



# Pension risk: Shortening sail for the corporate bond headwind

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- **The quest:** Pension plans often seek to minimize funding status risk by hedging the value of their plan liabilities with all-bond portfolios that match the liabilities' cash-flow, quality, and yield profiles.
- **The problem:** The bond portfolio faces downgrade and default risk. The plan liability does not. The result can be a sudden, potentially costly deterioration in funding status.
- **The solution:** Although perfect liability matching is impossible, plan sponsors can increase the correlation between the plan liabilities and plan assets through a small allocation to Treasury bonds. The cost is modestly lower returns. The benefit is less risk of a sudden, unexpected deterioration in funding status.

Pension plan sponsors dream of eliminating funding status risk by owning a 100% bond portfolio; since bonds mimic the movements in the liability valuation, sponsors may believe they can theoretically protect (or hedge) their pension liability from future funding status volatility. However, a truly perfect match between assets and liabilities is impossible to achieve in practice, for a number of reasons—one of which, the “corporate downgrade/default headwind,” we will examine in this note.

Because bonds can be downgraded or default and a pension liability cannot, the asset portfolio faces a headwind that prevents it from perfectly matching liability returns and zeroing out risk. While this headwind means that risk can't be completely eliminated, we suggest an approach to mitigate this corporate bond headwind: owning a slice of non-defaulting bonds—Treasury bonds. In addition, Treasury bonds often see relative gains during a crisis, courtesy of the “flight to quality” phenomenon, which further limits portfolio losses during downgrade periods. Our analysis suggests that a 20%–30% allocation to Treasury bonds improves a bond portfolio's liability tracking relative to a corporate-only bond portfolio, although it may reduce portfolio return. A plan sponsor must decide if the lower funding status volatility is worth the lower return and related higher cost.

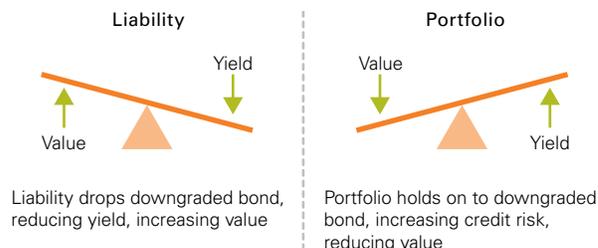
## Sailing into a headwind

The course from downgrade risk to funding shortfall reality has a few steps. Consider a typical scenario: A traditional final-pay pension plan calculates the value of its liability (future cash flow discounted at market interest rates). Toward the end of a glide-path strategy, your plan often seeks to reduce funding status risk by matching its estimated liability with an all-bond portfolio that looks just like the liability in terms of cash-flow profile, quality, and yield.

This reasoning is mostly sound, but it fails to account for the difference in default risk between plan assets and liabilities. The asset portfolio faces downgrade and default risk; the liability does not. Let's say a bond drops in price, reflecting a deteriorating issuer. Even so, it retains its good credit rating and remains in the benchmark used to calculate plan liabilities. This higher-yielding bond is attractive to the liability-hedging plan because it reduces the calculated liability size (higher interest rates do that). As long as this particular bond is in the liability-measuring benchmark and is held by the pension, the pension assets and pension liability are moving similarly.

Then one day, one or more rating agencies downgrade the bond (Figure 1). If it drops below the relevant quality threshold (i.e., below A for IRS funding liabilities, or below AA for U.S. GAAP accounting liabilities), it is removed from the liability-measuring portfolio. Immediately, the yield of the liability-measuring portfolio drops a bit, reflecting the “disappearance” of this higher-yielding bond. The liability is now measured using lower interest rates, meaning that the liability goes “up” in value (that inverse relationship between price and yield). Meanwhile, that bond, still in your investment portfolio, may have dropped even further in value because of the downgrade. The result? The liability went up but your pension asset value may have gone down. It doesn’t seem fair—sorry.

Figure 1. The risk of downgrade can hurt value

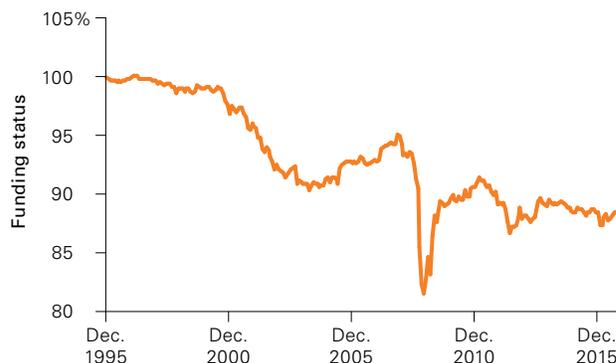


Source: Vanguard.

### The headwind measured

What kind of impact can this risk have? We measured what sort of drag, or corporate headwind, a bond portfolio faces. This study (Figure 2) starts in 1995 (with the introduction of the Citigroup Pension Liability Index [CPLI]) and runs through February 2017. The asset portfolio uses A or better rated bonds (while the CPLI is AA quality, using exclusively AA or better bonds is too limiting in terms of available issues and for matching a typical pension liability profile—the appendix shows the AA portfolio drag results). The asset portfolio was adjusted so its duration (rate sensitivity) is equivalent to the CPLI. We start the funding clock at 100% funded, and after the 22+ years, the funded ratio drops to 89%, or about 0.50% loss of funding per annum. Note the episodic nature—it’s not 50 basis points *each* year. The bottom line is that a high-quality bond portfolio does not prevent funding slippage.

Figure 2. A ‘best fit’ bond portfolio trails the liability due to corporate headwind



Sources: Vanguard, Citigroup, Bloomberg.

### Notes on risk:

*All investing is subject to risk, including possible loss of principal. Past performance does not guarantee future results. When interest rates rise, the price of a bond or bond fund will decline. Bonds are subject to credit risk and inflation risk. Credit risk is the risk that a bond issuer will fail to make timely payments of interest and principal. Inflation risk is the possibility that increases in the cost of living will decrease or eliminate the returns of an investment. Because high-yield bonds are considered speculative, investors should be prepared to assume a substantially greater level of credit risk than with other types of bonds. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.*

*U.S. government backing of Treasury or agency securities applies only to the underlying securities and does not prevent share-price fluctuations. Unlike stocks and bonds, U.S. Treasury bills are guaranteed as to the timely payment of principal and interest.*

*Although the income from the U.S. Treasury obligations held in a fund is subject to federal income tax, some or all of that income may be exempt from state and local taxes.*

*In a diversified portfolio, gains from some investments may help offset losses from others. However, diversification does not ensure a profit or protect against a loss in a declining market.*

### Ways to overcome the headwind

There is no perfect solution. The corporate headwind is just a fact of life that pension plan sponsors have to deal with. Perfect liability hedging simply isn't possible unless the sponsor hands off the pension liability to, perhaps, an insurance company that will take on the risk. Of course, the company will charge for taking the risk. There are nevertheless steps that a pension investor can take in an attempt to mute or offset the impact of this corporate headwind. These steps demand a consideration of two issues: return and risk.

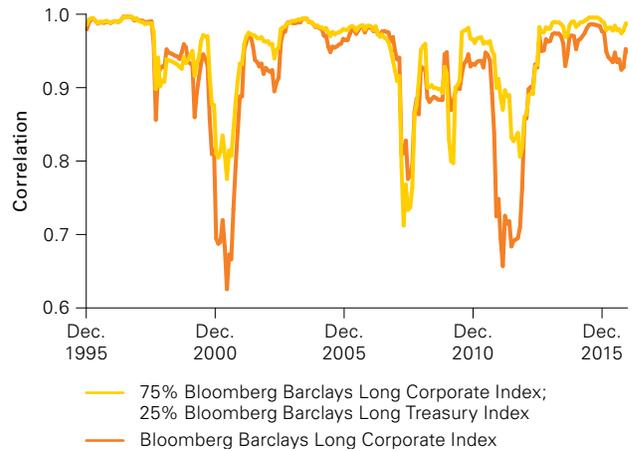
**Return** isn't often seen as the primary concern when employing a risk-minimizing strategy. And yet, most plan sponsors want the growth of the asset portfolio to keep up with the liability growth (or nearly so). But we know an all-bond portfolio likely won't keep up over the long term, as Figure 2 points out. If a plan sponsor is willing to make contributions of roughly 0.5% of the liability value, then it's set. Alternatively, a plan sponsor can attempt to offset the headwind via asset portfolio strategy. One way is to invest a portion of the portfolio in equities. If the long-term equity risk premium over bonds is 3%, then a 10%–20% equity allocation ought to earn sufficient equity risk premium to cover the bond headwind over time. This introduces tracking risk, but there's risk in this situation no matter what you do.

Another way is to invest in higher-risk bonds with more yield, with the expectation that the basis risk pays off. This higher yield expresses the market view of perceived risk, plus it is correlated with the equity markets. In most cases, such portfolios call for active management so selection, manager risk, and cost are issues to keep in mind. We have found that active managers tend to outperform their benchmark when spreads narrow, but trail when spreads widen as they consistently overweight the riskier bonds (see Bosse, Wimmer, and Philips, 2013). This outcome may not align with the objective of controlling downgrade/default risk during crises. Therefore, an active manager who is conservative and low-cost may be the best choice.

**Risk minimization** is usually the primary focus when a plan is (finally) fully funded and is considering termination or other plan design changes. Pension investors naturally gravitate to high-quality corporate bonds for this purpose because of their high correlation to the pension liability. However, our research indicates that this correlation may be further increased, and funding status risk may be further reduced, by including an allocation to bonds that do not default or downgrade (much): Treasury bonds (**Figure 3**).

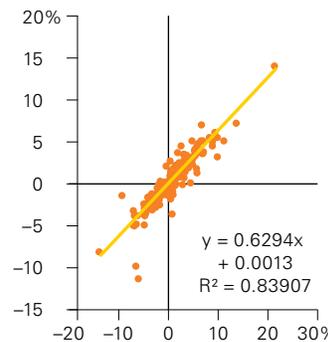
**Figure 3. Adding Treasury bonds improves tracking**

Historical return correlations with Citi Pension Liability Index: Monthly returns; one-year rolling correlations, 1995–2016



Sources: Vanguard, Citigroup, Bloomberg.

Fit to CPLI:  
Long Corporate Index



Fit to CPLI:  
Corporate (75%) + Treasury (25%)

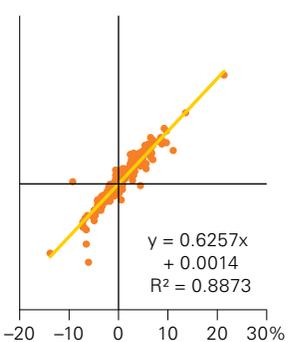


Chart summary statistics: 20%–30% allocation to Treasury bonds improves tracking to the liability.

Treasury Weight	0%	10%	20%	30%	40%
R <sup>2</sup> to CPLI	.839	.867	.884	.888	.878
Correlation to CPLI	.921	.933	.939	.940	.934

Sources: Vanguard, Bloomberg, Citigroup.

We tested portfolios with 100% fixed income and various levels of Treasury securities and found that an allocation of 20%–30% to Treasuries improves the tracking, measured by R-squared<sup>1</sup> and correlation. Two observations:

1. We show a range estimate rather than a specific allocation solution to acknowledge that this study has only 22 years of data and the series volatility is substantial. An allocation within this range is likely to reduce risk relative to an all-corporate bond portfolio, but there is no certainty that a specific percentage is better than another, similar one.
2. An additional benefit of this strategy should be noted. While the correlation to the pension liability is higher with a 20%–30% Treasury allocation, there were episodes when the correlation was lower, although beneficial to the portfolio. Witness 2008: The correlation of the mixed portfolio declined significantly, but that was because Treasury bonds enjoyed a “flight to quality” rally that corporate bonds did not. Funding was better preserved, despite the worse correlation/tracking.

## Conclusion

Corporate headwind—the downgrade and default of bonds held by pension plans relative to the liability “bond”—means that building a perfect immunization portfolio is not possible. What to do? For meeting the return need, consider including a small allocation (10%–20%) to equities in the portfolio, but acknowledge the risk it brings. Alternatively, active bond managers with a broader universe can add value but should be aware of their costs and that their underperformance timing may be a risk. If minimizing risk is the primary objective, as is usual for an immunization step, then an allocation to Treasury bonds can reduce funding status risk relative to an all-corporate bond portfolio.

## References

Bosse, Paul M., Brian R. Wimmer, and Christopher B. Philips, 2013. *Active Bond-Fund Excess Returns: Is It Alpha ... or Beta?* Valley Forge, Pa.: The Vanguard Group.

## Appendix

This chart shows the headwind associated with a double-A universe versus the liability. The drag is less, but we do not believe this reflects the actual experience most pension plans face, as the availability of appropriate AA bonds is limited in number and in maturity location. The headwind with this higher-quality portfolio is less, about 25 basis points per annum. But the AA bond universe is small, concentrated, and illiquid. Therefore, we do not think it is realistic to build a liability-matching portfolio based on this bond universe.

## Funded Status—AA



Source: Vanguard.

<sup>1</sup> R-squared: R-squared ( $R^2$ ) is a statistical measure of how close the data are to the fitted regression line. It is also known as the coefficient of determination.

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