



Bond Diversification in Target Retirement Funds

Vanguard commentary

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- In a period of low yields and expectations of rising interest rates, should the Vanguard Target Retirement Funds (TRFs) include bond market sectors that may perform better when rates rise? Currently, our TRFs provide exposure to only the investment-grade¹ portion of the global bond market. This excludes allocations to more credit-sensitive non-investment-grade segments such as high-yield,² floating-rate, and non-investment-grade emerging-market bonds.
- Historically, these segments have generally outperformed the broader investment-grade bond market during times of rising rates but have tended to display equity-like return patterns in periods of market stress. In this paper, we explore the merits of including them in the bond portion of our TRFs.
- We conclude that overweighting lower-credit-quality high-yield, floating-rate, or emerging-market bonds increases a portfolio's credit exposure and in turn its volatility, which may reduce the bond allocation's downside protection.

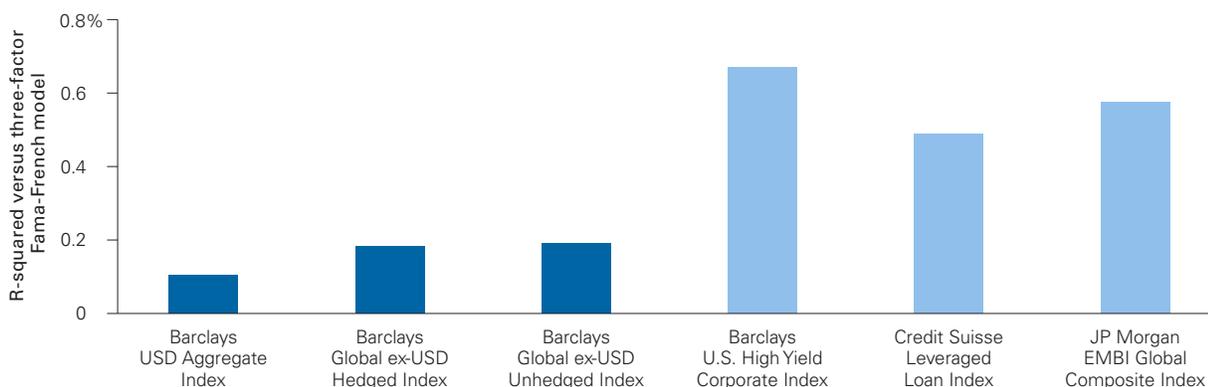
¹ We define high-grade or investment-grade bonds as those fixed income securities rated Baa3 and above by Moody's Investors Service.

² High-yield bonds represent the debt financing of companies rated below-investment-grade by the primary rating agencies (Ba or lower for Moody's, BB+ or lower for Standard & Poor's).

We believe the primary purpose of bonds in diversified portfolios such as the Vanguard Target Retirement Funds is shock absorption, particularly in times of market stress. In other words, we find value in *risk* diversification, or mitigating the impact of uncertainty and high-risk episodes. To further diversify bond allocation, investors may adjust sub-asset weightings to focus more on varying their

bonds' *return* profile. As **Figure 1** demonstrates, the challenge in this line of thinking is that the segments of the bond market targeted for this purpose are often more heavily influenced by the same factors that drive equity returns. This relationship has the potential to undercut the effectiveness of investment-grade fixed income's risk-diversification properties.

Figure 1. Credit-sensitive segments of the global bond market show equity-like characteristics



Notes: Data cover the period January 1, 1994, through June 30, 2014. R-squared is the percentage of variability in a dependent variable explained by an independent variable or variables. The three-factor Fama-French model expands on the capital asset pricing model (CAPM) by adding size and value factors to the CAPM's market risk factor. The data shown represent past performance, which is not a guarantee of future results.

Sources: Vanguard, Morningstar, Thomson Reuters Datastream, and the Kenneth R. French Data Library.

Notes on risk: All investments, including a portfolio's current and future holdings, are subject to risk, including the possible loss of the money you invest. Past performance is no guarantee of future returns. Bond funds are subject to the risk that an issuer will fail to make payments on time and that bond prices will decline because of rising interest rates or negative perceptions of an issuer's ability to make payments. High-yield bonds generally have medium- and lower-range credit-quality ratings and are therefore subject to a higher level of credit risk than bonds with higher credit-quality ratings. There are additional risks when investing outside the United States, including the possibility that returns will be hurt by a decline in the value of foreign currencies or by unfavorable developments in a particular country or region. Bonds of companies based in emerging markets are subject to national and regional political and economic risks and to the risk of currency fluctuations. These risks are especially high in emerging markets. Diversification does not ensure a profit or protect against a loss. Investments in Target Retirement Funds are subject to the risks of their underlying funds. The year in the fund name refers to the approximate year (the target date) when an investor in the fund would retire and leave the workforce. The fund will gradually shift its emphasis from more aggressive investments to more conservative ones based on its target date. An investment in a Target Retirement Fund is not guaranteed at any time, including on or after the target date. Currency hedging risk is the chance that currency hedging transactions may not perfectly offset the fund's foreign currency exposures and may eliminate any chance for a fund to benefit from favorable fluctuations in those currencies.

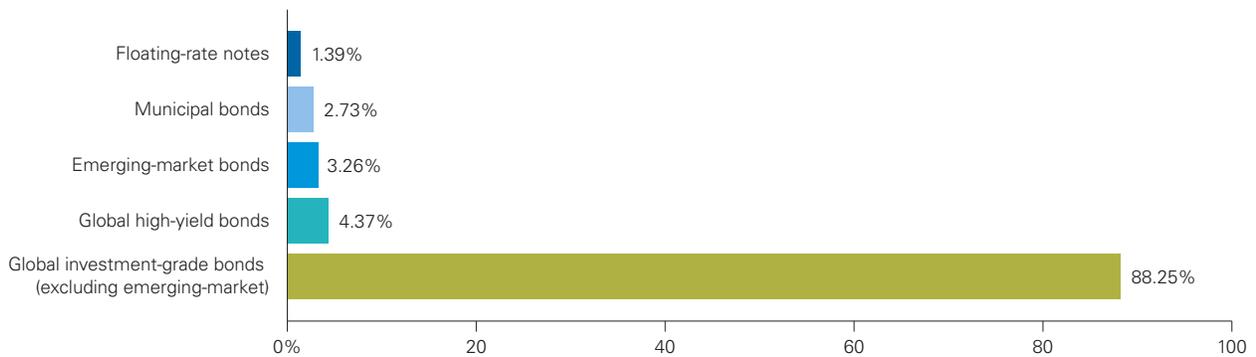
Bond diversification: A menu of options

Our study evaluated three fixed income sub-asset classes: high-yield, floating-rate, and emerging-market bonds. Before discussing their diversification properties, it is important to note the significance of their weights in the overall fixed income market, as shown in **Figure 2**.

As Figure 2 shows, investment-grade bonds make up almost 90% of the nominal global bond market. Based on their market capitalization weights, high-yield, floating-rate, and emerging-market bonds are not likely to materially affect prospective risk-adjusted returns in a diversified portfolio. Of course, an investor could choose to overweight any of these areas relative to market cap.

Figure 2. Composition of the global bond market

Relative size (in terms of market capitalization) of the high-yield, floating-rate, and emerging-market bond sectors.



Notes: Data are as of January 31, 2014. Floating-rate notes are represented by the Barclays USD Floating Rate Notes Index and the Barclays Pan-European Floating Rate Note Index. Municipal bonds are represented by the Barclays Municipal Bond Index. Emerging-market bonds are represented by the Barclays Emerging Market USD Aggregate Bond Index and the Barclays Emerging Market Pan-European Aggregate Bond Index. Global high-yield bonds are represented by the Barclays Global High-Yield Index. Global investment-grade bonds are represented by the Barclays Multiverse Bond Index after removing the Global High-Yield Index component and the two Emerging Market Debt Index components.

Source: Barclays.

A note on Treasury Inflation-Protected Securities (TIPS):

For the purposes of this analysis, we will focus on nominal bonds, not real bonds such as TIPS. Although Vanguard has incorporated them into its TRFs as an inflation hedge, TIPS fall outside the scope of our analysis.³

³ For more information on the inclusion of short-term TIPS in Vanguard TRFs, see the Vanguard research paper *The Long and Short of TIPS* (Davis et al., 2012).

A reasonable starting point in analyzing the efficacy of overweighting certain sectors is to examine the dispersion of returns relative to traditional asset classes in “normal” and bottom-decile equity markets, as shown in **Figure 3a** and **Figure 3b**.

Keeping in mind that this analysis is based on historical results and that future results may differ, these charts reveal at least two notable points. First, U.S. investment-grade bonds and hedged international investment-grade bonds are the only sub-asset classes analyzed that retained positive median returns in bottom-decile equity return environments. This is an illustration of the shock absorption previously described. Second, over the time period studied, the dispersion of returns for those two

classes retained a relatively normal distribution, whereas the dispersion of returns for high-yield, floating-rate, and emerging-market bonds resembled that of U.S. stock returns. Negative returns were more likely and worse within the latter three bond classes when U.S. stock market returns were worst. In contrast, the likelihood of negative returns for U.S. investment-grade bonds or hedged international investment-grade bonds actually diminished slightly during periods of bottom-decile equity returns. The results in Figure 3b may in part be driven by the fact that credit quality is a key component of the expected return premium associated with high-yield, floating-rate, and emerging-market bond positions, a topic that we will explore next.

Figure 3a. Dispersion of monthly returns among select asset and sub-asset classes

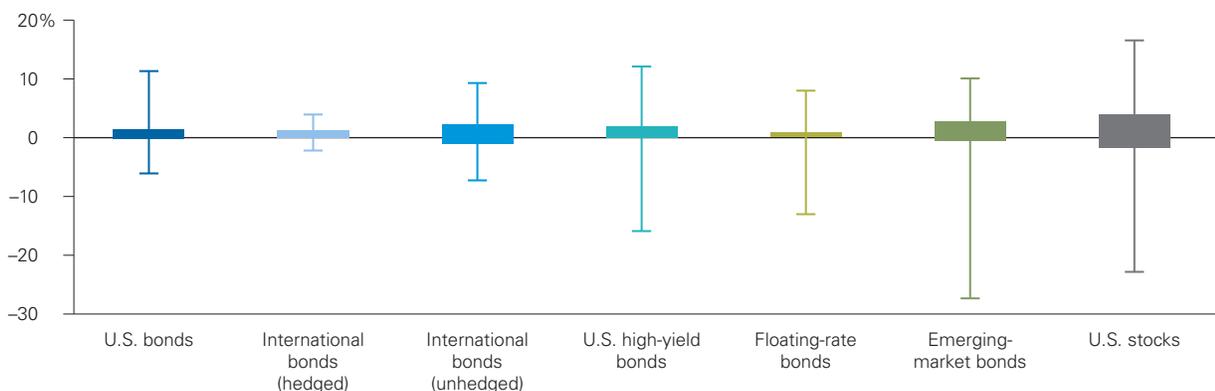
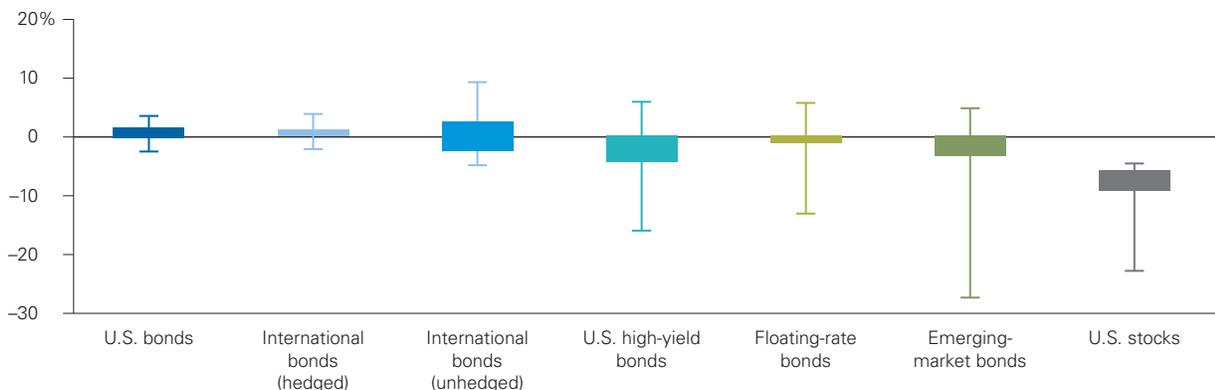


Figure 3b. Dispersion of monthly returns during periods of bottom-decile equity market returns



Notes: The time period analyzed is from January 1994 through December 2013. U.S. bonds are represented by the Barclays U.S. Aggregate Bond Index. International bonds (hedged) are represented by the Barclays Global Aggregate ex-USD Hedged Index. International bonds (unhedged) are represented by Barclays Global Aggregate ex-USD Unhedged Index. U.S. high-yield bonds are represented by the Barclays U.S. Corporate High Yield Index. Floating-rate bonds are represented by the Credit Suisse Leveraged Loan USD Index. Emerging-market bonds are represented by the JP Morgan Emerging Market Bond Index through July 2001 and Barclays Global Emerging Markets Bond Index thereafter. U.S. stocks are represented by the Dow Jones Wilshire 5000 Index through April 2005 and the MSCI Broad Market Index thereafter. The performance data shown represent past performance, which is not a guarantee of future results. The performance of an index is not an exact representation of any particular investment, as you can not invest directly in an index.

Sources: Vanguard calculations using data from Morningstar, Inc.

High-yield bonds

High-yield bonds have unique characteristics when compared to traditional investment-grade securities. They traditionally offer higher yields because of their increased probability for default. Of course, they also offer the chance for significant price appreciation should the issue or issuer be upgraded by the credit-rating agencies. And they have historically delivered characteristics of both equity and fixed income, each of which is already represented in most diverse, balanced portfolios. Vanguard studied the potential impact of adding high-yield bonds to such a portfolio. After accounting for liquidity and increased costs, we found that these bonds on

average would not have improved the risk and return characteristics of a portfolio such as a TRF (Philips, 2012).

Of course, the weighting of the sub-asset classes matters. A market capitalization-weighted exposure to high-yield bonds would likely not harm a diversified portfolio but would also be too small to offer a significant benefit. **Figure 4** shows the rolling impact on both returns and volatility of reallocating 20% of a hypothetical target-date 2020 fund's fixed income allocation into high-yield bonds. The analysis indicates that doing so would generally increase portfolio returns but also introduce significantly more volatility.

Figure 4. Impact of a 20% U.S. high-yield bond allocation on a hypothetical target-date 2020 fund



Notes: The period studied is from December 1987 through December 2013. The hypothetical target-date 2020 fund's allocation before adding 20% to high-yield bonds was 42% U.S. equities, 18% international equities, 32% U.S. investment-grade bonds, and 8% hedged international investment-grade bonds. The fund's allocation after adding 20% to U.S. high-yield bonds was 42% U.S. equities, 18% international equities, 16% U.S. investment-grade bonds, 4% hedged international investment-grade bonds, and 20% U.S. high-yield bonds. The analysis assumes a static allocation for the entire period. U.S. equities are represented by the Dow Jones Wilshire 5000 Index through April 2005 and the MSCI Broad Market Index thereafter. International equities are represented by the MSCI EAFE Index. U.S. bonds are represented by the Barclays U.S. Aggregate Bond Index. International bonds (hedged) are represented by the Barclays Global Aggregate ex-USD Hedged Index. U.S. high-yield bonds are represented by the Barclays U.S. Corporate High Yield Index. This hypothetical example does not represent the return of any particular investment. The performance data shown represent past performance, which is not a guarantee of future results.

Sources: Vanguard calculations using data from Morningstar, Inc.

Floating-rate bond funds

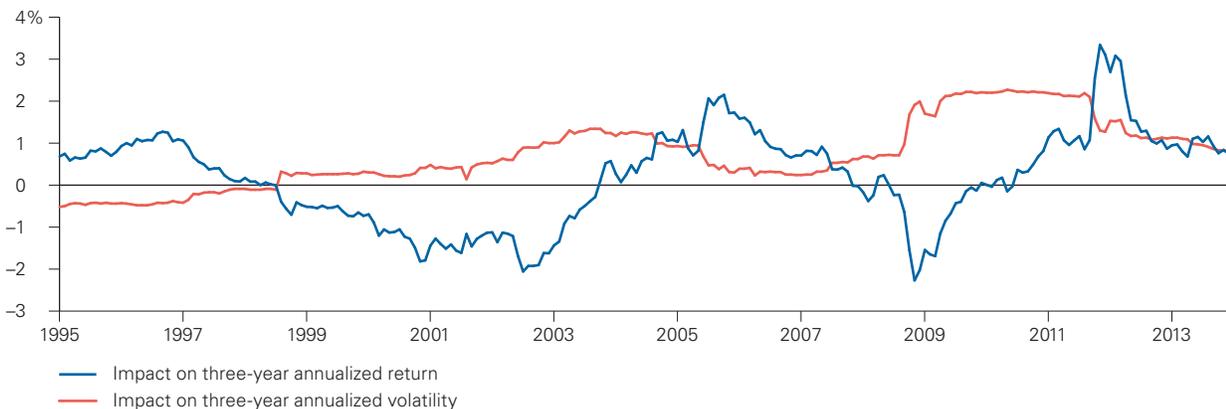
Floating-rate bonds can help mitigate the impact of rising interest rates because coupon payments are determined by a floating reference rate plus a fixed spread. The rate is typically adjusted periodically (e.g., daily, weekly, or biweekly). As a result, coupon payments mirror the current market rate and reduce the price sensitivity of the bonds' principal value. Indeed, floating-rate bonds in aggregate outperformed the aggregate bond market by 4.3% over three separate rising-rate periods (Bennyhoff and Zilbering, 2013).

This performance may seem appealing given the current level of interest rates. However, Vanguard research has also highlighted the significant losses attributed to

floating-rate bond funds during the global equity bear market from late 2007 through early 2009 (Bennyhoff and Zilbering, 2013). This occurred because these bonds are typically issued as alternative sources of financing for companies whose credit quality is rated below-investment-grade. This can be seen in their default rates (3.4%) compared to those of investment-grade bonds (0.1%) and speculative-grade bonds (4.5%) (Bennyhoff and Zilbering, 2013). We assess the impact of adding floating-rate notes to a TRF in **Figure 5**.

This analysis shows that the impact on portfolio returns was very dependent on time period and that, in general, the allocation would have increased volatility in most periods without meaningfully improving performance.

Figure 5. Impact of a 20% floating-rate bond allocation on a hypothetical target-date 2020 fund



Notes: The period studied is from January 1995 through December 2013. The hypothetical target-date 2020 fund's allocation before adding 20% to floating-rate bonds is 42% U.S. equities, 18% international equities, 32% U.S. investment-grade bonds, and 8% hedged international investment-grade bonds. The fund's allocation after adding 20% to floating-rate bonds is 42% U.S. equities, 18% international equities, 16% U.S. investment-grade bonds, 4% hedged international investment-grade bonds, and 20% U.S. floating-rate bonds. The analysis assumes a static allocation for the entire period. U.S. equities are represented by the Dow Jones Wilshire 5000 Index through April 2005 and the MSCI Broad Market Index thereafter. International equities are represented by the MSCI EAFE Index. U.S. bonds are represented by the Barclays U.S. Aggregate Bond Index. International bonds (hedged) are represented by the Barclays Global Aggregate ex-USD Hedged Index. U.S. floating-rate bonds are represented by the Credit Suisse Leveraged Loan USD Index. The performance data shown represent past performance, which is not a guarantee of future results. This hypothetical example does not represent the return on any particular investment.

Sources: Vanguard calculations using data from Morningstar, Inc.

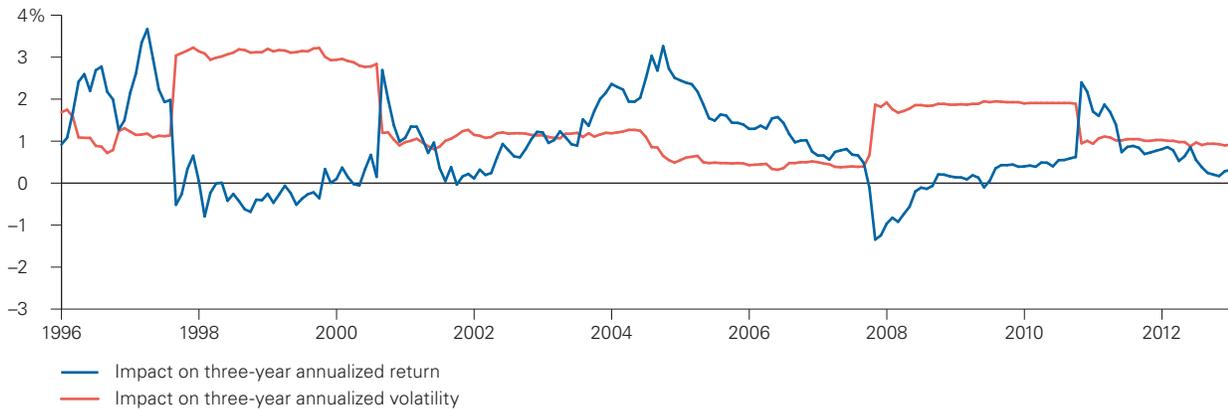
Emerging-market bonds

Emerging-market bonds broadly include debt issued by emerging-market governments, government agencies, and corporations. They have gained appeal because of their higher yields compared to traditional bonds, the strong relative fundamentals of the issuing countries, and their attractive historical risk-and-return attributes. However, even though these bonds are predominantly government-issued, Vanguard research has shown that investors should be concerned primarily with credit risk stemming from political, regulatory, or market/macroeconomic developments and with currency fluctuations (Philips et al., 2013). As a result of the relationship between credit risk and equity market risk, an overweight to emerging-market bonds in a TRF portfolio would likely

reduce its shock absorption. To the extent that local currency-denominated bonds were included, additional and sizable currency fluctuations would add another layer of volatility and thus reduce shock absorption even further. Vanguard does include emerging-market bond exposure at market cap in its TRFs through the Total International Bond Index Fund. However, because these bonds are both investment-grade and hedged to the U.S. dollar, the credit risk is reduced and the currency risk eliminated.

The results of this analysis look very similar to those of the high-yield bond allocation previously described. Although portfolio returns generally improve, they do so at the expense of increased volatility.

Figure 6. Impact of a 20% emerging-market bond allocation on a hypothetical target-date 2020 fund



Notes: The hypothetical target-date 2020 fund's allocation before adding 20% to emerging-market bonds is 42% U.S. equities, 18% international equities, 32% U.S. investment-grade bonds, and 8% hedged international investment-grade bonds. The fund's allocation after adding 20% to emerging-market bonds is 42% U.S. equities, 18% international equities, 16% U.S. investment-grade bonds, 4% hedged international investment-grade bonds, and 20% emerging-market bonds. The analysis assumes a static allocation during the entire period. U.S. equities are represented by the Dow Jones Wilshire 5000 Index through April 2005 and the MSCI Broad Market Index thereafter. International equities are represented by the MSCI EAFE Index. U.S. bonds are represented by the Barclays U.S. Aggregate Bond Index. International bonds (hedged) are represented by the Barclays Global Aggregate ex-USD Hedged Index. Emerging-market bonds are represented by the JP Morgan Emerging Market Bond Index through July 2001 and the Barclays Global Emerging Markets Bond Index thereafter. The performance data shown represent past performance, which is not a guarantee of future results. This hypothetical example does not represent the return on any particular investment.

Sources: Vanguard calculations using data from Morningstar, Inc.

Rationale for a strategic approach

Notably, all three sub-asset classes would have added to risk-adjusted returns over certain time periods. Indeed, the case for including one or more of them often points to outperformance at certain times in the business cycle. Through this lens, efficacy rests on the degree to which tactical asset allocation is successfully employed. The Vanguard TRFs focus solely on strategic asset allocation because this explains about 90% of long-term return variability (Davis, Kinniry, and Sheay, 2007). Successful tactical asset allocation is rare, and identifying managers who may successfully deploy such strategies involves significant time, effort, and ongoing due diligence on behalf of the plan sponsor (Stockton and Shtekhman, 2010). Simply put, concentrating on strategic asset allocation within the TRFs reduces the number of moving parts the plan sponsor needs to monitor and focuses on the factors most likely to affect long-term returns.

Conclusion

Investment-grade bonds have a unique role in a balanced portfolio such as a TRF: They act as a shock absorber in times of market stress. As with any other asset class, diversification within the asset class can reduce volatility. For fixed income, this diversification can occur across maturities, credit profiles, and durations. For plan sponsors seeking diversified fixed income portfolios, Vanguard's TRFs provide exposure to global bonds, including broad market hedged international investment-grade bonds that retain the shock absorption characteristics expected of a traditionally diversified U.S. investment-grade bond position. In contrast, other options such as overweighting lower-credit-quality high-yield bonds, floating-rate bonds, or emerging-market bonds increase a portfolio's credit exposure and in turn its volatility, which may reduce the bond allocation's downside protection.

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