market did not offer any new inflation-indexed instruments until the introduction of Treasury IIS.

Since Treasury's first IIS auction in 1997, more than \$2 billion of inflation-linked bonds and notes have been issued by 20-plus non-Treasury borrowers, including some municipal governments and financial corporations. Most of the issuance, however, was in the months immediately following the first auction of Treasury IIS in 1997.

Some of this inflation-indexed debt from the private sector was structured differently from Treasury's IIS. As described earlier, the principal amount of a Treasury inflation-indexed note or bond grows each month by the most recent CPI figure, and the entire inflation-adjusted principal is paid out at maturity. This means that the principal amount of the funds loaned to the issuer of a single inflation-indexed note or bond continues to grow until maturity, to the point that an uncomfortably large proportion of the lender's (i.e., the investor's) assets could be in the form of a single borrower's debt.

Reportedly, investors were not comfortable with lending to some private sector debt issuers under these circumstances, because of the possibility that a borrower might default on an ever-growing principal balance. Most investors try to diversify their assets so that they are not overly exposed to any single borrower, not only out of prudence but also because asset diversification may be required by state or federal regulation.<sup>30</sup> To address this problem, some private sector debt issuers have structured their inflation-indexed notes or bonds so that the inflation-adjustment is paid out as part of the coupon payment. Under this so-called "current pay" structure, the coupon rate is not fixed; instead, it "floats." This structure is popular with taxable investors, because the extra cash flow can be used to pay the yearly tax obligation on the inflation adjustment to the principal of the note or bond.

Why would a private sector borrower issue inflation-indexed bonds in the current economy, given that, in today's economic environment, it appears that inflation can only rise? The risk to the borrower is that rising inflation would lead to rising nominal coupon and principal payments on debt. While the borrower would not be worse off in "real" terms, many borrowers prefer predictability with respect to their nominal interest (and other) costs.

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<sup>30</sup> With Treasury debt, lenders do not face the same exposure concentration issues, because Treasury's creditworthiness is generally regarded as unimpeachable.

In theory, a corporation might find inflation-indexed bonds an attractive form of liability if its earnings were also correlated with inflation. In such circumstances, inflation-indexed debt could provide a hedge against earnings volatility that is at least partly attributed to inflation. Companies that may fit this characteristic include firms in the fields of pharmaceuticals, food, or energy, or companies with labor contracts that are indexed to inflation.

Borrowers may also be motivated to issue inflation-indexed debt if they believe that future inflation will be lower than the market's expectation. If that turned out to be true, then the future nominal interest costs on inflation-indexed debt would be lower than future nominal interest costs on conventional fixed-rate debt (because the fixed nominal interest rate on conventional debt embodies these supposedly overblown inflation expectations). Governments that have issued inflation-indexed debt have claimed that this aspect of the debt gives them incentive to pursue anti-inflationary policies (although even governments may not be fully able to control inflation).

Another reason that firms have issued inflation-indexed debt is to save money. Some firms found that they could borrow more cheaply by issuing this kind of debt, and then swapping out of it and into fixed rate debt, as compared to the alternative strategy of issuing conventional fixed-rate bonds. As a result, a small market has evolved for CPI swaps.<sup>31</sup> CPI swaps have been used by most of the private sector firms that have issued inflation-indexed debt since 1997.

In addition, some issuers used inflation-indexed debt as a way to issue long-term floating-rate debt. In the U.S. market, most floating-rate debt has a maturity of five years or less. However, the market has accepted inflation-indexed debt with longer maturities.<sup>32</sup>

One disappointment so far, from the government's point of view, has been the market's failure to develop innovative new financial instruments based on inflation indexation. In theory, the introduction of government IIS made it easier for financial firms to issue their own inflation-indexed instruments. By holding a portfolio of Treasury IIS, financial firms can protect themselves against the risk of higher inflation that would be inherent in offering their own inflation-indexed instruments.

Shortly after the introduction of IIS in 1997, the Chicago Board of Trade listed futures and options contracts on marketable IIS. These contracts have traded very thinly, if at all on some days, and the market is regarded as unsuccessful.

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<sup>31</sup> In a CPI swap, one counterparty pays to another the sum of the change in CPI plus a spread. This spread can be quoted either as a fixed amount (e.g., CPI plus a spread of 4 percent), or a spread to the yield of the nearest IIS issue (e.g., the IIS rate plus a spread of 1 percent). The second counterparty pays to the first either a fixed rate or a floating rate (typically the 3-month London InterBank Offer Rate, or "LIBOR"). As with many derivatives, the timing of payments and other specifics of a swap agreement can be structured to meet the specific needs of each counterparty.

<sup>32</sup> Rosen, Schumacher and Casaudoumecq, "Corporate and Agency Inflation-Linked Securities," in *Handbook of Inflation Indexed Bonds*, Brynholfsson and Fabozzi (eds.) (New Hope PA, 1999).

The development of a market for inflation-indexed annuities might be particularly useful, in the view of observers concerned about retirees who live on a partially fixed income. Remember that both Social Security and Supplemental Security Income are shielded from inflation because they are indexed to the CPI. Many retirees, however, supplement Social Security by spending down savings that are not indexed to inflation. For these individuals, an inflation-indexed annuity could help to shield retirement savings from inflation.

Recent proposals to replace part or all of Social Security's defined benefit with a system of individual accounts highlight a potential use for inflation-indexed, or "real," annuities. The current defined benefit offered under the Social Security program resembles a real annuity, because it is indexed to inflation in order to preserve the purchasing power of retirees. Individuals could lose this protection against inflation if part or all of the Social Security benefit were to be replaced with a system of defined contribution accounts. Some proposals for individual accounts would require that the accounts be annuitized at retirement; others would not require annuitization. But retirees will be unable to convert their individual accounts into inflation-indexed annuities, either voluntarily or under compulsion, if inflation-indexed annuities are not widely and easily available.<sup>33</sup>

The U.S. market for inflation-indexed annuities is minuscule. Only one inflation-indexed annuity is currently available --- from TIAA-CREF. A second inflation-indexed annuity had been offered in the U.S. market from May 1994 to July 1997 by the Interstate Assurance Company, a division of the Irish Life Company of North America. Interstate discontinued this product due to extremely low demand.

One possible reason for the lack of consumer interest is the fact that inflation is currently so low. This happy circumstance reduces retirees' concern about inflation. In addition, low inflation translates into low nominal returns on inflation-indexed annuities, especially when compared with the high nominal returns that are currently available from equity-based annuities. Jeffrey Brown, Olivia Mitchell and James Poterba found that a variable-payout annuity, with payouts linked to the returns on a portfolio of equities, would be more attractive to many consumers than an inflation-linked annuity would be.<sup>34</sup> Not only the nominal returns but also the real returns on equities have outpaced those on IIS, at least historically. The higher real returns on equities more than compensates potential annuitants for any inflation risk.

The higher equity returns may, however, be more volatile than are the returns to IIS. Additionally, Brown, Mitchell and Poterba report that the real returns to equities may move in the

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<sup>33</sup> Although it is beyond the scope of this paper, there would be additional costs associated with annuitizing individual accounts. See, for example, Poterba, James M., and Mark J. Warshawsky, "The Costs of Annuitizing Retirement Payouts from Individual Accounts," National Bureau of Economic Research, Working Paper No. W6918, January 1999.

<sup>34</sup> Brown, Jeffrey R., Olivia S. Mitchell, and James M. Poterba, "The Role of Real Annuities and Indexed Bonds in an Individual Accounts Retirement Program," National Bureau of Economic Research, Working Paper No. 7005, March 1999.

opposite direction from unexpected inflation, particularly in the short run. It is also true that the historical record is not a reliable predictor of future performance.<sup>35</sup>

Another reason that the market for inflation-indexed annuities has been slow to develop is the fact that the market for individual annuities of all varieties remains fairly small in the United States. The phenomenon of “adverse selection” may be a primary explanation for the small size of the annuities market. Adverse selection occurs because individuals who voluntarily purchase annuities tend to live longer than average. These voluntary annuitants know that they are in good health, and they understand that the annuity is likely to be a fair deal for them. By comparison, someone in poor health understands that he or she might die before receiving many annuity payments. Accordingly, insurers price annuities higher than they would for a population with a more average lifespan.

As TIAA-CREF points out, even its account does not attain the “holy grail” of inflation protection for retirement. In fact, the CREF account has, to date, trailed inflation somewhat. This is due to the structure of this and other variable annuities, combined with the low real return on inflation-indexed bonds.<sup>36</sup> According to TIAA-CREF, the only way to ensure that variable-annuity holders can keep pace with inflation would be to find assets that offer a high total *real* return in excess of expenses (i.e., a return of over 4 percent). Such assets do not yet exist, however.<sup>37</sup>

## Conclusion

With the introduction of government inflation-indexed notes and bonds in 1997, individuals can now protect the principal value of their investments from inflation. Additionally, the income stream of coupon payments is protected from inflation. As noted, however, this inflation protection is not guaranteed if the investor needs to sell a bond or note before it matures.

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<sup>35</sup> *Ibid.*

<sup>36</sup> Like most variable annuities, the TIAA-CREF annuity sets the payout in the first year based on a standard assumed interest rate, or “AIR.” TIAA-CREF uses a conservative AIR of 4 percent, the same one used for its other annuities, in order to make it easier for individuals to convert from one annuity to another. In subsequent years, the payout depends on the performance of the underlying assets, in this case, the IIS. The second year’s payout is increased or decreased, depending on whether the underlying assets chosen by the annuitant increased more or less than 4 percent during the first year. Stock accounts regularly exceed 4 percent per year, but IIS do not.

TIAA-CREF provides the following example. Assume that inflation-indexed securities offer a real rate of return of 3.3 percent, account expenses are 0.3 percent, and the AIR is 4 percent. The result is that the second and subsequent years’ annuity income will always trail inflation by 1 percent. To see this, if inflation is 3 percent in the first year, then in the second year the nominal payout will rise by 2 percent (3.3 percent real return + 3 percent inflation - 4 percent AIR - 0.3 percent expenses). This represents a decrease in real income of 1 percent (the difference between 3 percent inflation and the 2 percent payout increase).

Source: P. Brett Hammond, “Using Inflation-Indexed Securities for Retirement Savings and Income: The TIAA-CREF Experience,” in *Handbook of Inflation-Indexed Bonds*, Brynjolfsson and Fabozzi (eds.) (New Hope PA, 1999).

<sup>37</sup> TIAA-CREF suggests that this 4 percent goal could be achieved by combining equities with the coupon payments (known as “STRIPS”) from inflation-indexed securities. Currently, however, the inflation-indexed STRIPS market is nonexistent.

The market for inflation-indexed notes and bonds has been slow to develop, and it remains fairly illiquid. Moreover, the private sector has not yet developed a viable market for other inflation-indexed products, such as annuities. Such annuities would be particularly useful if the Social Security system moved from a defined benefit program to one that relies partially, or entirely, on individual accounts.

The recent performance of the stock market may be the single biggest reason why individuals are not buying IIS. In recent years, equities have offered a far higher return than IIS do, even if equities fall short as an inflation hedge because they are not well correlated with unexpected inflation. In fact, bond mutual funds of all varieties have lost a great deal of individual investment to the stock market. It may also be that investors are simply less concerned about inflation these days because annual inflation has run below two percent since 1997.

Institutional investors may also be deterred by lack of liquidity in the secondary market for IIS. Low liquidity means that it may be difficult to buy or sell a large block of these securities quickly, or at a fair price. (For the individual seeking to sell a few thousand dollars of notes or bonds, lack of liquidity is not a problem.)

In addition, IIS have a complex structure that some individuals may find difficult to understand. Moreover, the investor owes annual income taxes on the inflation adjustment to the principal of marketable IIS even though this principal will not be paid out until maturity. This “phantom income” problem can be overcome by holding IIS in an IRA or 401(k), or in a mutual fund. Alternatively, one can defer taxation until redemption (or for 30 years, whichever comes first) by buying I-Bonds instead of marketable IIS.

The Clinton Administration has announced its commitment to continue issuing IIS. This is despite the fact that projected budget surpluses may require the government to cut back on the issuance of certain types and maturities of government debt.

What will it take for the inflation-indexed market to develop? Although one would certainly not hope for it, a pickup in the inflation rate would likely raise awareness of the ravages of inflation. Additionally, the introduction of individual accounts would probably increase interest in inflation-indexed annuities.

Finally, this financial instrument is only three years old. As the Treasury Department continues to issue more inflation-indexed debt every quarter, the market may become more liquid. Additionally, familiarity with the instrument, among both investors and debt issuers, will likely increase.

## **APPENDIX: BACKGROUND ON INTEREST-BEARING SECURITIES**

The federal government issues marketable notes and bonds in order to borrow from the general public. When an investor buys a Treasury note or bond from the government, he or she is lending the government money.

Treasury **notes** have a maturity of one year but not more than ten years. Treasury **bonds** are long-term obligations with a maturity of more than ten years. Currently, Treasury issues marketable notes with a maturity of 10 years and marketable bonds with a maturity of 30 years.

Conventional marketable notes and bonds are issued with a fixed **principal** amount, also known as the “**par**” or “**face**” **value**. This principal amount represents the amount that the investor lends to the government: the investor “pays” the government the principal amount when he or she buys the security, and the principal amount is returned to the investor when the security matures.

Treasury notes and bonds also carry a **coupon rate**, which is the annual interest rate that is paid on the security’s face value. The coupon rate is what the investor earns in return for lending money to the government. Treasury notes and bonds are known as **fixed-income securities** because the coupon rate is fixed for the life of the security. Although the fixed coupon rate is stated in annual terms, Treasury notes and bonds actually make semiannual **coupon payments**. Each coupon payment is calculated as half of the stated annual coupon rate, multiplied by the principal amount.

A security’s **yield to maturity** (or **yield**) is a convenient single measure for comparing securities that have different maturities and coupon payment schedules. For our purposes, yield consists of two parts: (1) the discounted income stream from the note or bond, including all coupon payments and the principal payment at maturity; and (2) any capital gains or losses. The capital gains or losses represent the difference between the price at which the bond or note is purchased, and the price at which it is sold before maturity, or redeemed at maturity.

A note or bond is said to be bought at a **discount** when the price paid is below the face or par amount. A security is bought at a **premium** when the price paid is higher than the face amount.

Investors who are choosing between different securities will do so on the basis of yield, not on the basis of the coupon rates. A security’s yield generally differs from its coupon rate, because yield also includes capital gains or losses. Capital gains are the means by which the yield changes, because the coupon rate is fixed for the life of the security. The capital gains on a bond change when the market price of the security rises or falls (just as with capital gains on equities).

In particular, the yield and market price of a security that is offered for sale will change in response to changes in the general level of interest rates in the economy. For example, if general interest rates rise, then the yield on an outstanding security will rise, and its market price will fall. This is because potential buyers are familiar with the general level of interest rates. These

potential buyers know that other sellers are offering bonds of similar characteristics at the higher yield that prevails in the economy as a whole. An individual bondholder who wishes to sell must drop his or her selling price, in order to increase capital gains and raise the security's yield to a higher, more competitive level. If a bondholder refuses to drop his or her price, then potential buyers will make their purchases elsewhere.

In general, the **secondary market price** of a bond or note reflects the **discounted present value** of the security's future income stream, including all coupon payments and capital gains or losses.<sup>38</sup> The discount rate "r" is the same as the security's yield. The yield will have to be competitive with general market interest rates, as noted above, if the security is to be sold. The yield on an individual security may also include one or more risk premia, such as a credit or liquidity risk premium, as described in the main body of this report. There may be other adjustments to the yield for taxes or market demand, but these are beyond the scope of this paper.

## DURATION

The concept of **duration** explains why, for a given change in market interest rates, the market price of some bonds will change more than that of other bonds. Bonds such as IIS are said to have a "long" real duration. This means that their market price may be more volatile, with respect to a change in the real interest rate, than is the market price of a conventional bond of a similar maturity.

The "long" duration of an IIS stems from the fact that much of its income stream is backloaded, as compared to a conventional note or bond. This is because the principal payment at maturity reflects rising indexation for inflation over the course of 10 or 30 years. Moreover, coupon payments rise through the life of the inflation-indexed note or bond, because the coupon payments are calculated by applying the fixed real "coupon" rate to a principal amount that is constantly adjusted for rising inflation. Duration can be represented mathematically as a measure of the average length of time the bondholder has to wait for all payments of coupon and principal.

For a given discount rate, the present value (market price) of a backloaded income stream will be relatively lower than the present value of the income stream from a conventional bond, which is distributed more evenly over the near and middle periods. This is because payments that are received farther into the future have a lower present value than that of payments received closer to today.

A change in the real discount rate -- say the real market interest rate rises from 2 percent to 4 percent -- will produce change in present values of both the backloaded and conventional income streams. This is because both instruments must now be priced so as to yield 4 percent (real) to maturity, and a bond's yield rises through the mechanism of a fall in its market price (which

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<sup>38</sup> The standard formula for present value (PV) is:

$$PV = FV/(1+r)^n$$

where FV is future value, r is the discount rate or yield, and n is the number of periods until maturity.

causes higher capital gains at maturity, as explained earlier). The new bond price (the present value discounted at 4 percent) of the backloaded income stream will represent a *larger percentage change* from the initial bond price (its original present value, discounted at 2 percent) of that stream, as compared to the more evenly distributed income stream.<sup>39</sup>

The larger percentage change is due to the phenomenon whereby the present value of a distant payment is more affected by a change in the discount rate, as compared to the present value of a closer payment (even if the absolute change in present value is smaller). This is the same as saying that for a given change in the general level of real interest rates in the economy, the market price of an IIS will change more, as a percentage of the original market price, than will the price of a conventional note or bond of the same maturity.

A key issue for determining the severity of price volatility is whether or not the real interest rate itself is more or less volatile than the nominal interest rate. Recall that the nominal interest rate is a combination of the real rate and inflation expectations, plus any premia for risk. Academic opinion appears to differ on this issue; however, since IIS were issued three years ago, their price volatility with respect to changes in the real yield has been lower than that of nominal bonds.

## TREASURY AUCTIONS

Any firm or individual may submit a bid in a Treasury **auction** directly to a regional Federal Reserve Bank or to the Treasury, or indirectly through a dealer. Bidders can also submit their bids by paper, phone, facsimile (fax), or electronically through the Treasury Automated Auction Processing System (“TAAPS”). In recent auctions, TAAPS has accounted for 90 percent or more of the dollar volume of bids. Individuals can also submit bids electronically through Treasury DIRECT.

There are two types of bids in all Treasury auctions: competitive and noncompetitive. Competitive bids account for the overwhelming majority of auction bids. In the April 1999 auction of 30-year IIS, over 99 percent of bids were submitted on a competitive basis.

To make a **competitive bid**, the investor submits a tender specifying a yield expressed to three decimal places (no fractions allowed), and the dollar amount principal of the security that is desired. The Treasury determines the single lowest yield that will be sufficient to sell the entire announced amount of the security being auctioned. If the investor submitted a yield bid that was lower than the accepted yield, or at the accepted yield, then the investor will be awarded the security. Competitive bids will be rejected if the yield bid is higher than the accepted yield. If a competitive bid is made exactly at the accepted yield, the investor may not be awarded the full amount that he or she bid, if the result would exceed the dollar amount offered in the auction.

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<sup>39</sup> At a 4 percent interest rate, the present value of \$1 received in 5 years is \$0.82193, and the present value of \$1 received in 10 years is \$0.67556. Suppose that the general level of interest rates rises to 8 percent. The present value of \$1 received in 5 years is now \$0.68058, which is an absolute change of -\$0.1414 and a percentage change of -17.2 percent. The present value of \$1 received in 10 years is now .46319, which represents an absolute change of -0.2124 and a percentage change of -31.4 percent.

For example, in the April 1999 auction mentioned above, people who bid exactly at the winning yield of 3.899 percent were only awarded 24 percent of the dollar amount for which they bid.

Accepted bids (all competitive plus noncompetitive bids) usually amount to slightly over half of all tenders at Treasury auctions.

While **noncompetitive bids** account for a very small percentage of any Treasury auction, individuals generally choose to bid noncompetitively. In this type of bid, the investor specifies the desired dollar value of securities but does not specify a desired yield. Instead, he or she agrees to accept the yield that is determined by the auction. In return, he or she is guaranteed a security because Treasury awards all noncompetitive bids at the auction yield. These bids can be made over the Internet (through “Treasury DIRECT”), by phone (through “Buy Direct”), or in paper form directly at a regional Federal Reserve Bank.

In many auctions, the winning yield does not exactly match the new security’s coupon rate. This is because the market-clearing yield was expressed to three decimal places, while the coupon rate was expressed in increments of 1/8. The difference between the two will be capital gains or losses that are reflected in the **settlement price** of the security -- the price that auction winners pay to the government in order to purchase the note or bond being auctioned. In the April 1999 auction mentioned above, the settlement price was \$99.578 for every \$100 awarded. This means that auction winners had to give the government \$99.578 for every multiple of \$100 of IIS they purchased. The settlement price was calculated to produce a yield to maturity of exactly 3.899 percent (recall that this was the winning auction yield) on the investment of \$99.578. The capital gains are the difference between \$99.578 and \$100 in principal received when the bond matures.

The auction calculations are all performed at Treasury’s Bureau of the Public Debt. After auction closing time (generally 1:00 p.m. on the day of the auction), the calculations of winning yield, coupon rate, and auction awards are usually completed in about half hour, although Public Debt allows itself 1 hour. The government holds about 150 debt auctions each year.

About 7 to 10 days before a given auction, the Treasury announces specifics of the auction, including the important information of how many billions are to be offered. Treasury has determined how much to offer of each type of marketable security after examining its own financing needs and consulting with a volunteer group of leading market participants (the “Borrowing Advisory Committee”). During the week or so between the auction announcement and the actual auction, there is active trading in the not-yet-issued securities. This is called the “when-issued” market. When-issued trading permits price discovery and reduces uncertainty surrounding how to bid at an auction. Market participants can view both when-issued and secondary market trading, on a real-time basis, through subscriber-based computer terminals such as GOVPX or Bloomberg.

All Treasury auctions of notes and bonds, including marketable IIS, are conducted on a yield basis. This means that competitive bidders submit tenders specifying the yield (to three decimal places) and the amount they wish to purchase of the security being auctioned.

From the early 1970s until recently, the method for selling Treasury marketable securities had been multiple-price auctions. In a **multiple-price auction**, the Treasury ranks the yields that are bid from the lowest yield to the highest yield required to sell the amount offered to the public. Competitive bidders whose tenders are accepted pay the price equivalent to the yield that they bid.

In 1992, Treasury began conducting **single-price auctions** -- where all auction winners pay the same market-clearing yield -- for 2- and 5-year notes. Treasury has used single-price auctions for IIS since their inception in 1997. Treasury believes that single-price auctions have several advantages, including encouraging auction participants to bid more aggressively because they can avoid the “winner’s curse.” This occurs in a multiple price auction when a winning bidder pays a higher settlement price than other auction participants do (he or she bid a yield that was below the market-clearing yield), so that any subsequent sale would incur capital losses. Moreover, the absence of a “winners curse” penalty for bidding a high yield reduces the importance of specialized knowledge of the market, and hence the costs of collecting market information. In theory, this should help broaden the market.

### **DEBT BUYBACKS AND REOPENINGS**

If Congress and the Administration are able to realize the budget surpluses that have been forecast for the coming years, then there would be an opportunity to reduce the publicly held debt greatly. This would bring many macroeconomic benefits, such as lower interest rates and increased investment for private-sector uses.

Reducing the publicly held debt would also present a happy challenge: how to maintain a deep and liquid market for Treasury securities. If the market for these securities were to become small and illiquid, then investors would charge a “liquidity premium” as part of the price of lending the government money. One of Treasury’s key debt management functions is to prevent such a situation, in order to minimize the government’s borrowing costs and save taxpayer dollars. In August 1999, a committee of private sector advisors to the Treasury Department pointed out that liquidity in the Treasury market was already deteriorating. These advisors noted that a shortage of recently issued securities could save Treasury money in the short run, because demand would raise bond prices and lower yields; however, they added, these benefits would be outweighed by the long-run costs of loss of liquidity and the potential loss of benchmark status.

In order to address the problem of declining liquidity, Treasury has reduced the number of longer-term debt auctions by one-third, from 39 to 26 auctions per year, while keeping auction sizes relatively constant. In February 2000, Treasury announced that it would also start to reduce the auction sizes of longer-maturity debt. Second, Treasury has cut the size of short-term bill auctions by almost a quarter, from an average of almost \$20 billion 1996 to just over \$15 billion in 1999, while maintaining the same number of auctions. The auction frequency of one-year bills was also reduced starting in March 2000, and Treasury is considering eliminating the one-year bill completely. Issuance of IIS will also be affected by these across-the-board cutbacks: Treasury announced recently that it would issue only one 30-year IIS per year (down from two issuances per year), and that it would most likely make further modest reductions in the size of the

semiannual auctions of 10-year IIS. The January 2000 auction of 10-year IIS was for the amount of \$6 billion, for example.

In addition, Treasury announced in August 1999 that that it would consider two additional measures: “buying back” older securities, and regular “reopenings” of note and bond auctions. The principal goal of both these measures is increasing the liquidity of recently auctioned debt (“on-the-run” securities), and reducing the size of older issues (“off-the-run” securities). The more recently auctioned Treasuries are generally the ones that serve as benchmarks for other financial instruments. Older issues tend to be less liquid for reasons that the government can’t control: mainly, investors have socked them away in their portfolios and do not intend to sell.

The **“buyback” program** generated considerable press. In August 1999, Treasury issued for public comment a proposed auction mechanism through which the government could buy back its own debt. The buyback rules were finalized in January 2000. The main goal of the program is to buy back older issues of Treasuries, in order to free up money to hold larger auctions of new issues than would otherwise be possible. The buyback program will cost money in the short term: because interest rates have fallen in recent years, the government would have to buy back older securities at a premium. OMB has decided to treat the payment of premia as a “means of financing” rather than as a budget outlay. There would be interest savings going forward, however.

Treasury has announced plans to buy back up to \$30 billion in debt this year. Treasury conducted the first buyback, for \$1 billion par value, in March, 2000. The initial buyback operations were intentionally small in scale, to allow the market and the Treasury to gain experience with the reverse auction process.

In February 2000, Treasury announced the adoption of a regular reopening schedule for 5-, 10-, and 30-year debt. When Treasury **“reopens” a security**, it holds an auction to issue additional amounts of a security that has already been auctioned before. Although Treasury has not routinely reopened conventional notes and bonds, it has reopened most IIS auctions in order to add liquidity to the IIS market. For example, Treasury auctioned a 10-year IIS in January 1999, then “reopened” the same security at an auction in July 1999. Both auctions were for the same security, a 10-year note set to mature in January 2009, and carrying an annual coupon rate of 3.875 percent. The yields were different in the two auctions, however, reflecting the fact that market interest rates had changed in the intervening period and that the security was shortly due to make its first semiannual coupon payment.

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