

TIPS FOR DEFINED CONTRIBUTION INVESTORS

AN INTRODUCTION TO TREASURY INFLATION PROTECTED SECURITIES

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Introduction

Treasury Inflation-Protected Securities, or TIPS, are U.S. Treasury debt securities whose principal is tied to the Consumer Price Index (CPI). They are possibly the most overlooked and least understood bonds available to investors. This paper, geared toward our defined contribution clients, provides an introduction to TIPS, details how TIPS work, and lays out a case for adding a TIPS fund to the menu of participant investment offerings.

In anticipation of rising inflation in the next 18 to 24 months, NEPC recommends real asset exposure in all client portfolios. Of all the real return strategies (TIPS, commodities, energy, agribusiness, infrastructure, and real estate), TIPS are the most liquid, transparent and investable.

Stronger than the tactical case for TIPS is the strategic one: TIPS are the liability-matching investment for defined contribution investors. Inflation is the enemy of anyone saving for any goal. If an investor wants to *protect* the dollars saved towards a goal (such as retirement), he or she needs an investment that is safe and inflation matched. Current approaches to plan design offer participants funds that can help them build their retirement wealth through taking on stock market and other risks. TIPS are a core investment for participants that want to minimize those risks, perhaps even the risks inherent in a stable value fund, which is often positioned as the safest available fund in a program.

Adding a TIPS fund to a defined contribution program as a new investment option is generally straightforward. It can serve as a complement to

the capital preservation and all-purpose core bond choices offered in most programs today.

TIPS Issuance

The U.S. Treasury has been issuing Treasury Inflation-Protected Securities (TIPS) since 1997. Currently there are twenty-nine TIPS in existence, ranging in maturity from less than one year to 30 years. Over the past 12 years, TIPS were issued with coupons ranging from 0.875% to 4.25%, averaging about 2.3%. TIPS market capitalization totals more than \$515 billion, or about 11% of overall

Initial Issue Date	Maturity	Coupon	Bid	Asked	Yield*	Accrued principal
2000 Jan 18	2010 Jan 15	4.25	102	102	0.564	1267
2004 Oct 29	2010 Apr 15	0.875	100.02	100.02	0.796	1125
2001 Jan 16	2011 Jan 15	3.5	104.12	104.13	0.638	1225
2006 Apr 28	2011 Apr 15	2.375	102.27	102.28	0.759	1074
2002 Jan 15	2012 Jan 15	3.375	106.02	106.03	0.951	1200
2007 Apr 30	2012 Apr 15	2	102.16	102.17	1.084	1050
2002 Jul 15	2012 Jul 15	3	105.2	105.21	1.11	1185
2008 Apr 30	2013 Apr 15	0.625	98.11	98.12	1.067	1008
2003 Jul 15	2013 Jul 15	1.875	102.01	102.02	1.353	1160
2004 Jan 15	2014 Jan 15	2	101.25	101.26	1.585	1153
2009 Apr 15	2014 Apr 15	1.25	99.22	99.23	1.311	1007
2004 Jul 15	2014 Jul 15	2	101.22	101.23	1.647	1131
2005 Jan 18	2015 Jan 15	1.625	98.29	98.3	1.827	1116
2005 Jul 15	2015 Jul 15	1.875	100.11	100.12	1.809	1096
2006 Jan 17	2016 Jan 15	2	100.22	100.23	1.885	1074
2006 Jul 17	2016 Jul 15	2.5	104.07	104.08	1.856	1055
2007 Jan 16	2017 Jan 15	2.375	103.16	103.17	1.873	1057
2007 Jul 16	2017 Jul 15	2.625	105.22	105.23	1.856	1028
2008 Jan 15	2018 Jan 15	1.625	98.09	98.1	1.841	1017
2008 Jul 15	2018 Jul 15	1.375	96.06	96.07	1.831	988
2009 Jan 15	2019 Jan 15	2.125	102.18	102.19	1.829	993
2004 Jul 30	2025 Jan 15	2.375	101.1	101.11	2.273	1131
2006 Jan 31	2026 Jan 15	2	96.17	96.18	2.251	1074
2007 Jan 31	2027 Jan 15	2.375	101.31	102	2.238	1057
2008 Jan 31	2028 Jan 15	1.75	92.26	92.27	2.224	1017
1998 Apr 15	2028 Apr 15	3.625	119.3	119.31	2.31	1318
2009 Jan 30	2029 Jan 15	2.5	104.18	104.19	2.21	993
1999 Apr 15	2029 Apr 15	3.875	124.22	124.23	2.312	1296
2001 Oct 15	2032 Apr 15	3.375	124.06	124.07	2.042	1201

*Yield to maturity on accrued principal.
Source: Thomson Reuters; online.wsj.com

Treasury issuance. As with other bonds, you can hold a TIPS until it matures or sell it in the secondary market before it matures.

How TIPS Work

The principal of a TIPS increases with inflation and decreases with deflation, as measured by the non-seasonally adjusted urban Consumer Price Index (CPI-U NSA) with a three month lag (hereafter referred to as "inflation"). TIPS pay interest semiannually at a fixed rate. The rate is applied to the adjusted principal; so, like the principal, interest payments rise with inflation and fall with deflation.

For example, if an investor invests in a conventional bond with a 3.5% coupon and a \$1,000 face value, the investor receives interest payments of \$35 per year (normally in two semi-annual payments). The market value of the bond may change over time, as might inflation, but the bond will continue to pay \$35 a year and will return \$1,000 at maturity.

TIPS work differently. If an investor invested \$1,000 in a TIPS with a 3.5% coupon, the bond would initially pay \$35 interest. If inflation were to rise 1.5%, it would pay \$35.525 ($\$35 * 1.015$), and the principal would adjust upwards by \$15. Because the bond's principal adjusts with inflation, the coupon payments represent a real return. At maturity, the TIPS investor would receive the principal plus the accrued inflation adjustments, \$1,015 in this example. Deflation can erode principal value in any given year, but at maturity the TIPS will never pay less than the beginning principal. See the illustration below.

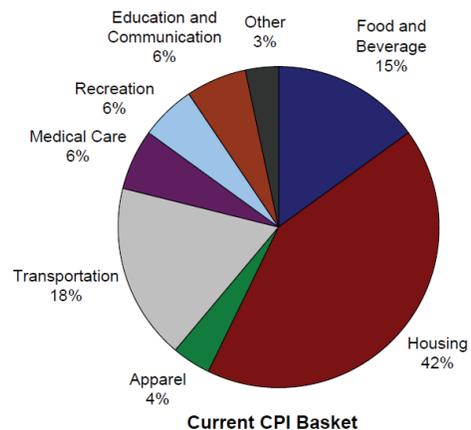
Please note that for facility this example assumed uniform 3.5% coupon rates for both the conventional bond and the TIP security, although in prac-

tice, the yield on a conventional bond will most likely be higher than the yield on a TIP security.

What is the CPI-U?

The urban Consumer Price Index (CPI-U) reflects the spending patterns of the "all urban consumer" group, representing about 87 percent of the total U.S. population. According to the Bureau of Labor Statistics, it is based on the expenditures of residents of urban or metropolitan areas, including professionals, retirees, the self-employed, the unemployed, and retired people. Not included in the CPI-U are the spending patterns of people living in rural or nonmetropolitan areas, including farm families, members of the Armed Forces, and those in institutions such as prisons.

The CPI is also called a cost-of-living index, as it measures changes over time in the amount that consumers need to maintain a certain standard of living. Each month, the Bureau of Labor Statistics visits and/or calls thousands of retail stores, service establishments, rental units, and doctors' offices throughout the United States to obtain price information on the thousands of items that make up the CPI-U basket. The changes in these prices taken together determine the overall price change in the CPI-U.



Example of a \$1,000 TIPS with a 3.5% Coupon Rate*

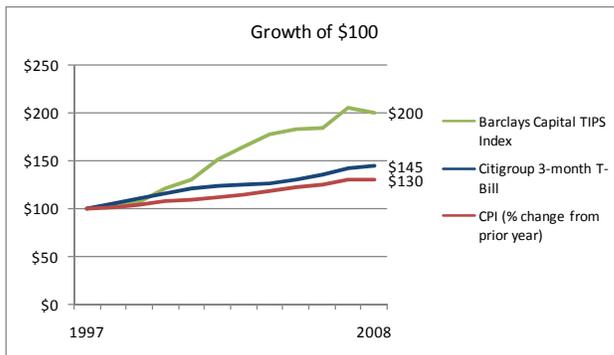
Year	Beginning Principal	Change in Inflation	Inflation Adjustment to Principal	Principal at Maturity	Coupon Payment	Income Return
1	\$1,000	0.00%	\$0	\$1,000	\$35.00	3.50%
2	\$1,000	1.50%	\$15	\$1,015	\$35.525	5.05%
3	\$1,000	-0.40%	(\$4)	\$1,011	\$35.385	3.09%

* This table assumes annual coupon payments (rather than semiannual). "Income return" is the sum of the "coupon payment" and the "inflation adjustment to principal", as a percentage of the "beginning principal". Bond prices change in response to market activity and may vary from principal value, generating a capital gain or loss as another component of total return (income return + capital return = total return).



TIPS Performance

At the most fundamental level, an investor in TIPS is looking for inflation protection. The illustration below shows the growth of \$100 from 1998 to 2008. Over the 11 year period, prices rose 30%. Investing in short-term instruments like risk-free T-Bills would have grown a portfolio to \$145, generating a return outpacing inflation without exposing investors to the risk of default or changes in market prices. Investing in TIPS, which are longer-dated Treasury investments, would have doubled the \$100 portfolio to \$200, but exposed the investor to more volatility in income yields and total returns.



We chose this period for the illustration because TIPS were launched in 1997. However, since the inception of TIPS, inflation has been low by historical standards. Within this 11 year period, inflation averaged 2.4%, rising higher than 4% only once (2007). The last time we saw heightened levels of inflation was the late seventies and early eighties, when inflation averaged 10%. We can't know how TIPS would have performed, but we do know that neither cash nor core bonds kept pace with inflation at that time.

Another way investors look at performance is trailing return comparisons, which are reprinted below from our year-end *Market Thoughts*.

Fixed Income Index Returns (12/31/08)	1 Yr	3 Yr	5 Yr	10 Yr
CPI	0.1%	2.2%	2.7%	2.5%
91 Day Treasury Bills	1.5%	3.8%	3.2%	3.3%
Barclays Capital TIPS	-2.4%	3.1%	4.1%	6.8%
Barclays Capital Aggregate	5.2%	5.5%	4.7%	5.6%
Barclays Capital High Yield	-26.2%	-5.6%	-0.8%	2.2%

TIPS sold-off in 2008 because the rapid deterioration of economic and financial conditions reversed inflation expectations. It was TIPS Index's first calendar year of negative returns since it launched. Although TIPS are similarly liquid and of the same quality as conventional U.S. Treasury bonds, they don't play the same safe-haven role in times of distress. Investors flocked to Treasuries in 2008, but were net sellers of TIPS.

On a forward looking basis, NEPC forecasts inflation at 3%, and assumes cash investments (as proxied by T-Bills) will also return 3%. We project a 6% annualized return for TIPS. Taken together, these facts suggest defined contribution investors can do one of two things: i) save their way to retirement using risk-free cash instruments, provided fees are sufficiently low so as not to erode returns relative to inflation, or ii) invest their way to retirement using TIPS and other instruments along the risk/reward spectrum, earning risk premiums above inflation.

TIPS in a Portfolio Context

The typical defined contribution program today offers diversified target date funds alongside a collection of single-asset class funds. Generally, the single-asset class choices include a capital preservation fund, an all-purpose core bond fund, and a handful of equity funds.

To understand the role TIPS can play in a portfolio, we've modeled four portfolios, three including TIPS and one excluding TIPS.

Portfolio Allocations	Simple 60/40	60/40 w/TIPS	60/40 All TIPS	Unconstrained
Cash	-	-	-	-
TIPS	-	20.0%	40.0%	30.6%
Core Bonds	40.0%	20.0%	-	-
High-Yield Bonds	-	-	-	46.9%
Large Cap Equities	60.0%	60.0%	60.0%	1.4%
Small/Mid Cap Equities	-	-	-	-
Int'l Equities	-	-	-	12.1%
Emerging Int'l Equities	-	-	-	9.1%
Expected Return	8.1%	8.3%	8.4%	10.0%
Standard Deviation	13.0%	12.6%	12.3%	13.0%
Sharpe Ratio	0.40	0.42	0.44	0.53

NEPC develops forward-looking risk, return and correlation assumptions for the major asset classes. The estimates above use our 2009 assumptions. Our assumptions are available to clients of NEPC by request. The Unconstrained Portfolio matches the risk level of the Simple 60/40 portfolio by using the asset classes in any weights, without constraints.



The portfolios that include TIPS are more efficient, meaning they have higher expected returns and lower volatility than those that exclude TIPS. Our modeling finds TIPS so attractive that they dominate core bonds in the “Unconstrained Portfolio”, as does high yield.

TIPS vs. Conventional Treasuries

At about this point in a conversation about TIPS, an investor might ask for comparisons with conventional U.S. Treasury bonds. After all, TIPS are a government security, and at any point, the market is attaching prices to Treasury bonds and TIPS. Current yields and inflation expectations over the life of the bond factor into the decision. For example, if the yield on a conventional 10 year Treasury is 4% and the 10 year real yield on TIPS is 1.7%, implied inflation is 2.3%. If inflation over the life of the bond exceeds 2.3%, the TIPS investment was the superior choice. Conversely, if inflation comes in at less than 2.3%, the conventional Treasury note or bond would have been the wiser choice.

It is important to understand that there are three elements in the composition of conventional U.S. Treasury yields: i) real yield, ii) expected inflation, and iii) an inflation risk premium. Because inflation protected securities are adjusted on the basis of changes in inflation, we can consider a TIPS yield to be a real yield. The sum of the remaining components (expected inflation and the inflation risk premium) represent “breakeven inflation”.

Breakeven Inflation

Breakeven inflation (“BEI”) is the spread that equates conventional Treasuries to TIPS.

The market convention for calculating breakeven inflation is simply:

Conventional Treasury yield - TIPS real yield

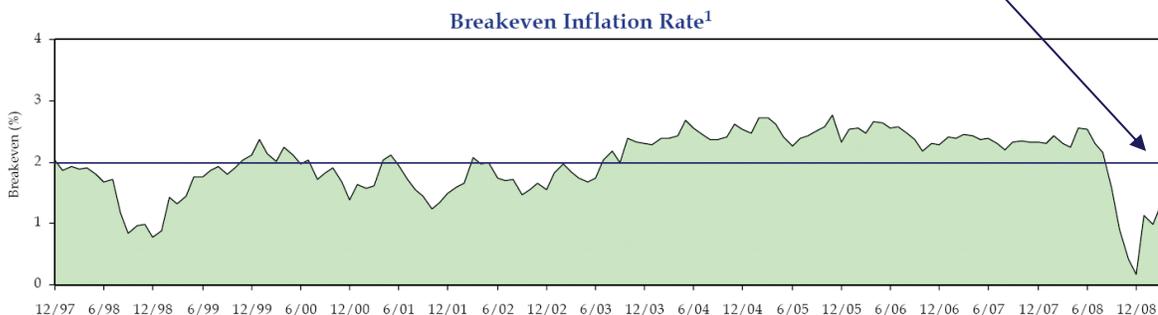
Breakeven inflation tells us something about the markets’ inflation expectations. A widening spread indicates investors believe inflation will rise. A narrowing spread indicates investors believe inflation will fall. TIPS are considered relatively cheap when breakevens are small (inflation expectations might be understated), and expensive when they are large (inflation expectations might be overstated). TIPS pricing reflects the outlook for inflation; not actual inflation experience.

TIPS from a Tactical Perspective

The backdrop to this paper is TIPS presently appear to be a very good buy relative to Treasuries. Breakeven inflation on 10-year TIPS was just 0.12% at year end. This suggests investors are expecting prices to rise at an average of 0.12% a year over the next decade. Unless inflation comes in under that number, TIPS should outperform Treasuries (and/or indexes weighted heavily toward Treasuries). The inflation insurance TIPS provide is cheap, while Treasuries are arguably overextended.

The illustration below, compliments of Income Research & Management, shows that breakeven inflation has trended around 2%.

Breakeven spread was at historic lows at year end, meaning very low inflation expectations were priced into conventional Treasuries. The breakeven has climbed this year, to nearly 1.6% as we release this paper in June.



TIPS for Defined Contribution Investors

Within defined contribution programs, participants can obtain exposure to TIPS through:

- Core investment options, such as a stand-alone TIPS fund or an all-purpose core bond fund,
- Target date funds, or
- A brokerage window.

As a practical matter though, most all-purpose core bond funds *do not* have a meaningful allocation to TIPS. This is because the benchmark index, the Barclays Capital Aggregate Bond Index excludes them. Also, most participants do not have access to a brokerage window, and fewer know how to use one.

Because it is not uncommon to see financial advisors recommend meaningful allocations to TIPS within investor portfolios, say one-third to one-half of the total fixed-income allocation, a real tension emerges with current approaches to plan design that focus on minimizing fund choices and confusion. Should sponsors add a TIPS fund to the core line up or leave it out? The fiduciary concerns of the sponsor and the investment needs of the participants are the key factors when making this decision.

TIPS Within Target Date Funds

Financial professionals rely on equity in a portfolio as a *long-term* hedge against inflation. High equity returns balance out the threat of rising inflation eroding purchasing power. Over the short run, however, equities are certainly an imperfect “hedge”, as corporate earnings and stock prices are hurt by inflation. Due to their unique inflation feature, TIPS have lower correlations to other assets than core bonds (see accompanying table), and can be additive at any point along the glide path.

NEPC (5 to 7 Yr Projected Correlations)	TIPs	Core Bonds	HY	Large	Small/Mid	Int'l
TIPS	1.00	0.75	0.30	0.00	0.00	0.00
Core Bonds	0.75	1.00	0.50	0.20	0.00	0.00
High-Yield Bonds	0.30	0.50	1.00	0.50	0.60	0.40
Large Cap Equities	0.00	0.20	0.50	1.00	0.90	0.70
Small/Mid Cap Equities	0.00	0.00	0.60	0.90	1.00	0.60
Int'l Equities	0.00	0.00	0.40	0.70	0.60	1.00

Additionally, TIPS could be considered the liability-matching investment for defined contribution investors, and increasing the allocation to TIPS investments as an investor ages is appealing.

Active vs. Passive Management

Throughout this paper we have used the Barclays Capital U.S. TIPS Index for our representations of the TIPS asset class. This is a market cap weighted index of the 28 issued U.S. TIPS.

It is not uncommon to find managers of TIPS funds retaining discretion to invest up to 20% of a fund’s assets outside of the index, say in holding that are not inflation-indexed, or in inflation protected securities issued by corporations (rather than the U.S. Treasury). Active managers may also introduce other sources of risk to a portfolio, such as leverage, and may have higher costs overall.

NEPC recommends index or low tracking error TIPS strategies for defined contribution plans unless the TIPS fund is layered within a multi-manager blended fund or a target date fund.

Mutual Fund vs. Direct Investment in TIPS

One criticism of a TIPS fund that is difficult to debunk is that it is “evergreen”. A TIPS index fund invests in every TIPS issuance of the U.S. Treasury and as such has no set maturity date. Conceptually, this means that a participant cannot invest in a TIPS fund and “lock in” a risk-free, inflation-protected rate of return tied to a specific retirement date, the way perhaps that an investor in an individual TIP security could (see the list of TIPS on page one).

This criticism really could be applied to *all* bond funds, because all bond funds are evergreen. Bond funds provide diversification - small pieces of many different bonds - but they sacrifice the certainty of receiving regular income payments (fondly known as “clipping coupons”) and the principal at maturity. Individual bonds, like individual stocks (aside from employer securities) are not offered in defined contribution programs.

Risks/Issues/Challenges

As sponsors consider the potential benefits of adding a TIPS fund to their program, there are



risks, issues and challenges to also consider. These include:

- Generally lower coupon rates on TIPS compared to the same maturity conventional bonds. In a low inflation environment, TIPS could provide very low returns.
- The debate about the authenticity of U.S. inflation calculations. If CPI *understates* true inflation, investing in a CPI-based product will not provide a complete hedge against inflation. Commodity-based strategies or equities would be favored.
- TIPS funds have relatively long durations (7+ years). If interest rates were to go up without inflation, TIPS would be expected to sell-off at almost twice the rate of an all-purpose core bond fund.
- TIPS are not risk-free investments. There is a very real sense that participants may associate “Treasury Inflation Protected Securities” with some form of government guarantee of no volatility. They may be surprised if a TIPS fund showed a loss in value.
- Finally, TIPS do not pay the inflation adjustment (the increase in principal) until the bond matures, but *both* the interest payments and the inflation adjustment are subject to federal income tax annually. This is akin to paying federal income tax on income not yet received. Holding TIPS in a tax-deferred retirement account like a traditional or Roth 401k or 403b, however, postpones the payment of income taxes on both the interest and inflation adjustments, so this is not a meaningful consideration.

Conclusion

While zero inflation may persist in the short run, the markets are already reflecting fears of rising inflation. Inflation has averaged about 3% since 1926. It erodes the purchasing power of every dollar saved toward retirement. Participants in de-

defined contribution programs can try to protect their purchasing power by investing in a plan’s capital preservation option, or in higher risk investments which should stay ahead of inflation over time. Using T-Bills as a proxy, we showed how capital preservation investments have only just kept pace with inflation over the past decade, a period of historically benign inflation. We introduced TIPS as a more direct and pure inflation hedge, and cautioned that inflation over the coming years could run much higher than recent historical experience.

NEPC currently has a higher 5 to 7 year return assumption on TIPS (6.0%) than core bonds (5.0%). Even if those two estimates were reversed, NEPC would see a role for TIPS within a defined contribution program as a defensive hedge against unexpectedly high inflation. Further, as TIPS are not included in the Barclays Capital Aggregate Bond Index they offer a distinct diversification tool for investor portfolios.

NEPC looks forward to discussing our research and views with plan sponsors considering making changes to their defined contribution programs. Over the years we have cautioned sponsors against adding narrowly-focused funds to their line-ups, as option proliferation is a negative thing. However, we are aware of the diversification value of TIPS and that TIPS are typically held in low allocations, if at all, within the all-purpose core bond funds and target date funds offered in most programs. We would like to see all of our clients have greater inflation protection in their portfolios in the coming years, and the features of a TIPS fund (low cost, daily valuation and liquidity) make this an investment opportunity as accessible to the defined contribution marketplace as to our discretionary client base.

