ABSTRACT

This paper will attempt to answer the question of how much, if any, of an investment fund's portfolio should be strategically allocated to Treasury Inflation Protected Securities (TIPS). Specifically, the paper will evaluate the implications of dedicating specific amounts of a fund's long-term bond allocation to TIPS.

DEFINITION OF INFLATION-LINKED BONDS

Unlike traditional bonds, inflation-linked bonds offer a guaranteed return over inflation, if held to maturity. The yield for a traditional government bond is comprised of three components: the expected rate of inflation, the inflation risk premium, and a premium over inflation (the "real" yield). Because inflation-linked bonds eliminate the risk associated with uncertainty over inflation, their yield does not include an inflation risk premium. Consequently, the yield provided by an inflation-linked bond will be comprised of the "real" yield and the market's expectation for inflation.

History of Inflation-linked Bonds

The U.S. government first issued Treasury Inflation Protected Securities (TIPS) in 1997. However, several other countries had issued inflation-linked bonds prior to this. The UK first issued "Linkers," as they are commonly called, in 1981. Inflation-linked bonds represent roughly 20% of total public debt in the UK. Further, UK pension plans held half of their fixed income investments in inflation-linked bonds at one time.[1] Australia and Canada followed suit in 1985 and 1991, respectively. More than twenty countries now offer some form of inflation-linked bonds. Though the mechanics differ, the concept is the same: a guaranteed return over inflation.

All of these governments introduced inflation-linked bonds during periods of declining inflation. Therefore, there is little historical basis for measuring how inflation-linked bonds have performed during periods of rising inflation. Models have been developed to replicate how inflation-linked bonds would have performed historically had they existed in the U.S. market, but data produced from these models is unreliable.

U.S. TIPS

With one important difference, TIPS are identical to traditional U.S. Treasury securities. Traditional U.S. Treasuries pay a specified rate of income and return par value at the maturity date. TIPS also pay income and return the owner's principal at a stated maturity date. However, the principal value and coupon income for TIPS is adjusted to reflect the effects of inflation, as measured by the Consumer Price Index (CPI-U). The inflation rate used is the monthly rate experienced three months prior. As with ordinary Treasuries, the full faith and credit of the U.S. government backs TIPS.

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[1] Source: Roger Bootle, "Index-Linked Gilts: A Practical Investment Guide"

Other Inflation-Linked Bonds

Federal governments are not the only issuers of inflation-linked bonds. In the UK, perhaps the most mature market for inflation-linked bonds, there were eighty-eight inflation-linked issues outstanding as of July 2003. Only eleven of these bonds were government-issued.

Since the first TIPS issuance by the U.S. Treasury, other entities began to issue inflation-linked bonds in the U.S. Through mid-2003, the list included two federal agencies (Freddie Mac and the Tennessee Valley Authority), eleven states or municipalities, and eight financial service companies (e.g., JP Morgan Chase, Lehman Brothers). Most of these issues were under $100 million, limiting their liquidity. Though these issues are dwarfed in size by the TIPS market, their evolution provides evidence that the market for inflation-linked bonds in the U.S. is continuing to grow.

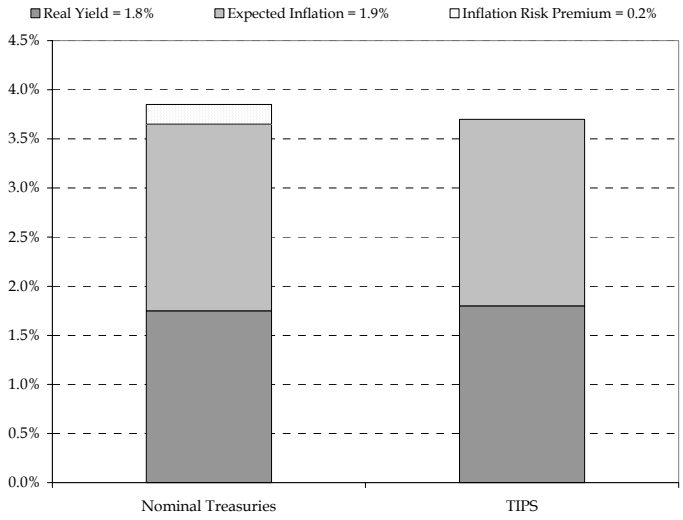
CHARACTERISTICS OF TIPS

Expected Returns

The expected return for a traditional Treasury bond is comprised of three components: the expected rate of inflation, the inflation risk premium, and a premium over inflation (the "real" return). The simplest way to estimate the return for TIPS is to add the "real" yield on TIPS to the market's expectation for inflation.

For example, on June 30, 2003, the real yield for 10-year TIPS was approximately 1.8%. Based on the 3.9% rate offered by nominal Treasuries (10-year zero coupon), this implies that the market expected inflation of 1.9% (assuming the inflation risk premium is twenty basis points) over the next ten years. By adding the 1.8% real yield to the 1.9% expectation for inflation, we arrive at a projected average annual return for TIPS of 3.7% versus 3.9% for nominal Treasuries (see chart below).

Expected Return of Treasuries vs. TIPS



The existence and value of an inflation risk premium for nominal bonds is an important factor in determining the expected return for inflation-linked bonds. If an investor perceives the inflation risk premium to be zero, then inflation-linked bonds will have the same expected return as nominal bonds of the same maturity. Further, all else being equal, a low inflation risk premium means that TIPS are inexpensive relative to Treasuries.

When investors perceive a period of inflation on the horizon, they will likely bid up prices for inflation-linked bonds relative to conventional bonds. In so doing, they will drive up the inflation risk premium. Conversely, when investors perceive a period of disinflation or deflation, they will drive down the inflation risk premium, possibly making it negative. Finally, when inflationary *uncertainty* appears high, the inflation risk premium will increase.

When TIPS were first issued, various academic studies were conducted to estimate the long-term inflation risk premium. The resulting estimates were generally between forty and sixty basis points.[2] However, the actual inflation risk premium has varied widely since the market's inception, becoming negative at times (representing a discount).

Because of its longer history, the UK market may offer a better example of how the TIPS market will behave in the U.S. As noted previously, the UK introduced inflation-linked bonds during an extended period of declining inflation. Inflation-linked gilts lagged the returns of conventional gilts during this period. This may serve as sufficient evidence that an inflation risk premium exists and is clearly discernable over the long term. Alternatively, it may be due to lower demand for inflation-linked bonds vis-à-vis conventional bonds, due to a perceived lack of inflationary pressure.

There were some periods when inflation-linked bonds outperformed in the UK. For example, inflation-linked gilts outperformed conventional gilts during the two and one-half year acceleration in inflation that began in 1988.[3] This appears to support the premise that investors are attracted to inflation-linked bonds in periods of emerging inflation.

Globally, the inflation risk premium has gradually shrunk for countries that have issued inflation-linked bonds. This has been due to either a steady secular decline in inflation, or a widespread outlook that inflation will stay low or decline.

The above data implies that an inflation risk premium does exist, but that it varies widely according to market sentiment. Intuitively, the concept of an inflation risk premium is reasonable, as it represents a "cost of insurance" against inflation. Because the inflation risk premium has varied so widely in the U.S. and abroad, estimating its long-term value is very difficult. However, by combining the market's current inflationary expectations with the theoretical premium predicted by academic research, we are able to estimate the inflation risk premium. Hence, as of June 30, 2003, we estimated the inflation risk premium to be twenty basis points (0.2%). That is to say, we expect TIPS to return twenty basis points less than nominal Treasuries over long time periods.

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[2] Source: Brett Hammond and Andrew Fairbanks, "The Inflation Risk Premium;" Campbell and Shiller, "A Scorecard for Indexed Government Debt;" Christopher Good, "The Inflation Risk Premium in Government Bond Returns"

[3] Source: Merrill Lynch

Volatility

Investors' expectations for inflation can vary across time, resulting in substantial swings in the attractiveness of TIPS. Because TIPS are marked-to-market daily, prices for TIPS will fluctuate with market sentiment. Hence, it is possible for TIPS to experience a negative annual return, even if inflation is positive.

In real (inflation-adjusted) terms, TIPS represent the risk-free asset, and therefore would possess a real volatility equal to that for cash. However, most optimization models are run in nominal terms, and most institutional investors set their expected return and risk goals in nominal terms. Therefore, we must estimate the volatility for TIPS in nominal terms.

The volatility for UK inflation-linked gilts was much lower than for conventional gilts during the first fifteen years of the market, as shown in the table below:[4]

Annualized Standard Deviation (1982-1996)

Maturity	Conventional Gilts	Inflation-Linked Gilts
Less than 7 years	4.6%	3.9%
7 to 15 years	9.7%	6.6%
Over 15 years	11.8%	8.4%

More recently, however, inflation-linked gilts exhibited higher volatility than conventional gilts. Since January 1997, inflation-linked gilts exhibited a 5.1% annualized standard deviation versus 4.7% for conventional gilts.

Since inception in 1997, TIPS have exhibited a level of volatility similar to that of nominal Treasuries (4.5% standard deviation), and they have been more volatile than the broad bond market. This result is likely due to the nature of the time period measured, as 2000 through 2002 saw a widespread "flight to quality" by investors that inflated the returns and volatility of U.S. Treasury bonds, including TIPS.

Because prices for TIPS are subject to the movement of (nominal) interest rates, their returns should be more volatile than those of cash. However, because TIPS provide a hedge against inflation, their returns should be less volatile than nominal bonds. Therefore, we set the expected annual standard deviation for TIPS at 300 basis points more than cash and 100 basis points less than nominal Treasuries.

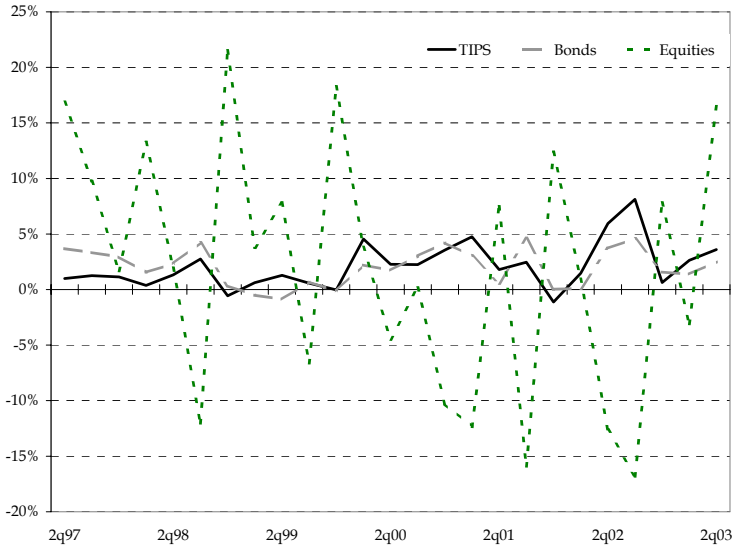
Correlations

The correlation between TIPS and other asset classes will vary through time. However, in most environments, TIPS are negatively correlated with equities and only modestly correlated with nominal bonds. Over long time horizons, TIPS should exhibit a positive correlation with inflation. Conversely, nominal bonds are usually negatively correlated with inflation since their returns are inversely related to changes in interest rates and inflation.

[4] Source: Mark Deacon and Peter Andrews, "The Use and Value of Index-Linked Bonds"

Stocks tend to be negatively correlated with inflation in the short-term and positively correlated with bonds. Hence, it is logical that TIPS should not be highly correlated with stocks or bonds.

The chart below shows the quarterly returns for TIPS, investment grade bonds, and public equities since 1997. Through June 2003, the return pattern for TIPS was similar to that for investment grade bonds, but quite different from domestic equities.



A regression analysis over the brief period from their inception shows that TIPS have not been highly correlated with investment grade bonds or public equities on a monthly basis (see correlation matrix below). Still, the correlation between TIPS and nominal bonds may be high over short-term periods. This is because short-term movements in nominal and real yields tend to be similar, and changes in real yields will dominate inflation-indexed bond returns in the short-term.

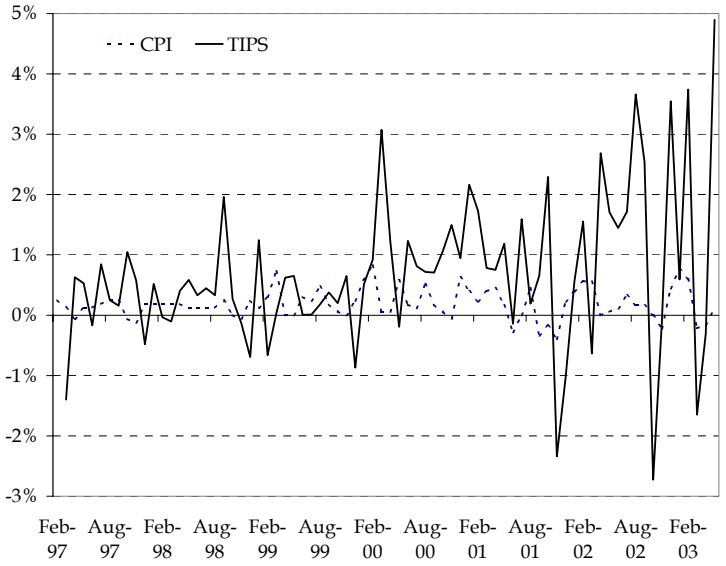
Correlation Matrix (1997 – 2003)[5]

	TIPS	Bonds	Stocks	Inflation	Yield Changes
TIPS	1.00				
Bonds	0.66	1.00			
Stocks	-0.24	-0.11	1.00		
Inflation	0.13	0.14	-0.07	1.00	
Yield Changes	-0.64	-0.87	0.28	-0.04	1.00

[5] Represents the period from March 1997 through June 2003. TIPS are measured as the Merrill Lynch TIPS index; Bonds are measured as the Lehman Aggregate index; Stocks are measured as the Wilshire 5000 index; Inflation is measured as the year-over-year change in the CPI-U; Yield Changes are measured as the monthly change in the Ibbotson U.S. Government intermediate-term yield series.

Also of note from this table is that, on a monthly basis, TIPS are not highly correlated with inflation. This is because a rational investor would value TIPS based on his *expectations* for inflation, which may differ from current inflation. Hence, the returns for TIPS will not necessarily track the change in inflation over short time periods (see chart below). However, over longer time periods, TIPS will provide a guaranteed return over inflation.

Monthly TIPS Returns vs. Inflation



Return Behavior in Various Environments

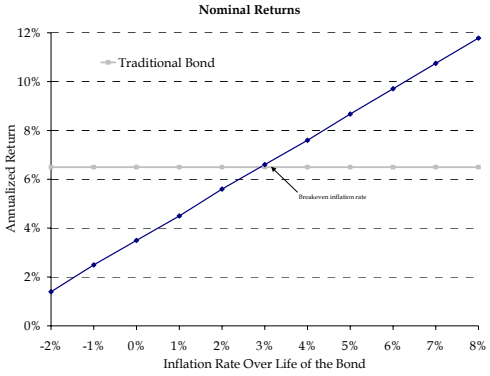
The limited history of the inflation-linked bond market prevents investors from accurately determining how they would have performed in each of the many economic scenarios that investors will face in the future. However, the characteristics of inflation-linked bonds allow investors to predict how TIPS should perform relative to other asset classes in various economic environments. The table below shows how we anticipate TIPS, nominal bonds, and equities will perform relative to each other in a variety of environments.

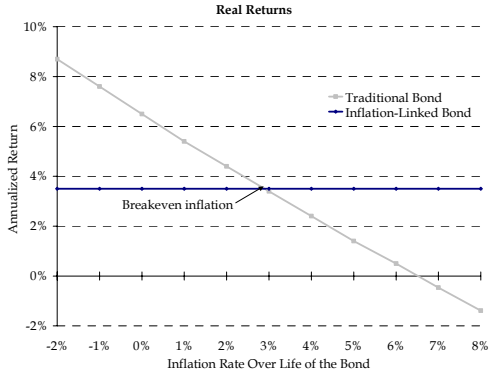
Environment	TIPS	Nominal Bonds	Equities
Increasing inflation:			
High growth	*Outperform*	*Underperform*	*Neutral*
Low growth	*Outperform*	*Underperform*	*Underperform*
Disinflation/deflation:			
High growth	*Underperform*	*Neutral*	*Outperform*
Low growth	*Underperform*	*Outperform*	*Neutral*
Stable inflation:			
High growth	*Underperform*	*Neutral*	*Outperform*
Low growth	*Neutral*	*Outperform*	*Underperform*
Stable growth	*Neutral*	*Neutral*	*Outperform*

The essence of the table above is that TIPS will perform differently than the two major asset classes under most economic scenarios, providing substantial diversification benefits. The table can be summarized as follows. When real growth declines, real rates will also likely decline, causing TIPS to outperform equities. In deflationary periods, TIPS will fare poorly, and nominal bonds will outperform. In inflationary periods, TIPS will rally, equities will lag, and nominal bonds will decline. In periods of high growth, equities will outperform.

TIPS will, in the long run, underperform nominal bonds in periods during which inflation expectations decline. In periods of rising inflation expectations along with slowing growth in the economy, TIPS are expected to outperform nominal bonds. However, if inflation spikes and the Federal Reserve response is to raise interest rates quickly, both nominal bonds and TIPS may be affected equally.

The charts below shows the expected nominal and real returns of a traditional bond and an inflation-linked bond if both were held to maturity. Assuming that the traditional bond is issued with a 6.5% coupon, and the inflation-linked bond is issued with a 3.5% coupon, the breakeven inflation rate is 3.0%, representing the difference between the original coupon of the traditional bond and the inflation-linked bond (i.e., the implied inflation at issuance plus the inflation risk premium).



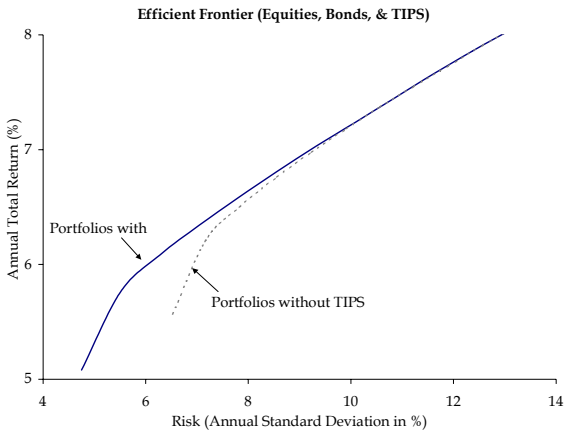


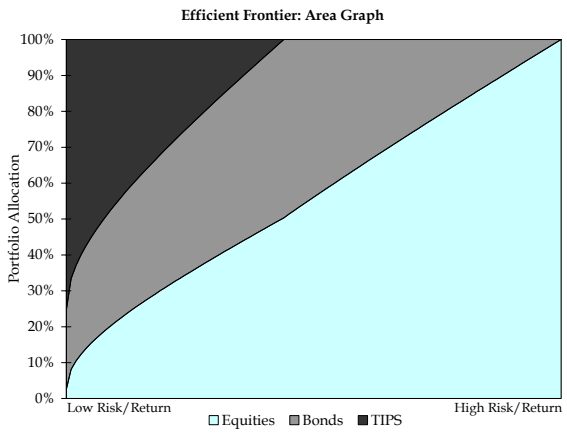
ROLE OF TIPS – STRATEGIC VS. TACTICAL

Total Portfolio Context

In diversified investment programs, traditional bonds control equity volatility and provide a predictable level of income. Over most time periods, high quality bonds provide a modest return in excess of the rate of inflation. However, when actual inflation significantly exceeds investor expectations of inflation, bond returns can fall well behind the rate of inflation. Unlike nominal bonds, TIPS can provide to investors protection from unanticipated inflation.

The chart on the left on the next page compares an efficient frontier of a portfolio comprised solely of U.S. stocks and nominal bonds to an efficient frontier of a portfolio comprised of U.S. stocks, TIPS, and nominal bonds. The efficient frontier moves up and to the left when TIPS are included, indicating that more efficient portfolios can be achieved by incorporating TIPS into a portfolio.





The chart on the right above shows the allocation to each of the three asset classes (U.S. stocks, nominal bonds, and TIPS) for every portfolio on the efficient frontier. Note that TIPS play a prominent role in less risky portfolios, but their role diminishes as risk tolerance increases.

Their low correlation with most other asset classes, along with their low expected volatility, makes TIPS an attractive asset class. In an optimal portfolio context, TIPS add value through two possibilities: 1) they allow an investor to increase return without significantly increasing volatility (by taking on greater equity exposure), or 2) they allow an investor to decrease volatility without significantly impairing expected return.

Long-Term vs. Short-Term Funds

Shifting assets from higher yielding nominal bonds to TIPS will make almost any portfolio more efficient, as displayed by the superior Sharpe measures in the table below. By shifting assets from nominal bonds to TIPS in a conservative long-term fund, an investor can take on more equity exposure. However, TIPS will not completely offset the commensurate increase in risk for a fund with an already high equity allocation.

Equities-Bonds-TIPS (%):	60-40-0	60-20-20	60-0-40	65-0-35	65-25-10
U.S. Equities	60%	60%	60%	65%	65%
Bonds	40%	20%	0%	0%	25%
TIPS	0%	20%	40%	35%	10%
Expected Return	8.02%	7.88%	7.74%	7.98%	8.16%
Standard Deviation	13.02%	12.59%	12.26%	13.20%	13.64%
Sharpe Measure	0.62	0.63	0.64	0.60	0.60

Adding TIPS will make the biggest difference in a portfolio that currently has a small equity allocation and a large nominal bond allocation, such as a typical health benefits fund. As the table at the top of the next page shows, a short-term investment fund can significantly decrease its volatility without impairing its expected return if it includes TIPS as an asset class. For example, a fund can increase its equity allocation by five percent yet decrease its volatility by moving forty percent of the bond allocation from nominal bonds to TIPS.

Equities-Bonds-TIPS (%):	20-80-0	20-60-20	20-40-40	25-45-30	25-60-15
U.S. Equities	20%	20%	20%	25%	25%
Bonds	80%	60%	40%	45%	60%
TIPS	0%	20%	40%	30%	15%
Expected Return	6.34%	6.20%	6.06%	6.34%	6.44%
Standard Deviation	7.45%	6.77%	6.24%	7.05%	7.47%
Sharpe Measure	0.72	0.77	0.81	0.76	0.73

Alternatively, a fund can increase its expected return while maintaining its volatility level. For example, a fund can increase its equity allocation by five percent and offset the consequent increase in volatility by moving just twenty percent of the bond allocation from nominal to inflation-linked bonds.

Need for an Inflation Hedge

Over long-term periods, investments in real assets such as equities and real estate will likely protect investors from inflation by appreciating in value significantly in excess of the rate of inflation. As the prices of goods and services increase, the prices of these assets will generally be re-priced upward. It is important to note that inflation produces major dislocations that can result in very unpredictable investment returns.

While equities have proven to be a good long-term hedge against inflation, in the short-term equity prices usually react negatively to inflation. Conversely, TIPS should react positively to periods of high inflation.

Similarly, TIPS can provide significant diversification benefits relative to nominal bonds. One purpose of bonds in an investment fund is to offset equity volatility and provide stability in tumultuous markets. Historically, periods of rising inflation have been accompanied by rising interest rates and, consequently, falling bond prices. Rising interest rates usually depress stock prices. However, an investment in TIPS would likely produce attractive gains in a rising inflation environment, offsetting some of a fund's likely losses in stocks and traditional bonds. In this way, TIPS may behave like real estate or other inflation hedges. However, unlike other inflation hedges, TIPS provide an assured real (i.e., inflation-adjusted) return over time.

TIPS are most appropriate for matching investors' need for inflation-adjusted income. Virtually all investors have at least a portion of their liabilities exposed to inflation. For investors with inflation-sensitive liabilities, TIPS represent the lowest risk asset available. Defined benefit plans that offer a COLA (cost of living adjustment) possess liabilities that are explicitly linked to inflation. By owning TIPS, pension funds can more closely match their assets to their liabilities. Similarly, endowments and foundations that must keep up with rising salaries and other costs can likewise use TIPS to match their assets to their likely future liabilities.

It can be argued that investors in the U.S. have been desensitized to the effects of inflation due to the extended environment of disinflation and then low inflation that began in the early 1980's. The central bank has made it their primary objective to constrain inflation during this period. However, a rational investor would not disregard inflation simply because the most recent data does not point toward its rapid reemergence. Since many asset classes perform poorly in an inflationary environment, in both nominal and real terms, a bout of high inflation could catch many investors off-guard and unprepared. A meaningful allocation to TIPS would lessen the negative impact resulting from a high inflation scenario.

EFFECT ON AGGREGATE BOND PORTFOLIO

Even a small allocation to TIPS will result in a better risk-adjusted return than a portfolio comprised solely of investment grade bonds. For example, a bond portfolio allocated 80% to investment grade bonds and 20% to TIPS would exhibit an expected return 14 basis point lower than a portfolio comprised solely of investment grade bonds, but a standard deviation a full 73 basis points lower. This results in a superior Sharpe measure (0.76 vs. 0.69).

From March 1997 through June 2003, a bond portfolio allocated 80% to the Lehman Aggregate index and 20% to TIPS would have produced a higher risk-adjusted return than a portfolio comprised solely of the Lehman Aggregate index. This result occurred despite the unexpectedly higher volatility experienced by TIPS than the investment grade market.

Duration

Duration is usually defined as a bond's sensitivity to a change in (nominal) interest rates. Theoretically, duration can be broken into two components: sensitivity to a change in real interest rates, and sensitivity to a change in investors' expectations for inflation. Since TIPS provide a complete hedge for inflation, their sensitivity to the latter is zero. Hence, the duration for inflation-linked bonds measures their sensitivity to a change in real yields only.

The aggregate TIPS market exhibited a duration of approximately nine years in mid-2003 when evaluated in terms of real interest rates. Several index providers have chosen to split evenly (50/50) the duration due to a change in real interest rates versus investors' expectations for inflation, and have assumed a duration of roughly 4.5 years for the TIPS market.

Calculated in this fashion, duration is not as meaningful a tool for TIPS portfolios as it is for nominal bonds. Because it is not possible to predict if a shift in nominal interest rates will be due to a change in real interest rates or in investors' expectations for inflation, an investor cannot foresee how a shift in nominal rates will affect TIPS. Hence, the nominal duration for TIPS can range between zero and their duration in real terms (e.g., between zero and nine years for the Lehman TIPS index). In other words, it is impossible to accurately predict the sensitivity of a portfolio of TIPS to a change in nominal interest rates.

Further, incorporating the duration of a TIPS portfolio into the calculation of duration for an aggregate bond portfolio will skew the results of the latter. Therefore, an investor who has a

dedicated allocation to TIPS should exclude TIPS when calculating the duration of their aggregate bond portfolio.

Yield

Because TIPS are quoted in terms of a real yield, it is similarly misleading to compare them to the nominal yields of an aggregate bond portfolio. If it is imperative to estimate a nominal yield for TIPS, the investor can do so in many ways, including using the yield for a similar maturity nominal Treasury (assumes no inflation risk premium), adding the most recent inflation rate to the real yield, or adding their own expectation for inflation to the real yield. All of these efforts require a certain amount of estimation, however.

TIPS should generally offer a lower nominal yield than mortgage-backed securities, corporate debt, or other fixed income securities that possess credit risk. Consequently, an increased allocation to TIPS will reduce the nominal yield of a diversified bond portfolio.

Quality

Because TIPS are issued and backed by the U.S. government, they possess no credit risk, and are considered to be of the same quality as Treasuries. Hence, an increased allocation to TIPS will increase the quality of a diversified bond portfolio.

IMPLEMENTATION ISSUES

As of July 2003, the U.S. Treasury had issued twelve TIPS, ranging from 5-year to 30-year maturities. The market value of the eleven outstanding issues was roughly $180 billion, representing just 10% of the total outstanding issuance of the U.S. Treasury. TIPS are currently auctioned three times per year. However, the U.S. Treasury has provided many indications that they will continue to support the TIPS market, including the possibility of holding a fourth annual auction and continuing to offer new issues to fill out the yield curve.

Market Liquidity

The liquidity for the TIPS market does not approach that for nominal Treasury bonds, which are the most liquid investments in the world. This is due to the small relative size of the TIPS market, the fact that TIPS would constitute a non-benchmark investment for most bond managers, and that many investors find them attractive as buy-and-hold investments.

Consequently, it is slightly more expensive to trade TIPS than it is to trade Treasuries. However, because they are issued and backed by the U.S. government, there is no credit risk, hence TIPS tend to be more liquid than corporate bonds.

At present, the trading spread is approximately 0.06% (1/16th) of principal value for TIPS, versus approximately 0.03% (1/32nd) for Treasuries. Therefore, for every trade, Treasuries have a one-time 0.03% advantage. High quality corporate bonds usually trade with a bid-ask spread of at least 0.25% (1/4th), however, giving TIPS a significant trading advantage over corporates. It is possible that during periods of high volatility the spreads for TIPS could widen, but if this occurs it would likely be a temporary phenomenon.

Active vs. Passive Management

With passive management, an investor receives what the Treasury issues and there is no chance for alpha or added value. With active management, an investor may outperform, but may also not track the index at times when it is most important to do so.

The primary means for adding alpha in a TIPS portfolio is by managing the term structure of the portfolio to differ from that of the TIPS index. Hence, a manager may employ a bullet or barbell strategy, or may take modest interest rate bets through changes to the portfolio's duration.

Another means of adding value includes making a relative value decision between TIPS and nominal Treasuries, and swapping between these instruments accordingly. Note, however, that too much of an exposure to nominal Treasuries would defeat the purpose of a strategic allocation to inflation-linked bonds.

Additionally, a manager may try to add value by investing in other inflation-linked bonds, such as those issued by U.S. corporations or foreign governments. The prior strategy may offer a pick-up in yield at the expense of credit risk and limited liquidity. The latter strategy may be a relative value decision between real rates in the U.S. versus foreign countries. While foreign real rates may look attractive, it is important to note that these inflation-linked bonds track inflation in those countries, which can differ significantly from U.S. inflation. This would be undesirable to an investor seeking to hedge their U.S. dollar-denominated liabilities.

Term Structure

Investors can likewise accept the term structure that the Treasury offers by investing in a market-weighted portfolio, or they can modify the term structure to better match their liabilities or their inflation concerns. For example, since the liabilities of defined benefit plans are correlated to wage growth and inflation, long-maturity TIPS would serve as a natural hedge against increases in the plan's liabilities.

Benchmark

There are several benchmarks available to TIPS investors. The two most commonly used are the Merrill Lynch U.S. Treasury Inflation-Linked Securities index, and the Lehman Brothers U.S. TIPS index. The differences in methodology between these indices are subtle, and should result in return dispersion of only a few basis points per month. The Merrill Lynch U.S. Treasury Inflation-Linked Securities index is rebalanced on the last calendar day of the month, as is the Lehman TIPS index. Both indices only include TIPS that have at least one year remaining to final maturity.

Alternatively, if an investor is structuring a custom TIPS portfolio, a custom index may be constructed using the appropriate issues. For example, an investor concerned only about near-term inflation may invest only in TIPS maturing in the next five years, and would construct a benchmark accordingly.

Timing

Even sophisticated investors often err in presuming that the recent past will persist indefinitely. During the first year that TIPS were issued, the U.S. inflation rate fell from 2.8% to 1.4%. Because TIPS tend to underperform Treasuries when the rate of inflation declines, early TIPS investors experienced relatively weak performance (see table below).

Calendar Year Performance

	TIPS	Bonds	Equities	CPI
Partial 1997	2.0%	9.1%	24.7%	1.7%
1998	3.9%	8.7%	23.4%	1.6%
1999	2.5%	-0.8%	23.6%	2.7%
2000	13.2%	11.6%	-10.9%	3.4%
2001	8.0%	8.4%	-11.0%	1.6%
2002	17.0%	10.3%	-20.9%	2.4%
1H03	6.3%	3.9%	12.9%	2.1%

The annual rate of inflation fell from 13.3% in 1979 to 2.1% in 2003. This sustained decline in inflation led some to expectations of persistently falling inflation. These expectations may have depressed the prices of TIPS to unusually attractive levels. Particularly in early 2000, when the 10-year TIPS issue traded at real yields above 4% even though inflation had moved above 3% and nominal Treasuries yielded 6.7%, TIPS were a bargain for long-term investors.

More recently, the real yield on TIPS dropped below 1% in June 2003, despite Federal Reserve Chairman Alan Greenspan warning that deflation posed a greater concern than inflation. Hence, TIPS were priced at their most expensive levels since inception during a period when the market was particularly uncertain about the direction of inflation.

Though calendar year performance has been positive since inception, there is a realistic chance that TIPS could decline by 5% or more over a twelve-month period. TIPS experienced a 4.9% decline in July 2003 alone. Because TIPS exhibit lower volatility than most asset classes, the risk of mistiming an entry into the TIPS market is not as high as it would be with most other assets (e.g., an increased allocation to equities in early 2000).

Vehicle

An investor who holds an individual inflation-linked security and plans to hold it to maturity is unconcerned with unexpected changes in inflation. However, an investor who invests in inflation-linked bonds through a vehicle that marks to market daily will be concerned with the fluctuations in price that unexpected changes in inflation can cause. Notably, a TIPS portfolio may not outpace inflation during short time periods.

Investors willing to accept the structure the market (and the Treasury) offers can invest in a commingled vehicle that is charged with matching or slightly outperforming the index, net

of fees. Because the potential to add value is minimal, low fees are essential to meeting this goal.

Alternatively, if an investor seeks a custom portfolio, a separate account structure must be utilized. The investment manager could construct a portfolio to match the liability or inflation requirements of the investor. This portfolio could be actively traded or treated as a buy-and-hold portfolio.

SUMMARY AND RECOMMENDATION

TIPS have risk and return patterns that differ from those of stocks or traditional bonds, and thus provide valuable diversification to both long- and short-term investment funds. An investment in TIPS would likely produce very attractive gains in a rising inflation environment, offsetting losses in stocks and traditional bonds. Because the future is always uncertain, owning an asset that may do well in an otherwise adverse environment could be extremely valuable. TIPS also provide greater diversification benefits relative to stocks than do nominal bonds. Additionally, unlike cash, TIPS provide an assured real return over the long-term.

The main disadvantages of TIPS are that they will likely underperform when inflation falls, and they will provide little protection against a rise in interest rates without a commensurate increase in inflation. However, the advantages of TIPS outweigh the disadvantages.

Meketa Investment Group therefore recommends that most funds consider allocating approximately twenty percent of their investment grade bond allocation to TIPS. Specifically, we recommend that defined benefit pension plans consider investing five to ten percent of the plan's assets to TIPS. In addition, we recommend that short-term plans with high fixed income allocations consider investing up to half of their bond allocation in TIPS.