

Familiar Topic

Intuitively Appealing. Inflation-linked bonds (ILBs) are intuitively appealing to investors who frame their goals in inflation-adjusted terms, including most of the endowed institutions eligible for TIFF. Given this appeal, TIFF monitors closely the global market in ILBs, which came into being when the UK government introduced inflation-linked gilts almost two decades ago and which received a major boost when Uncle Sam auctioned the first linked US Treasury obligations in January 1997. In anticipation of the latter event, TIFF published an extensive discussion of ILBs in its quarterly report dated June 30, 1996, as well as a follow-on discussion three months later. (Both reports may be obtained via the Publications section of TIFF’s Website, www.tiff.org. TIFF encourages readers who are not familiar with the basic mechanics of inflation-linked bonds to peruse these two “primers” before tackling the higher-level discussion that follows.) At this writing, the global ILB market comprises approximately \$254 billion in securities, including \$107 billion of Uncle Sam’s linked issues, commonly but unofficially referred to as TIPS (an acronym for Treasury Inflation Protected Security). (See Figures 1 and 2.) Given its current size, which equals less than 1/10 of the more than \$1 trillion in investable wealth controlled by US-based charities and less than 1/70 of the market value of publicly traded US stocks, the TIPS market is both too small and arguably too dull to capture the imagination of investment bankers or mutual fund mavens. But that does not mean that ILBs in general and TIPS in particular do not merit serious consideration by eleemosynary investors. Indeed, after much careful thought, TIFF’s directors concluded in September 1999 that TIPS merit a permanent allocation (5% at present) in the TIFF Multi-Asset Fund, and several of the endowed institutions with which such directors are affiliated have also implemented policy allocations to TIPS.

Early But Not Hasty. While the TIPS market is older and more predictable than some of the Internet-related ventures that have induced certain institutions to allocate vastly more money to venture capital than to TIPS in recent years, TIPS are undeniably a relatively immature “asset class.” This is offputting to some fiduciaries, especially those who believe that intuition should play no role whatsoever in policy formulation. TIFF takes a different view, rooted in the empirical fact that if fiduciaries postpone investment choices until all relevant return data have rolled in, the

investment opportunities that such data highlight are likely to have been arbitrated away. As applied to TIPS, intuition as well as non-intuitive study of TIPS’ essential mechanics tells us that such securities are indeed highly reliable hedges against high rates of unanticipated inflation. (Conventional bonds provide a decent hedge against anticipated inflation, as do equities for that matter.) A more challenging but no less important task for thoughtful fiduciaries is to intuit how TIPS might perform during an extended **deflation**. Why? Because if fiduciaries can convince themselves that TIPS will indeed perform adequately during an extended deflation (i.e., a period of falling prices for goods, services, and — assumedly —

Figure 1: Global ILB Market

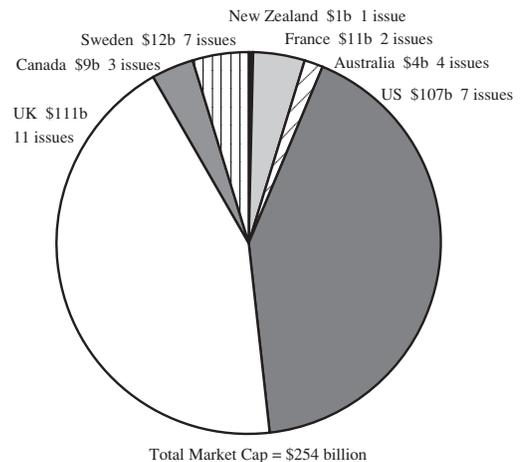


Figure 2: US Treasury ILB Market

Coupon	Maturity	Market Value Outstanding	Yield at 6/30/00
3.625%	7/15/2002	\$17.8 billion	3.97%
3.375%	1/15/2007	\$16.3 billion	4.08%
3.625%	1/15/2008	\$17.3 billion	4.09%
3.875%	1/15/2009	\$16.3 billion	4.08%
4.250%	1/15/2010	\$6.5 billion	4.06%
3.625%	4/15/2028	\$17.0 billion	3.89%
3.875%	4/15/2029	<u>\$15.3 billion</u>	3.89%
		\$106.5 billion	

Note: As this essay was being formatted for publication, the US Treasury announced that it would auction an additional \$5 billion of TIPS on July 12. The bonds will mature in 2010, i.e., the auction will essentially re-open the 2010 TIPS first issued in January 2000 (see fifth row of Figure 2). The additional \$5 billion issuance is not reflected in the amounts above.

common stocks), then they might prudently do something nifty indeed: shift a defined portion of their policy portfolios from conventional bonds to inflation-linked bonds, while simultaneously boosting (via further reductions in conventional bond holdings) their normal or policy allocations to equities or equity substitutes. The aim of such shifts? To enhance long-term returns without increasing portfolio risk, especially under extreme conditions. The policy allocations alluded to at the close of the preceding paragraph seek precisely this aim. The fact that historical data do not exist indicating how TIPS might perform during an extended deflation does not make such allocations imprudent *per se*. As the analysis below indicates, intuition plus careful study of TIPS' inherent mechanics tells us that the worse deflation becomes — i.e., the more rapidly and materially prices and interest rates spiral downward — the more TIPS purchased at par or below will produce returns resembling those produced by conventional Treasuries. This counterintuitive conclusion spells opportunity for endowed institutions, especially those governed by trustees who assign equal probabilities to the two disaster scenarios that can befall equity investors: deflation or very high rates of unanticipated inflation.

Interesting Opportunity. The following essay seeks to stimulate further discussion of this opportunity among trustees and officers of the charities that TIFF seeks to serve. Should such discussion cause governing boards to reach the same affirmative conclusion with respect to TIPS that TIFF's board reached last fall, TIFF stands ready to help with implementation: TIFF has elected to offer an index fund that will invest exclusively in US government ILBs, benchmarked against the Treasury's 10-year inflation-linked security. Detailed information on this new fund's objectives and expenses may be obtained by phoning TIFF at 804-817-8200.

Basic Facts¹

No Panacea. As a form of creditorship rather than ownership, inflation-linked bonds provide expected returns below those needed to satisfy most endowed

institutions' overall real return goals (inflation plus five or more percent per annum). This is especially true of high quality inflation-linked bonds (e.g., the US government's Treasury Inflation Protected Securities or TIPS).

Inflationary Bias. The economies of liberal democratic regimes have displayed an inflationary bias since the gold standard was repealed (by the UK in the early 1930s, followed by the US 40 years later). Central bankers' anti-inflation biases notwithstanding, the switch to a pure fiat money standard creates a reasonable presumption that democratic capitalism will continue to display an inflationary bias due to politicians' (i.e., the electorate's) pursuit of the "Ricardian equivalence." As 19th century economist David Ricardo first observed, taxpayers can pay for government programs through one or more of three means — current taxation, borrowing, or inflation — and there is very little difference between the three with respect to their eventual burden on society (unless agents outside "society" furnish capital via unduly cheap loans). Accordingly, over the very long term, inflation is more likely than deflation in societies using a fiat money standard (e.g., the US).

Real Concern. Under the gold standard that prevailed from the dawn of democratic capitalism through the 1930s in Britain and the 1970s in the US, rising productivity (i.e., increasing prosperity) manifested itself in falling **nominal** prices of basic goods such as food and shelter, and in the ease with which consumers could redirect a portion of their incomes to "non-essentials." In the current fiat money era, increasing prosperity is reflected primarily in falling **real** prices, and in the steadily growing portion of consumer incomes directed to goods and services that would have been deemed "non-essential" by our forebears. However, because the nominal money supply continues to expand, this decline in real prices (and associated increase in living standards) unfolds behind a veil of rising nominal prices. Judging from today's lofty stock valuations (on broad, cap-weighted US stock indices), the "market" clearly "sees through" the veil — indeed, the "market" assumes that productivity will continue to soar and that the real price of goods and services will continue to fall at a measured pace. What if it is wrong?

¹ This section incorporates concepts described in greater detail in *The Handbook of Inflation Indexed Bonds*, edited by John Brynjolfsson and Frank J. Fabozzi (New Hope, PA: Fabozzi Associates, 1999), especially the fine essay therein entitled "Inflation Hedging in a Low-Inflation World: The Plan Sponsor's Rationale" by Laurence B. Siegel of The Ford Foundation.

Hedging against Disaster

Troubling Scenarios. The “market’s” sanguine outlook respecting future price trends **could** prove materially wrong in one of two directions — real prices could plummet (severe deflation) or they could soar (severe inflation). Either scenario would be damaging if not disastrous for unhedged holders of US stocks (and perhaps other equities) purchased at today’s prices. What to do?

Tradition. Traditionally, endowed institutions have hedged against severe declines in equity prices by holding conventional bonds (so-called nominal bonds) as a deflation hedge and real estate or resource-related assets (including commodities) as an inflation hedge. Whether real estate, commodities, and other resource-related holdings constitute a more cost-effective hedge against very high rates of unanticipated inflation than inflation-linked bonds lies beyond the scope of this paper. Our chief question here is not whether these alternative “inflation hedges” are more choiceworthy than inflation-linked bonds but whether endowed institutions can safely rely on inflation-linked bonds as their primary “disaster hedge,” i.e., whether they can prudently divide their investable assets between equities broadly defined (including equity substitutes such as absolute return-oriented strategies) and inflation-linked bonds and reduce if not eliminate altogether their conventional (a/k/a nominal) bond holdings.

Conventional Bond Mechanics. The chief argument against such a policy (jettisoning conventional or nominal bonds in favor of inflation-linked bonds as an all-purpose hedge) is rooted in a consideration of bond mechanics, i.e., what makes bonds “tick.” Returns on conventional bonds can usefully be subdivided into three parts: (1) income or accretion of market value that compensates holders for current inflation, (2) income or accretion that compensates holders for expected future inflation (the so-called “inflation risk premium”), and (3) income or accretion that compensates holders for deferring consumption, a/k/a “real yield.” As we shall see, “real yields” are anything but stable because they are tied directly to society’s ever-changing willingness to defer consumption in favor of investment, i.e., to what market historians call “changing animal spirits.”

Peering beneath the Hood. Returns on inflation-linked bonds have not three but rather just **two** subcomponents: they compensate holders for current

inflation [see (1) above] and provide a “real yield” [(3) above] but do not provide an “inflation risk premium” [(2) above]. Accordingly, when bought and held on a permanent and passive basis, the nominal bonds of a very high quality issuer such as Uncle Sam can logically be expected to **outperform** inflation-linked bonds from the same issuer that are bought and held on the same basis by the amount of the “inflation risk premium” that the former generate. Putting the same point differently, the US Treasury is correct to argue (as it very conspicuously did when introducing TIPS in 1997) that Uncle Sam’s long-term borrowing costs will be reduced by issuing inflation-indexed bonds rather than conventional bonds — provided, of course, that the Federal Reserve keeps inflation at levels equal to or below investors’ *ex ante* expectations.

Offputting? The assumed long-term underperformance of inflation-linked bonds is offputting on its face, but if return maximization were prudent fiduciaries’ sole goal then we would not be discussing bonds at all, whether nominal or inflation-linked. We are discussing such assets because our assumed risk tolerance is such that we cannot withstand the volatility associated with an all-equity portfolio. Just because nominal bonds can logically be expected to produce higher returns than inflation-linked bonds does not mean that nominal bonds deserve a permanent place in endowment portfolios. Our aim is to determine which mix of assets provides the highest long-term returns that are consistent with specified risk tolerances, and it is entirely possible that the distinctive attributes of inflation-linked bonds cause portfolios that comprise **only** equities broadly defined plus inflation-linked bonds to dominate portfolios that comprise these two asset classes plus conventional bonds. To validate this claim, we need to do more than simply peek “beneath the hood” of each type of high quality bond that we might consider holding for disaster hedging purposes — we need to climb right into the engines themselves and better understand what makes them tick.

Inside the Engine

Different Engines. As noted previously, bond returns can usefully be subdivided into discreet parts, with nominal bonds having a “three-cylinder engine” and inflation-linked bonds having a “two-cylinder engine.” The first “cylinder” is the return that compensates investors for current inflation; the second is the return that compensates them for unknown future inflation;

and the third is the return that compensates them for deferring consumption, also known as “real yield.” Importantly, both conventional bonds and inflation-linked bonds are affected (indeed, identically affected) by changes in real yields: as real yields rise, the market value of both types of bonds will tend to fall and vice versa.

Real Yields. What is a “real yield” and why is it so important to the policy issue we’re attempting to resolve here — whether to jettison nominal bonds in favor of inflation-linked bonds? We have already advanced one definition of real yield: it is the compensation that investors demand for deferring consumption in favor of investment. Looked at another way, the prevailing real yield in an economy is a measure of investors’ collective judgment about the real or inflation-adjusted rate at which the economy can be expected to grow, i.e., the rate at which living standards are expected to improve. Ask yourself this question: if you expect the money in your pocket to buy more goods and services in the future than it does today, would you not consider deferring consumption so that you can enjoy more things later rather than fewer things today? Assumedly, you would, and the precise balance that you strike between current consumption and investment determines how much you yourself will contribute to the overall supply of risk or investment capital in the economy. The more you elect to defer consumption, the more investment capital you will supply to the economy, and the more capital you supply to the economy, the more you will bid up the price of financial assets such as stocks and bonds. Of course, as financial asset prices rise, each marginal dollar that you shift from consumption into investment “buys” incrementally less future consumption (because you’re paying more for the investments in question), and at some point you might decide to stop shifting funds from consumption to investment and hit the shopping mall. Viewed abstractly, the point at which you stop investing and start spending determines your required “real yield” — the price you demand for saving rather than spending. *Reductio ad absurdum*, if most investors suddenly elect to favor spending over saving, their combined act of cashing their portfolios in favor of trips to the mall (real or virtual!) will cause financial asset prices to fall. If you buck the crowd rather than join it and buy these assets after their price has fallen, then the reward you receive for deferring consumption will increase, i.e., you will be rewarded with a higher “real yield.” Conversely, if investor sentiment swings sharply in

the other direction — away from near-term consumption in favor of long-term investment — and you elect to jump aboard the same bandwagon, then your expected “real yield” will be reduced. An observer monitoring your behavior would say, logically, that your **required** “real yield” has dropped — that you are incrementally willing to defer consumption.

Unique Asset. There are lots of ways you can defer consumption: Wall Street is very inventive. You can buy nominal bonds, stocks, other investments — or inflation-linked bonds. The difference between the former types of investments and inflation-linked bonds — and it is a profound difference indeed — is that the real or inflation-adjusted return that you will receive on inflation-linked bonds held to maturity is **known ahead of time**. This is untrue of any other type of investment, and it is such a profound difference that economists (including Mr. Greenspan) ascribe acute importance to the price behavior of inflation-linked bonds: when the price that investors are willing to pay for such bonds falls (all else equal), it tells policy-makers that investors think they can earn incrementally higher real yields investing elsewhere. In other words, it tells them that investors think there are incrementally superior growth opportunities elsewhere in the economy, i.e., that the economy’s long-term real growth rate has risen incrementally. Conversely, when the price of inflation-linked bonds rises (all else equal), it tells policy-makers that investors expect incrementally lower real or inflation-adjusted growth in the economy.

Troubled Infancy. This is not mere conjecture. When Uncle Sam first issued TIPS in February 1997, the price at issue enabled buyers to lock in a real yield of 3.6%. (The first TIPS issued were 10-year notes.) This first tranche of TIPS has since fallen slightly in price, boosting the guaranteed real yield to a prospective buyer from 3.6% to 4.1%. Over the same 41-month time period, the S&P 500 has risen 93%, and the Nasdaq Composite Index (as hairy-chested a measure of investors’ future growth expectations as exists today) has risen an even more impressive 189%. Clearly, investor expectations respecting the US economy’s future real growth rate have risen since early 1997, and this increased optimism has manifested itself in their decreased willingness to accept the 3.6% guaranteed real return that TIPS provided when the first tranche of them were issued almost three years ago. Why settle for a derisory 3.6% real return when you have the potential to earn much higher real returns investing in, say, Cisco or Oracle?

Avoiding Crack-Ups

Needless Insurance? Clearly, if one assumes that the economy will grow indefinitely at the same consistently high inflation-adjusted rate that it has in recent years, there is no reason to own any assets other than common stocks. Indeed, some investors appear to have reached precisely this conclusion and have moved to an all-equity posture. The risk they run is that the economy will grow at a slower or more erratic inflation-adjusted pace, for one of two reasons: the actual volume of goods and services produced by the economy could fluctuate materially, causing real growth to vary materially even if price levels stay relatively flat, or nominal prices (i.e., inflation) could change at an unexpectedly rapid rate, causing real or inflation-adjusted GDP growth to vary from *ex ante* assumptions even if tangible output stays relatively flat. Of course, **both** variables (actual output and nominal prices) could fluctuate more than investors assume they will, and if both determinants of real GDP growth swing to unanticipated extremes simultaneously, economic turmoil if not disaster could ensue.

Parade of Horribles. In general, such disaster could take one of two forms: a major deflation such as that which the world endured in the 1930s and Japan has endured in the 1990s or a major inflation such as that which Germany endured in the 1920s and much of the developed world endured in the 1970s. History teaches us that stocks will perform very poorly under both scenarios — poorly enough that endowed institutions with finite tolerances for falling endowment income or capital values may need to hedge against such disasters. Conventional Treasury bonds are a better **deflation** hedge than TIPS. Why? Because as previously noted the attribute that distinguishes the two is that conventional or nominal Treasuries embody an inflation risk premium, thereby virtually guaranteeing that conventional Treasuries will outperform inflation-linked bonds of comparable maturity if inflation is unexpectedly low, as would be true under deflationary conditions.

Basic Math. How does one measure this inflation risk premium? It is simply the difference between the yield-to-maturity on a conventional Treasury obligation and the guaranteed real yield on a Treasury linker with the same maturity. For example, at this writing, a 10-year Treasury note due in 2010 has a yield-to-maturity of 6.02%; the corresponding real yield on an inflation-linked Treasury maturing at about the same time is

Figure 3: Breakeven Inflation Rates

TIP Maturity Date	TIP Real Yield	Breakeven Inflation Rate*
7/15/2002	3.97%	2.42%
1/15/2007	4.08%	2.14%
1/15/2008	4.09%	2.11%
1/15/2009	4.08%	2.08%
1/15/2010	4.06%	1.96%
4/15/2028	3.89%	2.23%
4/15/2029	3.89%	2.20%

* TIPS yield less yield of comparable maturity nominal Treasury.
Source: Bloomberg.

4.06%. (See fifth row of Figure 3.) The difference of 1.96% is referred to as the conventional note's "inflation risk premium" and is also known as the "breakeven rate of inflation" for 10-year Treasury paper. In other words, a tax-exempt investor who thinks inflation will average 1.96% over the next 10 years should essentially be indifferent between the two instruments just described. [TIPS are structured in a manner that makes them suitable primarily for tax-exempt investors, including individuals investing through IRAs or 401(k) plans.] If, by chance, the economy slides into a decade-long deflation and inflation averages far less than 1.96% per year through 2010, then investors who purchase the Treasury's nominal bonds of 2010 rather than its TIPS will pocket the 1.96% per annum inflation risk premium.

Nice Kicker. Importantly, due to the magic of compounding and the way in which interest payments on TIPS are computed, investors who hold nominal Treasuries rather than TIPS in our example will actually earn incremental returns exceeding 1.96% per annum for the 10 years in question. Not only that: in addition to arriving at a different and more attractive destination in 2010, holders of conventional Treasuries will likely have a more pleasant ride en route because the bonds they hold are less susceptible to an interim sell-off caused by investors' need to sell bonds to offset deflation-induced declines in stock dividends (or to meet margin calls!).²

² But note that under all scenarios excepting deflation, TIPS tend to display less downside volatility than conventional bonds of comparable maturity. This is because TIPS' structure shields their holders from the principal source of downward volatility of conventional bonds, namely an increase in the rate of expected future inflation. As previously noted, TIPS are sensitive not to changes in expected future inflation but to

**Figure 4: Deflation Scenario
Cash Flows on 10-Year TIPS**

Semi-Annual Period	Inflation Index	Inflation-Adjusted Principal	Nominal Cash Flow	Inflation-Adjusted Cash Flow
0	100	\$100,000	(\$100,000)	(\$100,000)
1	99	99,000	1,980	2,000
2	98	98,000	1,960	2,000
3	97	97,000	1,940	2,000
4	96	96,000	1,920	2,000
5	95	95,000	1,900	2,000
6	94	94,000	1,880	2,000
7	93	93,000	1,860	2,000
8	92	92,000	1,840	2,000
9	91	91,000	1,820	2,000
10	90	90,000	1,800	2,000
11	89	89,000	1,780	2,000
12	88	88,000	1,760	2,000
13	87	87,000	1,740	2,000
14	86	86,000	1,720	2,000
15	85	85,000	1,700	2,000
16	84	84,000	1,680	2,000
17	83	83,000	1,660	2,000
18	82	82,000	1,640	2,000
19	81	81,000	1,620	2,000
20	80	80,000	101,600	127,000
	Annualized IRR		3.6%	6.0%

Note: Assumes 2% coupon paid every six months on 10-year TIPS with actual inflation of -1% every six months. Semi-annual coupon on TIPS is based on original principal adjusted for deflation.

Swift Kick. But what if the opposite scenario unfolds and the economy undergoes a major **inflation**? Clearly, TIPS are a better hedge against this scenario than conventional Treasuries — indeed, under any scenario entailing inflation that exceeds the “breakeven rate” at the time TIPS rather than conventional Treasuries are purchased for inflation-hedging purposes. Moreover, just as the incremental total return on conventional Treasuries is unexpectedly large (in relation to the “breakeven rate”) under deflationary scenarios, so too is the incremental total return on TIPS under inflationary scenarios. Again, this surprising but by no means counterintuitive result is rooted in both the magic of compounding and the peculiar way in which Uncle Sam computes interest on TIPS.

changes in required **real** yields, which tend to be $1/3$ to $1/2$ as volatile as changes in required nominal yields. In other words, the deflation “hedge” imbedded in TIPS asymmetrically skews their expected returns relative to conventional Treasuries: TIPS’ expected outperformance during inflationary conditions sharply exceeds their expected underperformance during deflationary conditions, an attribute highlighted by Figure 5.

How to Choose? Given the facts just presented, how can thoughtful trustees choose between conventional bonds and inflation-linked bonds for disaster hedging purposes? The answer would appear to turn on whether they think deflation or severe inflation is more probable because conventional bonds perform best under the former condition and inflation-linked bonds perform best under the latter. In fact, most experienced fiduciaries (including TIFP’s officers and directors) are unwilling to place large bets on their own or anyone else’s ability to forecast accurately such probabilities. Accordingly, they end up owning both conventional bonds and some sort of “inflation hedge,” with inflation-linked bonds appearing in many “state-of-the-art” portfolios and with more and more institutions adding them to their policy mixes with each passing day. The question before the house is whether it makes sense to own both conventional bonds and inflation-linked bonds or whether the former can safely be excised from long-term policy portfolios (even if they are sometimes held for strategic or tactical purposes).

Sharper Point. To put a sharper point on the problem, the question we seek to answer is whether the advantages of holding TIPS rather than a combination of TIPS and conventional bonds during inflationary shocks outweigh the disadvantages of pursuing this policy when deflation rears its ugly head. To answer this question, we need to explore more fully how both types of bonds (as well as equities) might be expected to perform in abnormal economic environments. Alas, the phenomena we seek to explore are less monolithic than they appear: as with cholesterol, there is “good deflation” as well as “bad deflation” and “good” as well as “bad” inflation.

Going Downhill

Good Deflation. Deflation is synonymous with falling prices — nominal prices, that is.³ “Good deflation” occurs when nominal prices fall but the actual output of goods and services (i.e., the number of cars, refrigerators, ice cream cones, plane rides, etc. actually

³ A nominal price is what appears on the price tag. Laypersons lacking PhDs in economics education can be excused if they confuse nominal prices with so-called “real prices,” which are nominal prices adjusted by cumulative inflation since a specified inception date. You’d think that economists would have the decency to call the prices actually paid at the checkout counter “real prices,” but they prefer to call these “nominal prices,” reserving the term “real” for prices that are inflation-adjusted. In other words, “real” and “inflation-adjusted” are synonymous.

produced and purchased) does not. It might seem silly to think that economic conditions could ever be so benign, but there have been numerous intervals of “good deflation” in the history of democratic capitalism, as can be inferred from historical stock returns: during the 32 years since 1790 that US consumer prices have fallen at the rate of more than 4% per annum, US stocks have generated an average annual return of 11.3%.⁴

Happy Days. There is no reason to think that we will not enjoy such happy circumstances again. (Indeed, some skeptics would assert that the lofty levels at which some US stocks are trading today are unreasonably high unless “good deflation” is just around the corner). Clearly, inflation-linked bonds are suboptimal investments during “good deflations”: stocks can be expected to perform surprisingly well (as indicated by the historical returns cited in the preceding paragraph), and conventional bonds can be expected to outperform inflation-linked bonds of the same maturity (due to conventional bonds’ unique inclusion of an inflation risk premium).

Bad Deflation. “Bad deflation,” on the other hand, is a prospect much to be feared. Characterized by dramatically waning “animal spirits” (i.e., business confidence), “bad deflation” can be as nasty and as self-reinforcing as its polar opposite (hyperinflation). As people facing shrinking incomes curtail their manufacture or purchase of goods and services for fear of getting caught short, others with whom they might have transacted also ratchet down their buying, reinforcing both downward pricing pressures and shrinking output. As the experiences of the US circa 1930s and Japan circa 1990s suggest, stocks tend to perform poorly during “bad deflations.” During the most severe bout of “bad deflation” that the US economy has undergone, inflation averaged -9.2% and US stocks (as measured by the S&P 500) generated an average annual compound return of -44.9%. (These data reflect CPI inflation and the total return on the S&P 500 from October 1, 1929, through May 31, 1933.) Over the same 44 month period, an index of the relatively small (by post-WW II standards) amount of US government bonds then-outstanding generated an average annual compound return of 4.0%.⁵ On an

initial investment of \$1 million, this return differential would have produced a stunning \$1 million difference in terminal wealth by the time consumer prices stopped falling in mid-1933 (\$1.15 million bond portfolio versus \$112,750 stock portfolio). Alas, investors cannot know how inflation-linked US Treasury obligations performed during the 1930s, because such securities were first issued in 1997. Nor do we know how inflation-linked bonds performed during Japan’s “bad deflation” of the 1990s because the Japanese government has issued only conventional bonds to date. We do know that Japanese stocks performed very poorly in the decade just ended, with the widely followed Nikkei 225 index producing an average annual compound return of -6.9% (in yen terms) for the 10 years ending December 31, 1999, during which time Japan’s equivalent of the CPI rose just 1.1% per year on average with two years exhibiting outright deflation. (Exclude 1999, which was a good year for Japanese stocks, and the Nikkei’s compound return falls from -6.9% for 10 years to -10.8% for the nine years ending December 31, 1998.) Not surprisingly, conventional bonds vastly outperformed stocks in Japan in the 1990s, with the Japan component of the J.P. Morgan Government Bond Index producing an average annual compound return of 6.8% (in yen terms), about 14% better per year than equities. On an initial investment of \$1 million, this return differential would have produced a staggering \$1.44 million difference in terminal wealth by the end of the decade (\$1.93 million bond portfolio versus \$487,000 stock portfolio).

Floor It

Startling Inferences. Although there are no historical data on which we might base forecasts of inflation-linked bond returns during periods of “bad deflation,” careful study of the manner in which the US government’s inflation-linked bonds have been structured produces some interesting if not startling surmises about their likely behavior during such periods. To the extent that such inferences prove startling, it is usually because those being startled have overlooked or given short shrift to the crucial fact that Uncle Sam’s TIPS (or sovereign credits of comparable quality with TIPS-like contractual terms) are guaranteed to return par at maturity, with par (i.e., \$1.00 for each \$1.00 of face value) defined in **nominal** terms. Differently put, some folks are floored to learn that the floor underlying such securities is as high as it is. To be sure, TIPS and other comparably structured inflation-

⁴ Ibbotson and Brinson, quoted in Brynjolfsson and Fabozzi at page 66. Note also that in 1999, Hong Kong stocks (as measured by the MSCI Hong Kong Index) returned 66%, which translated into a 70% inflation-adjusted return. Hong Kong’s CPI actually fell by 4% in 1999 — a vivid recent example of “good deflation.”

⁵ Source: Global Financial Data.

linked bonds provide their holders with periodic **interest** payments that can **decline** in nominal terms if the price index to which such bonds are “linked” actually falls. (See Figure 4 for an illustration of what happens to cash flows on TIPS held during an extended deflation.) As Figure 4 indicates, an investor who buys one of Uncle Sam’s inflation-linked bonds at par with a guaranteed real yield of 4% will not necessarily receive \$4,000 per year for every \$100,000 he invests. The bond’s actual yield could fall below \$4,000 per annum if the annual recalibration of the bond’s indexed value causes this amount to fall below the original \$100. But the pain caused by income payments whose nominal value is less than what an investor expected to earn based on the real yield his broker quoted when the inflation-linked bonds were purchased is at least partially mitigated by the enhanced purchasing power of his principal when the bond matures (see right-hand column of Figure 4). The key point to note is that US inflation-linked bonds (as well as those issued by France, Sweden, and certain other countries) have a “deflation floor” whereby holders are guaranteed a return of principal in nominal terms when these securities mature.

Bumpy Ride? What about interim losses? This is of profound importance to endowed institutions for two reasons. First, many employ spending rules tied to the market values of their overall portfolios, and they do not want assets held for hedging purposes to decline materially in price at the same time that assets held for total return purposes (i.e., equities broadly defined) are undergoing a deflation-induced collapse. Second, quite apart from interim capital losses and the big dips in formula-driven endowment withdrawals that they can spawn, the last thing perpetual life institutions want is to engage in the forced sale of long-term holdings at temporarily depressed prices — something they will have great difficulty avoiding if their “hedging” assets as well as their total return assets are undergoing a general sell-off when bills must be paid.

Where’s the Beef? The chief if not sole virtue of using conventional Treasuries rather than TIPS to hedge against deflation is that the former can be expected to **appreciate** during an extended deflation, making them an attractive source of cash when **something** needs to be sold to fund annual withdrawal requirements. Interestingly, the computer-based models that most institutions use to choose among competing “policy portfolios” tend to ignore the nasty little problem of cash outflows, focusing instead on the probable path

that capital values alone will take if and when disaster strikes. This is by no means the sole or even chief drawback of such models. Indeed, as the two-part monograph on asset allocation that TIFP published in 1999 makes plain,⁶ computer-based models provide little if no help to trustees seeking to unlock the puzzle with which we’re wrestling, because the puzzle’s key “lies within.”

Risk Is in the Eyes of the Beholder. More specifically, to determine whether and to what extent conventional bonds should be jettisoned in favor of inflation-linked bonds for hedging purposes, trustees must first specify with reasonable precision which forms of risk they are most interested in controlling: (1) cash flow shortfalls, (2) interim absolute losses, (3) interim shortfalls relative to peer institutions’ results, or (4) some other measure(s) of risk. The analysis that follows assumes that the first two forms of risk are very important while the others are not, i.e., it assumes that trustees who have read this far are interested in a “non-political” or “non-behavioral” answer to the question before the house. To repeat, the question before the house is whether trustees can prudently jettison conventional bonds in favor of inflation-linked bonds as their endowed institutions’ primary hedge against big problems (shrinking current yields or market values or both) in the total return segments of their portfolios. Trustees who are unduly concerned about “embarrassments” cannot act upon the analysis that follows, because it ignores the third form of risk identified immediately above (“interim losses relative to peer institutions’ results”).

Getting to Yes. TIPS’ attributes are such that one doesn’t need a huge percentage allocation to them to keep overall endowment peak-to-trough losses to tolerable levels under extreme inflationary conditions. Under such conditions, of course, it is hugely helpful to maintain *de minimis* or zero exposure to conventional deflation-hedging bonds, i.e., one can adopt a higher policy allocation to so-called total return assets (equities and equity substitutes) precisely because the mix entails an abnormally low allocation to conventional bonds. Turning to the opposite disaster scenario — deflation — one must simply ask whether the maximum prudent policy commitment to total return assets (TRAs) under the **inflation** scenario will prove tolerable (i.e., produce results consistent with prespecified risk tolerances) if

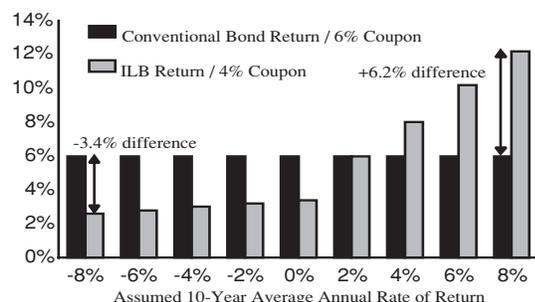
⁶ Message in a Bottle, Parts I and II, published in the TIFP Commentary dated March 31, 1999, and June 30, 1999.

deflation strikes and if the funds not allocated to TRAs are allocated instead to TIPS. In short, the “solution” to the investment policy dilemma that TIPS pose can be characterized as follows: we are struggling to forecast what would happen to TIPS in an extended deflation; if we knew the answer to this question, then we would know the answer to the larger question of whether we can safely jettison most or perhaps all of our conventional bonds. We cannot be sure of the answer to such questions because TIPS were introduced just three years ago, and the US has not experienced an extended deflation since the 1930s. But perhaps we can “back into” the answers by simulating what would happen to various alternate asset mixes under highly **inflationary** conditions — mixes comprising just total return assets (proxied by, say, the MSCI All Country World Stock Index or even the S&P 500) plus TIPS. More specifically, with the aid of their staff and outside consultants, individual governing boards could and arguably should do what several cutting-edge endowments have done, namely to test the extent to which alternate mixes of total return assets and TIPS (e.g., 70/30 total return/TIPS, 75/25, 80/20, 85/15, 90/10, etc.) satisfy their prespecified risk parameters, including any guidelines adopted respecting maximum tolerable peak-to-trough declines in endowment capital values. Of course, trustees will also need to analyze interim cash flow vulnerabilities, i.e., where they are going to obtain the cash to meet payout requirements, but this can come after the analysis of principal volatility has been completed.

Specific Example. Assume that a governing board has decided to adopt whatever policy mix will produce the highest possible return without subjecting the institution in question to potential peak-to-trough losses exceeding

30%. (In an environment of historically low dividend yields on common stocks, most institutions necessarily assume that cash flow shortfalls will be met through securities sales, thus logically making peak-to-trough declines their primary if not sole measure of risk.) Assume further that, based on simulation work performed by staff and outside consultants, the board has concluded that a permanent policy allocation of 20% to TIPS would indeed provide a wholly reliable hedge against peak-to-trough declines exceeding 30% under highly **inflationary** conditions. (In other words, a policy mix comprising 80% total return assets and 20% TIPS will produce the highest expected long-term returns without exposing the institution to the possibility of 30% or greater peak-to-trough declines.) Our hypothetical trustee group could then don its deflation caps and ask the question, “How far would TIPS have to fall (in principal value) during the early stages of an extended **deflation** for our indicated mix (80%/20% in our example) to violate our prespecified risk parameters?” The question focuses on deflation’s early stages because the aforementioned “floor” beneath TIPS’ terminal value ensures that the more CPI inflation and interest rates spiral downward during a major deflation, the more TIPS resemble conventional bonds, with the resemblance becoming an identity once conventional bond yields have fallen to levels commensurate with TIPS’ stated coupons. For example, if our hypothetical trustee group were pondering how TIPS purchased at today’s prices might perform relative to conventional Treasuries (also purchased at today’s prices) under deflationary conditions, they could safely confine their analysis to that portion of an extended deflation that would cause conventional Treasury yields to fall by about 1.96% from today’s levels. Why 1.96%? Because this is the breakeven inflation rate reflected in prevailing Treasury yields (inflation-linked vs. conventional).

Figure 5: Conventional Bond and ILB Returns under Different Inflation Assumptions



Source: Bridgewater Associates.

Figure 6: Short-Term Price Impact

Instantaneous Change in Inflation Expectations with 0% Instantaneous Change in Real Yield	Price Return of 8-Year Duration Bond	
	Nominal Bond	Inflation-Indexed Bond
-2.0%	16.0%	2.6%
-1.0%	8.0%	0.5%
0.0%	0.0%	0.0%
1.0%	-8.0%	0.0%
2.0%	-16.0%	0.0%

Source: Bridgewater Associates.

Consequently, should yields on conventional Treasuries fall by about 1.96% (from, say, 6.02% on 10-year bonds to 4.06%, which is the current real yield on 10-year TIPS), an endowment that owned both types of Treasury debt would find that the two securities would perform essentially the same should yields on conventional Treasuries continue spiraling downward.

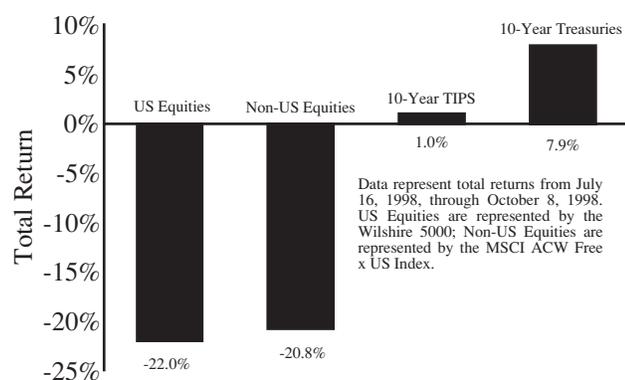
Attractive Asymmetry. As difficult as it is for some investors to accept the notion that TIPS become identical to conventional Treasuries once deflation becomes sufficiently pronounced, most have little difficulty understanding that TIPS behave nothing like conventional bonds under highly inflationary conditions. In short, for institutions that frame their investment goals in inflation-adjusted terms, TIPS entail very attractive **asymmetry**, performing superbly when inflation is unexpectedly high, adequately when inflation is moderate, and surprisingly well — at least in theory — when general price levels collapse. We add the qualifier “in theory” because no one truly knows the extent to which the market value of US TIPS might fall below par on a temporary basis due to deflation-induced liquidity problems in the TIPS market. The only objective data to which we can point when pondering this issue is the price performance of TIPS during the so-called Asian crisis of 1998. As indicated in Figure 7, 10-year TIPS produced modestly positive returns during the “panic” phase of this crisis, underperforming 10-year conventional Treasuries (1.0% vs. 7.9%) but providing very valuable protection against the sharp losses produced by both US and non-US stocks (down 22.0% and 20.8%, respectively). Had the crisis worsened as 1998 gave way to 1999, yields on conventional Treasuries would assumedly

have continued to fall, approaching and perhaps even eclipsing (i.e., falling below) TIPS’ coupon yields, causing these two very different forms of Treasury debt to behave more like identical twins than second cousins.

The Bottom Line

Reputational Risk. Trustee groups that approach disaster hedging in the manner outlined above **and** that are relatively indifferent to reputational risk (i.e., the risk of being wrong and alone) are likely to conclude that TIPS deserve a material policy allocation. Indeed, some might logically conclude that they can jettison conventional bonds altogether, in favor of policy mixes comprising just two main elements: total return assets and TIPS. Such mixes entail considerable reputational risk because few if any institutions have eliminated completely their normal or policy allocations to conventional bonds. But an increasing number of institutions are shifting money at the margin out of conventional bonds and into TIPS, a policy choice whose discomfort is eased by the juicy real yields that TIPS continue to provide (see Figure 2).⁷ Given the relatively small size of the TIPS market (about \$110 billion at present, as noted above), it would not take too dramatic a shift of institutional money from conventional bonds into TIPS to drive down such available real yields, and trustee groups intent on exploiting the attractive asymmetry alluded to in the preceding paragraph would do well to complete their analysis of this intriguing opportunity before the thundering herd of other perpetual life institutions (including actuarially driven pension funds) stampedes toward this still-novel but intuitively appealing asset class. If TIPS do ultimately attract the institutional demand that they theoretically deserve, savvy trustees will have to take great care to avoid TIPS’ major potential flaw: their proclivity to produce interim capital losses should investors be foolish enough to buy them at large premia to par. Though real and acute, this danger is not present in the current environment,

Figure 7: Comparative Total Returns during 1998 Crisis



⁷ Readers who believe that conventional bonds provide sufficient protection against expected future inflation should review again the breakeven inflation rates furnished in Figure 3. At this writing (June 30, 2000), CPI inflation is 3.1%, with one major CPI component — namely energy — rising at a much higher rate and with other major components (e.g., shelter, medical care and services) rising at 2.3% or higher. Importantly, the index on which Uncle Sam’s ILBs are based is the CPI-Urban Series, which **includes** energy and food, as distinct from the so-called Core CPI, which excludes these two traditionally volatile components.

TENDING TOWARD TIPS *concluded*

and institutions seeking to initiate or augment their TIPS exposure can do so today without fear of overpaying for the disaster insurance that TIPS entail.

One Final Caution. The US Treasury has never promised that **all** of the TIPS that it will sell will be priced at or below par at issuance. Thus, if the Treasury elects to price certain TIP issues at a premium (i.e., to offer such bonds at implied real yields that are much higher than those required to clear the market were the bonds priced at par), then the supply of TIPS suitable for **deflation** hedging purposes could shrink materially. If the US government **were** to decide to issue future TIPS at premium prices (i.e., substantially above par), foundations could look to other ILB markets (e.g., other nations' ILBs) for appropriate disaster hedging instruments, mindful that the purchase of such instruments could expose them to undesired currency risk. But there is always the risk that there will not be adequate supplies of ILBs — Uncle Sam's or other issuers' — at reasonable prices, with reasonable defined to include not only the implied real yield but also the gap between initial prices and par.

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