FOCUS ON THE LONG RUN

The Potential Diversification Benefits of Long Government Bonds in the Target Date Glidepath

STATE STREET GLOBAL ADVISORS®

State Street Global Advisors differs from other passive providers in its dedicated exposure to long government bonds in our target date funds for younger investors. Long government bonds have been one of the best-performing fixed income instruments in our glidepath over the last five years as interest rates have continued their downward trend. This has led some investors to question whether our long bond exposure could become a disadvantage if the secular downward trend in interest rates has now reversed.

In this paper we explore the diversification effects of long bonds and study the impact that a rise in interest rates would have on target date investors in more detail. Long government bonds can play a valuable role in early phases of the glide path, both because they are consistent with the long-dated future liabilities of younger participants and because they can provide meaningful diversification benefits at a time when the portfolio is heavily tilted towards equities. Furthermore, by breaking our fixed income allocation down into components, rather than relying almost exclusively on the Bloomberg Barclays Aggregate Index[1] (the "Agg") like many of our competitors, we seek to achieve more precision in mitigating the key risks faced by participants at different stages of their life cycle.

This paper contains a case study from 2016 of the expected impact of higher interest rates on target date investors. While rising interest rates would probably lead to a short-term drag on performance, target date investors are less exposed to this than lump-sum investors, and in the longer run, participants would be expected to profit from higher yields. The expected diversification benefits and the ability to more closely mirror participant liabilities continue to justify including long bonds in the target date glidepath.

[1] BLOOMBERG®, is a trademark and service mark of Bloomberg Finance L.P. and its affiliates, and BARCLAYS®, is a trademark and service mark of Barclays Bank Plc.

Negative Correlation with Equities Provides Diversification Benefits

In recent decades, long government bonds have provided diversification to portfolios, thanks to their negative correlation with equity prices. When equity prices have fallen, bond prices have typically risen, offsetting the decline in portfolio values. This effect has been particularly marked for long-duration government bonds; while the Agg index has provided a low positive correlation, long government bonds have most reliably provided a clear negative correlation (Figure 1).

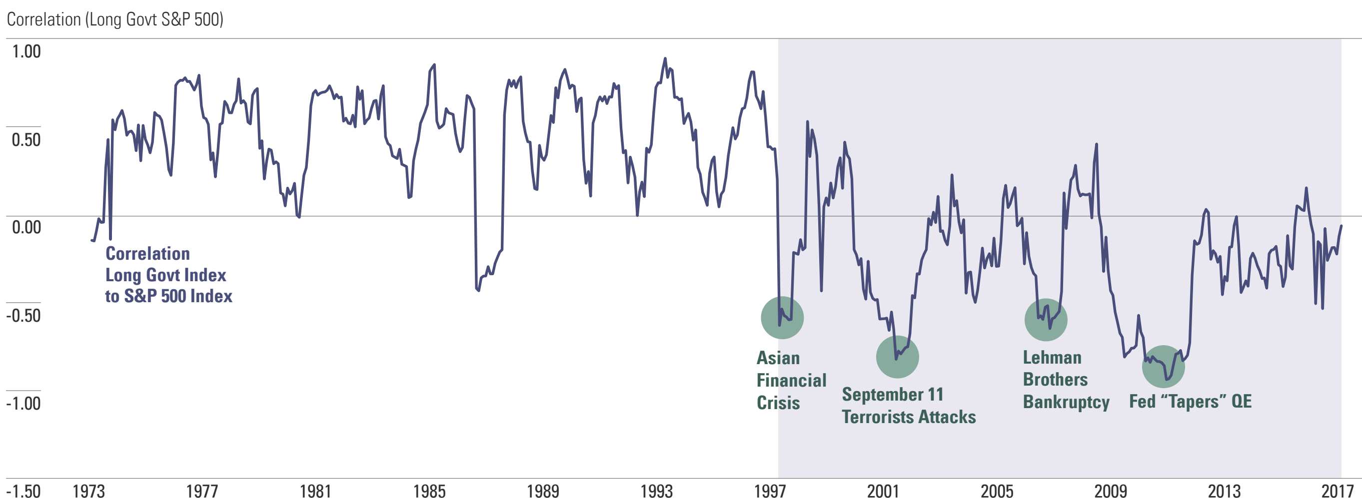
Bond prices have not always been negatively correlated with equity prices. Indeed, over much of history the correlation between the two asset classes has been positive. The current period of sustained negative correlation dates back to the Asian financial crisis in the late 1990s (Figure 2) and is probably a consequence of central banks' policy of systematically loosening monetary policy in response to economic shocks. This environment seems likely to persist. For example, following the vote for Brexit, markets immediately assumed that central banks would adopt looser monetary policy in response. Academic research also shows that stock and bond prices tend to be negatively correlated in periods of low inflation and low economic growth, such as we are currently experiencing.[2,3] For these reasons, it is reasonable to assume that long government bonds will continue to have a negative or very low correlation with equities and thus play a useful diversifying role in the target date portfolio.

Figure 1: Asset Class Index Correlations

	S&P 500 Index	Russell Completeness Index	MSCI ACWI ex USA IMI Index
Long Government Bonds	-0.26	-0.28	-0.21
US Aggregate	0.01	-0.02	0.11
US TIPS	0.13	0.13	0.25
1–3 year Gov/Credit	-0.07	-0.09	0.07
US High Yield	0.69	0.70	0.74

Source: FactSet, SSGA. Period January 2003–September 2018. Indices used in calculations: Bloomberg Barclays US Aggregate, Bloomberg Barclays Capital Long Government Bond Index, Bloomberg Barclays Capital US TIPS Index, Bloomberg Barclays Capital 1-3 Yr Gov/Credit Index, Bloomberg Barclays High Yield Very Liquid Index, MSCI AC World ex USA IMI Index, S&P 500 Index, Russell Small Cap Completeness Index.

Figure 2: The Negative Correlation Between Equities and Long Government Bonds Since the Asian Crisis



Source: SSGA calculations. Indices used in the calculation: Bloomberg Barclays Capital Long Government Bond Index, S&P 500 Index Data as of September 30, 2018.

[2] Ilmanen, Antti, "Stock-Bond Correlations," *Journal of Fixed Income*, vol. 13, no. 2 (September 2003), 55–66.

[3] Rankin, Ewan and Muhammed Shah-Idil, "A Century of Stock-Bond Correlations," *Reserve Bank of Australia Quarterly Bulletin* (September 2014).

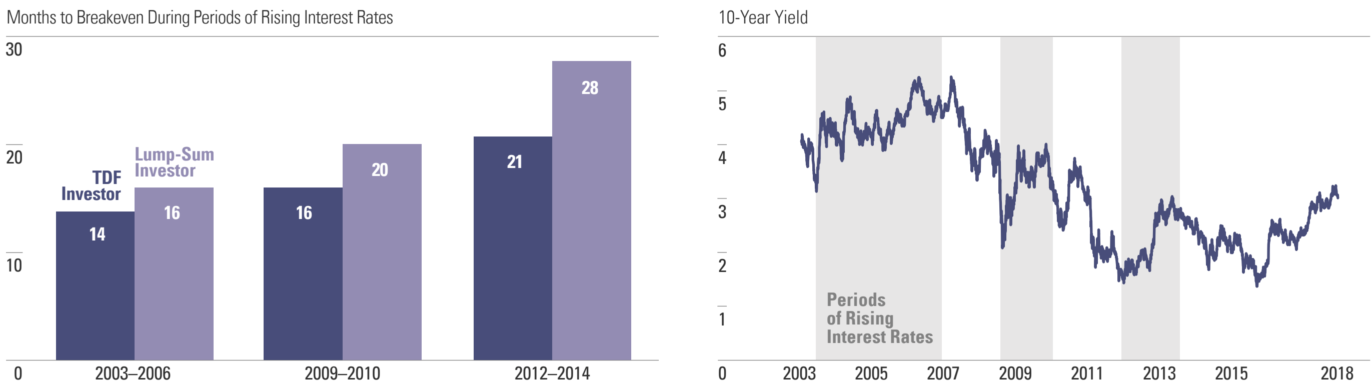
Case Study

Target Date Investors Recover from Rising Yields Faster than Lump Sum Investors

A common concern for investors is the potential for long government bonds to detract value from the portfolio if interest rates finally rise from their current extremely low level. If interest rates start to rise, this will indeed have an initial negative impact on long bond investors. However, rising interest rates are not all bad news for investors. As rates rise, the yield on the bonds in a portfolio also rises; this effect helps to offset the capital loss. Furthermore, a target date investor, making biweekly contributions, benefits from the higher yield more quickly than a lump-sum investor because each subsequent contribution is made at a higher yield (or lower price).

In our case study, we examined three recent periods of rising interest rates to see how long it would have taken an investor making monthly contributions to recoup their initial investment in the long bond index (Figure 3). As we can see, this period has steadily become longer as rates have fallen ever lower, but even in the recent interest-rate cycle, when rates rose by about 1.5 percentage points from July 2012 to December 2013, after 21 months the monthly investor would already have reached breakeven (assuming they started making contributions when interest rates were at their lowest point). The advantage of the monthly investor compared with the lump-sum investor has also steadily widened as rates have fallen ever lower in each subsequent interest-rate cycle.

Figure 3: Target Date Investors Have Benefited from Higher Yields Faster than Lump-Sum Investors



Source: SSGA calculations. Months to breakeven calculated first for a hypothetical target date investor making monthly contributions of $100 to the Bloomberg Barclays Capital Long Government Bond Index. The breakeven for the lump-sum investor is calculated by taking the total sum invested by the target date investor until breakeven and investing this amount at the start of the period in the same long government bond index.

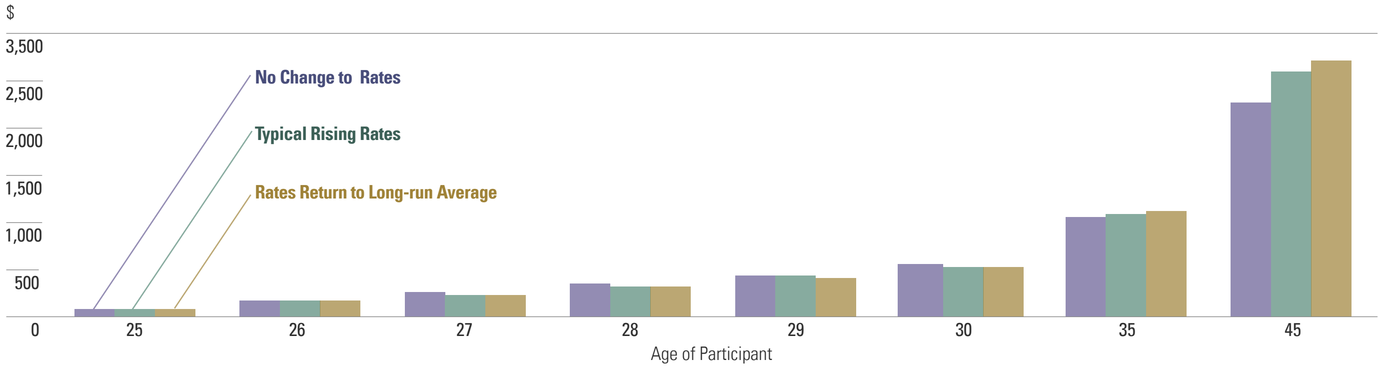
Performance of an index is not illustrative of any particular investment. It is not possible to invest directly in an index. Index returns reflect capital gains and losses, income, and the reinvestment of dividends.

Past performance is not a guarantee of future results.

The above chart is for illustrative purposes only.

Case Study

Figure 4: Value of the Example Long Government Bond Portfolio for a Participant Making $100 Annual Contributions in Different Interest Rate Scenarios



SCENARIO A

No Change to Rates
Interest rates remain at their current level for the next 20 years

SCENARIO B

Typical Rising Rates
Interest rates rise 0.75 percentage points each year in years 1 and 2 and then stabilize. An increase of 1.5 percentage points over 2 years is fairly typical of recent rising rate cycles

SCENARIO C

Rates Return to Long-run Average
Interest rates rise 0.75 percentage points in years 1 and 2 and then rise another 0.5 percentage points to their long-run average level (since 2000) in year 3

Source: SSGA calculations based on a parallel shift in the yield curve using the yield curve for 6/30/2016. The above hypothetical scenarios are based on certain assumptions and analysis made by SSGA. There is no guarantee that the estimates will be achieved. Returns reflect capital gains and losses, income, and the reinvestment of dividends. Returns are unmanaged and do not reflect the deduction of any fees or expenses.

The Overrated Fear of Rising Interest Rates

As an alternative way of studying the impact that a rise in interest rates would have on a portfolio, we simulated a parallel shift in a portfolio that is invested in the long government bond index with maturities from 10 to 30 years. In this case study, we used the level of interest rates at the end of June 2016 as our starting point. With the benefit of hindsight, this was actually very close to the bottom of the current rate cycle. We then studied the three resulting scenarios (Figure 4) for a participant who starts making annual contributions of $100 at the age of 25.

In both hypothetical rising rate scenarios, the bond investor initially sustains losses of 7%–9% in the years in which yields rise. However, the benefits of the higher yields soon make themselves felt in the portfolios — by the time the participant is 30, the value of the portfolio in the rising rates scenario is almost the same as the scenario in which interest rates stay at current levels. The value of the portfolios in both rising rates scenarios exceeds that of the stable interest rates scenario in the year when the participant reaches 33.

These calculations are based on an investor making annual contributions, but we know that most target date investors make bi-weekly contributions. As we showed in Figure 3, an investor making frequent contributions could expect to reap the benefits of higher yield levels more rapidly, so this simulation probably overstates the time it would take for the target date investor to benefit from higher yields.

Figure 5: SSGA Provides a More Detailed Fixed-Income Portfolio Breakdown Than Our Competitors

Asset Classes	SSGA	Provider A	Provider B
Fixed Income			
Long Government	✓	X	X
Core Aggregate	✓	✓	✓
Cash or ST Gov't/Credit	✓	X	X
US High Yield	✓	X	X
International Developed Debt	X	✓	X
Emerging Markets Debt	X	X	X
Inflation Protection			
Inflation-Linked Bonds (TIPS)	✓	✓	✓
Commodities	✓	X	✓
REITS	✓	X	✓

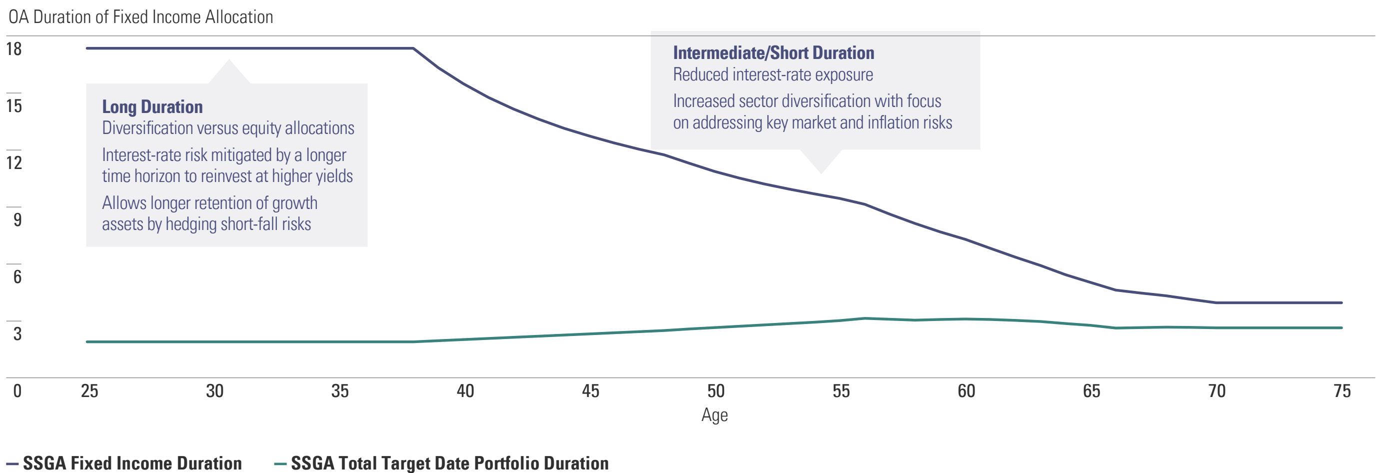
Source: SSGA analysis based on publicly available information as of December 31, 2018. Provider A and B chosen as sample passive target date competitors due to highest AUM among comparable investment strategies. Competitor info sourced from fact sheets. The information contained above is for illustrative purposes only.

Tailoring the Glide Path's Risk with a Granular Approach

SSGA employs a granular approach within the fixed income allocation in the target date glidepath, dynamically adjusting the composition of the fixed-income portfolio at different phases of the retirement saving journey. This allows us to more closely match the composition of the portfolio to the key risks faced by participants in different phases. Compared with our competitors, we employ more asset classes within our fixed income allocation (Figure 5). While our competitors maintain essentially a stable fixed income duration throughout their glidepath, SSGA tailors the duration of the fixed income glidepath to each stage of the participant's lifecycle, starting at a high level and gradually falling as participants approach retirement (Figure 6). The declining duration of the fixed income portfolio reflects the falling duration of participants' retirement liabilities as they age.

In the early stages of retirement saving, participants have a long investment horizon. This implies both a high risk tolerance, which is reflected in the high equity weight at this stage, and a long duration of retirement liabilities. Long government bonds

Figure 6: SSGA Strategically Manages Interest Rate Risk, While Competitors Maintain Static Duration



Source: State Street Target Retirement Strategies strategic asset allocation roll-down schedule as of September 30, 2018. Updated annually.

Competitor information sourced from fact sheets and/or prospectuses.

Fixed Income asset class statistics sourced from Bloomberg Barclays POINT as of September 30, 2018. Updated annually.

The information contained above is for illustrative purposes only. Past performance is not a guarantee of future results. Please refer to the disclosure slide for additional risk disclosures.

Allocations are as of roll-down schedule date indicated, are subject to change, and should not be relied upon as current thereafter.

perform a valuable role at this stage, both by diversifying equity risk and matching the duration profile of retirement liabilities.

As participants approach retirement, their risk tolerance and the duration of their liabilities typically fall. We start to reduce the allocation to long government bonds 10 years before the fund vintage reaches its target date. By the time the fund has reached the target date, it no longer contains any long government bonds. As participants prepare to draw down their savings in retirement, managing inflation risk becomes more important, and we increase our allocation to TIPS (Treasury Inflation Protected Securities). In the decumulation phase, the fixed income portfolio consists of the Agg, short-duration treasuries and corporates, TIPS and high-yield bonds.

Long Government Bonds Continue to Play a Valuable Role in the Target Date Glidepath

We believe that long-duration government bonds continue to be a valuable component of target date funds for early vintages, as they offset equity risk at the time when the equity weight is at its highest. Based on academic research, the economic environment is likely to support a low or negative correlation between stocks and long-dated bonds in the coming years. In this case, long government bonds would be expected to continue to provide valuable diversification benefits to early stage target date investors with high levels of equity risk. It is true that in view of the current low level of interest rates, long-dated bonds are unlikely to perform as strongly going forward as they have over the past few decades, but this is also true for all longer-duration fixed income in general. Our allocation decisions are based on our long-term forecasts rather than short-term tactical decisions, and this provides our glidepath with an important element of consistency.

Fears regarding the negative impact of rising bond yields are likely to be exaggerated. If bond yields rise, long bond investors will initially suffer losses, but these will be offset by higher future yields on the bond portfolio. Furthermore, target date investors, who typically make biweekly contributions, could reap the benefits of higher interest rates faster than a lump-sum investor, as they are essentially dollar-cost averaging their exposure. We believe long government bonds continue to play a valuable role in the glidepath, despite the potential for rates to rise from current levels.

About State Street Global Advisors

For nearly four decades, State Street Global Advisors has been committed to helping our clients, and those who rely on them, achieve financial security. We partner with many of the world's largest, most sophisticated investors and financial intermediaries to help them reach their goals through a rigorous, research-driven investment process spanning both indexing and active disciplines. With trillions* in assets, our scale and global reach offer clients access to markets, geographies and asset classes, and allow us to deliver thoughtful insights and innovative solutions.

State Street Global Advisors is the investment management arm of State Street Corporation.

* AUM reflects approximately $28.32 billion (as of September 30, 2018), with respect to which State Street Global Advisors Funds Distributors, LLC (SSGA FD) serves as marketing agent; SSGA FD and State Street Global Advisors are affiliated.

ssga.com/definedcontribution

State Street Global Advisors One Iron Street, Boston MA 02210.
T: +1 866 787 2257.

Investing involves risk including the risk of loss of principal.

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The views expressed in this material are the views of DC Investment Strategy Team through the period ended December 31, 2018 and are subject to change based on market and other conditions. This document contains certain statements that may be deemed forward-looking statements. Please note that any such statements are not guarantees of any future performance and actual results or developments may differ materially from those projected.

Bonds generally present less short-term risk and volatility than stocks, but contain interest rate risk (as interest rates rise, bond prices usually fall); issuer default risk; issuer credit risk; liquidity risk; and inflation risk. These effects are usually pronounced for longer-term securities. Any fixed income security sold or redeemed prior to maturity may be subject to a substantial gain or loss.

Government bonds and corporate bonds generally have more moderate short-term price fluctuations than stocks, but provide lower potential long-term returns.

Diversification does not ensure a profit or guarantee against loss.

SSGA Target Date Fund are designed for investors expecting to retire around the year indicated in each fund's name. When choosing a Fund, investors should consider whether they anticipate retiring significantly earlier or later than age 65 even if such investors retire on or near a fund's approximate target date. There may be other considerations relevant to fund selection and investors should select the fund that best meets their individual circumstances and investment goals. The funds' asset allocation strategy becomes increasingly conservative as it approaches the target date and beyond. The investment risks of each Fund change over time as its asset allocation changes.

Dollar cost averaging does not assure a profit or protect against a loss in declining markets. For the strategy to be effective, you must continue to purchase shares both in market ups and downs.

Assumptions and forecasts used by SSGA in developing the Portfolio's asset allocation glide path may not be in line with future capital market returns and participant savings activities, which could result in losses near, at or after the target date year or could result in the Portfolio not providing adequate income at and through retirement.

Increase in real interest rates can cause the price of inflation-protected debt securities to decrease. Interest payments on inflation-protected debt securities can be unpredictable.

Investing in REITs involves certain distinct risks in addition to those risks associated with investing in the real estate industry in general. Equity REITs may be affected by changes in the value of the underlying property owned by the REITs, while mortgage REITs may be affected by the quality of credit extended. REITs are subject to heavy cash flow dependency, default by borrowers and self-liquidation. REITs, especially mortgage REITs, are also subject to interest rate risk (i.e., as interest rates rise, the value of the REIT may decline).

Investing in commodities entail significant risk and is not appropriate for all investors. Commodities investing entail significant risk as commodity prices can be extremely volatile due to wide range of factors. A few such factors include overall market movements, real or perceived inflationary trends, commodity index volatility, international, economic and political changes, change in interest and currency exchange rates.

Investing in high yield fixed income securities, otherwise known as junk bonds, is considered speculative and involves greater risk of loss of principal and interest than investing in investment grade fixed income securities. These Lower-quality debt securities involve greater risk of default or price changes due to potential changes in the credit quality of the issuer.

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