



Liability-hedging strategies for pension plans: Close may be best

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- Corporate pension plans are very different today than they were two or three decades ago. Back then, most plans remained open to new employees, and balanced asset portfolios frequently produced double-digit returns—more than enough to enable many sponsors to take a lengthy funding “holiday.”
- Today, most plans are closed or frozen, asset returns are likely to be lower (Davis, 2017), new rules have shortened the investment time horizon, and expenses are ratcheting higher. Increasingly concerned with risk control and exiting the pension business altogether, sponsors are turning to strategies such as “glide-path” designs that focus on liability hedging.
- This paper will review the use of liability hedging as the final step of a glide-path strategy. Our research shows that:
 - A liability-hedging strategy can reduce contribution risk and funding level volatility.
 - The elimination of all contribution and corporate risk is nearly impossible.
 - Therefore, liability hedging that greatly reduces risk yet is flexible and low-cost is a good option.

What is pension liability hedging?

For pension plans, liability hedging means removing as much investment risk as possible through asset allocation design. Pension plan investment strategies are very different from those used by most individual investors. Whereas most individuals consider risk in terms of absolute portfolio volatility, pension sponsors are more concerned with how the plan's assets move *in relation* to its pension liability.

Pension liability value is calculated based on future payments discounted to the present using market interest rates. Because payments are made into the distant future, pension liability often has a high degree of interest-rate sensitivity, or duration.¹ To mimic the

liability and keep the mismatch low, pension assets must have similar duration, as offered by long bonds. This greatly reduces the chance of a big drop in funding, which can trigger large contributions and deficits that may encumber the corporate balance sheet, loan covenants, or performance ratios.

Liability hedging is often used when a firm is preparing to terminate a plan, considering a partial de-risking transaction (such as annuitization of the retired lives), or responding to a corporate preference to reduce the plan's financial impact. Risk can also be reduced through plan design features such as lump-sum payouts and freezing future employee benefit accumulation.

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.

¹ Duration risk is a measure of interest rate sensitivity and expresses how much price movement occurs with a 1% move in interest rates. For instance, a liability with a duration of 10 will drop 10% with an interest rate rise of 1% or rise 10% if interest rates drop 1%.

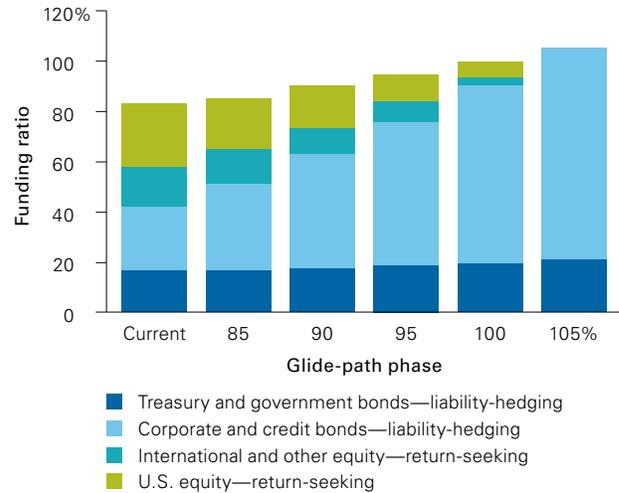
When to hedge liabilities

Complete liability hedging is often the final stage of a glide-path strategy, which seeks to improve pension funding by keeping risk higher (for expected higher return) when the funding level is lower and reducing risk as funding rises. In essence, as a plan’s funding level improves through risk-taking or contributions, its investment risk is reduced to minimize the chance of losing those gains. (Many uniquely named and trademarked versions of this concept all basically do the same thing.) To see what the process looks like in practice, consider the example shown in **Figure 1**.

The figure shows a stepwise migration *away* from risky return-seeking assets (such as equities and alternatives) and *toward* risk-reducing liability-hedging assets (bonds that match the character of the liability) as the funding ratio rises. The glide path’s specifics are based on a combination of sponsor objectives and preferences such as risk tolerance, economic cyclicalities (pension contributions typically follow these cycles), and the size of the pension relative to the sponsor.

The glide path’s final objective is to bring risk to its lowest level once the plan attains maximum funding. At this point, the plan’s assets should be able to maintain full funding well into the future without further substantial contributions or investment risk. The amount of funding required depends on several factors. One of these is the plan’s status. A plan that is open (available to new participants and accumulating pension benefits to current and future participants) requires more funding because a substantial portion of its liability is unknown, driven by future employee growth and wage gains, and expected to grow along with future service costs. Depending on those costs, funding levels of 130% or higher could be required if a sponsor wants the assets to cover the future cost of the plan.

Figure 1. Example of a pension glide path: Reducing risk as the funding level improves



Notes: For illustrative purposes only. Not based on any particular portfolio.
Source: Vanguard.

A closed plan (closed to new participants but accumulating pension benefits to current participants) has more liability certainty because the employee base is now fixed, but the plan remains exposed to unknown future wage gains and has a service cost that will decline over time along with the shrinking employee base. The funding required for liability hedging a closed plan can be 115% to 120%.

Finally, a frozen plan (no new participants, no further benefit accrual) has a well-defined liability with fewer unknowns, so a matching strategy is easier to construct. As a general rule, a good target for funding a frozen plan’s liability hedging is about 105%. This often approximates the amount of assets required to fully terminate the plan. However, the funding level required to terminate varies widely among plans because of differences in features, demographics, and other factors.

Addressing all the risks

Although the low-risk investment choices for individual investors may be cash or short-maturity bonds, because a pension plan's risk is defined by its liability, a sponsor's choice is likely to be very different. A typical final-pay pension liability can have a duration of 12 years or longer. This was why the global financial crisis of 2008 was so hard on pensions. Not only did equity prices drop, but declining interest rates meant that pension liability valuation soared, leading to major declines in funding levels.

Liability hedging may focus on interest rate risk, but the process is naturally more complicated than that. All of the following risks should be considered.

Return risk: The return of the portfolio should approximate that of the liability. If the portfolio yield is lower, the plan sponsor may have to make future contributions. Raising the expected return can reduce contribution risk but usually means raising the portfolio's return risk and possibly increasing the volatility of its funding status.

Yield-curve risk: Pension liability is defined by a series of cash flows continuing far into the future. Each cash flow is part of the calculation. Simply matching the liability duration without being aware of the liability's profile could result in funding status volatility when the shape of the yield curve flattens or inverts.

Credit-spread risk: Pension liability is measured using discount rates based on AA-quality bond yields—a high quality level that is difficult to replicate. Holding bonds of lower quality could result in future funding status volatility. Mortgage bonds have unusual aspects (such as convexity) that can lead to poor liability tracking. Derivative securities such as interest rate swaps also introduce tracking error from a credit-spread perspective. Higher-quality bonds such as U.S. Treasuries can lead to higher tracking error too, but often in a positive direction.

Their appeal during “flights to quality” can ameliorate the downside risk that an equity position can bring (Dutton and Plink, 2018).

Liquidity risk: Corporate bonds do not trade like company stock. Whereas most companies have just one class of common stock, a single firm can issue dozens of different bonds all along the maturity spectrum. Selling a bond can be more challenging and expensive than selling a stock because it will require a specific buyer.

Interaction with return-seeking assets: Even when the objective is to minimize asset-liability risk, some plans may hold a 10%–20% allocation to return-seeking assets as a way to manage future costs (see “Return risk”). The interaction of those assets with the liability and matching assets represents a risk to the liability-hedging strategy. (Although equities are often said to have duration, it is too volatile and uncertain to be used as a liability-hedging position.)

Wait—there's more . . .

The paragraphs above summarize the risks related to asset selection and construction. But additional factors further complicate the liability-hedging equation.

Cost: Simply put, the cost of running a pension plan is a drag on the return required to service the liability. The costs of investments, plan management, asset-liability studies, consultants, pension payment systems, and government insurance programs all need to be paid. Some of these are controllable, but others are unavoidable and raise the hurdle for required return.

Bond downgrades and defaults: Bonds in the portfolio face the headwinds of downgrade or default risk. Episodic bouts of downgrades affect bond prices at inconvenient times, often coinciding with declining interest rates and falling equity prices (and general

economic malaise). To make matters worse, the liability does *not* face a downgrade or default risk. That poses a matching problem—even a perfectly constructed portfolio will eventually suffer a headwind (Bosse, 2017).

Although high-quality (AA) bonds offer the best liability match in theory, liability-hedging portfolios more often contain a broad range of corporate bonds. Mixing in some Treasury bonds (with no credit spread risk and little downgrade price risk) can improve the tracking of the portfolio versus the liability.² Treasury bonds also help in tough investment scenarios that feature flights to quality. This can further dampen the downside risks of other assets such as equities and lower-quality bonds, leading to better liability tracking.

Supply: High-quality long bonds are a small sliver of the total new-issue market. As of March 2018, AA bonds with maturities longer than 10 years made up just 5.8% of the corporate bond market.³ And demand for these bonds is a global phenomenon. Insurance companies buy them to match up to their life policies and normally hold them to maturity. At the time of this writing, high U.S. corporate bond yields have caused foreign insurance companies to buy U.S. issues to meet their bond requirements. Finally, the finance industry is the second-largest provider of bonds to the market. These tend to come to market early in the year and then taper off. All of these factors are hurdles to building effective liability-hedging bond portfolios.

Plan and sponsor changes: Liability hedging is often viewed as a precise science, involving the development of a close-tracking asset portfolio based on a highly detailed actuarial report. But that careful setup can turn into a house of cards if the sponsor changes the plan by, for example, closing or freezing it, offering a lump sum to terminated vested participants, or starting a cash balance plan. Such changes can significantly affect a liability profile, and a precisely built liability-hedging portfolio may suddenly become obsolete.

Exogenous shocks: Shocks to the system can come from a host of sources. Actuaries, for example, have changed their minds several times in the last few years about how long people will live. This has had a major impact on pension liability durations and profiles. Pension Benefit Guaranty Corporation premiums⁴ have risen significantly during the last few years and are expected to continue to rise, which may lead sponsors to rethink their plans. And new rules around measurement of the liability for minimum contribution requirements⁵ have made that liability impractical to hedge.

How to construct a liability-hedging portfolio

There are two primary ways to build a liability-hedging portfolio. The first is to go to market and buy the bonds that match your liability cash flows by matching each year's liability future outflow (the actuarial estimation for each year) with the coupons and maturities of the asset portfolio. Ideally, this bond portfolio will need no further tinkering, as the predicted pensioner payments are matched to a schedule of maturing bonds or their coupon payments. The bonds are typically held in a separately managed account under the watchful eye of an investment manager until the last payment is made decades later.

This would seem to be the ideal solution, but some issues must be addressed. First, finding those perfect bonds in terms of quality and maturity will be a challenge. Second, the status quo is usually not static: Changes in *any* of the factors listed earlier can make a carefully constructed portfolio no longer optimal.

An alternative approach is to buy a set of bond funds and build an approximate match to the liability profile. This match will be less precise and will likely need periodic adjustments, depending on actual pensioner outflows and market movements. But in return, you'll get a diversified bond portfolio not tied to current availability

² For a complete discussion, see Dutton and Plink (2018).

³ Bloomberg Barclays Indexes, March 9, 2018.

⁴ The Pension Benefit Guaranty Corporation, a government agency that backstops the voluntary pension system, is severely underfunded. As a remedy, it has been raising the insurance premium it charges plan sponsors. The premium was \$64 per participant in 2016 and is scheduled to rise to \$80 per participant in 2019, with additional charges for unfunded vested benefits.

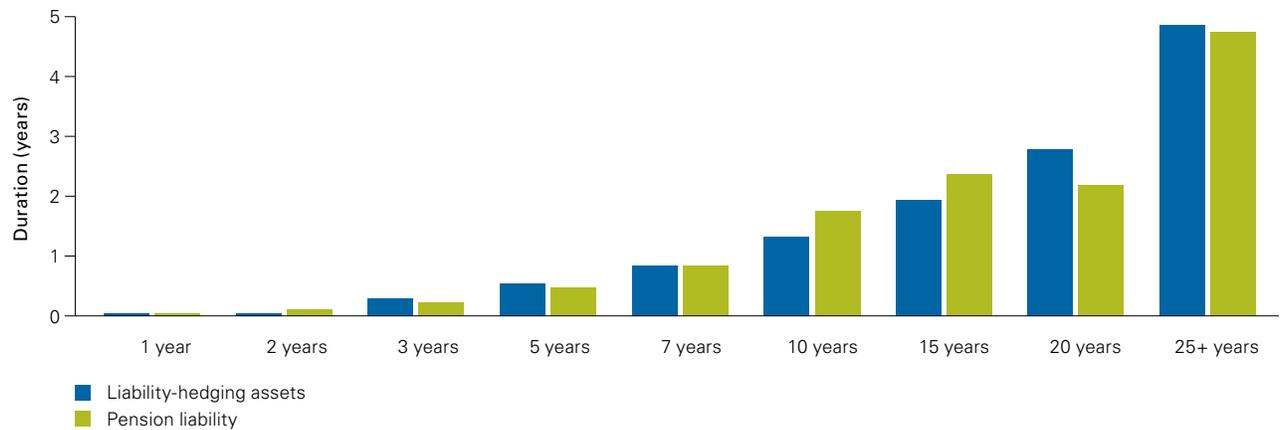
⁵ The Highway and Transportation Funding Act of 2014 and the Moving Ahead for Progress in the 21st Century Act (2012).

that is liquid/flexible and typically lower-cost. **Figures 2 and 3** show examples of what matching with bond funds can look like.

All matching strategies greatly reduce a corporation's pension risk. Some imprecision may be acceptable in exchange for diversification, flexibility, lower cost, and the recognition that a perfect match is not truly possible.

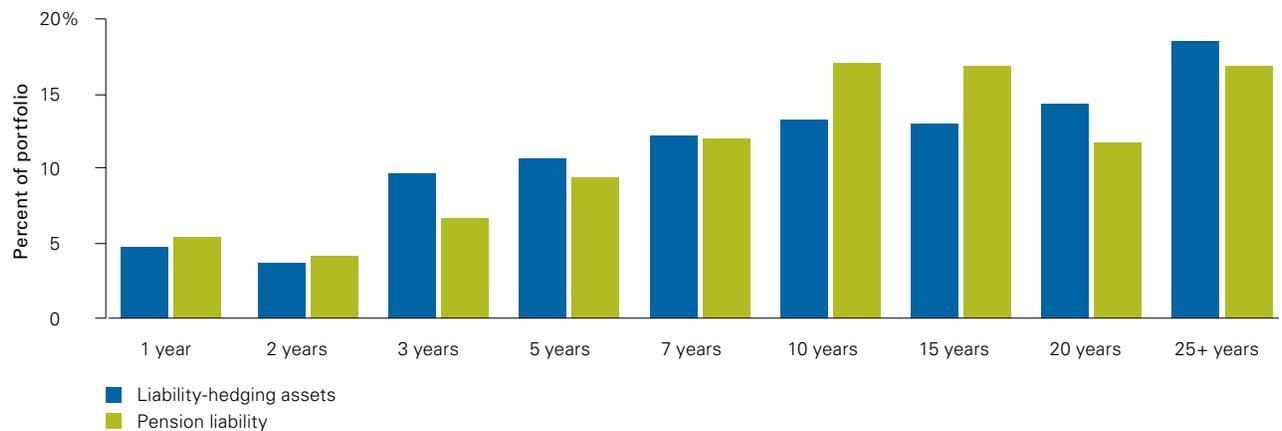
The cash flow match will not be perfect, but it may be good enough. Because the market's yield curve tends to transition smoothly between maturities through market efficiency, precise "bucket-to-bucket" matching is not required for effective yield-curve risk control.

Figure 2. Example of a bond-fund-based liability-hedging strategy: duration exposure



Notes: For illustrative purposes only. Not based on any particular portfolio.
Source: Vanguard.

Figure 3. Example of a bond-fund-based liability-hedging strategy: portfolio weight



Notes: For illustrative purposes only. Not based on any particular portfolio.
Source: Vanguard.

The Vanguard experience with fund solutions: Vanguard institutional advisors have constructed several liability-hedging portfolios using bond funds. Some portfolios are designed for the long term; others were set up to maintain funded status during plan termination.

Bond funds often can also accommodate an annuitization handoff. Past experience has seen up to 95% of the bond fund holdings accepted through an in-kind transfer agreement with the insurer.

Derivatives: Futures, swaps, and other derivatives can help with liability matching, but our view is that the refinement gained comes with additional challenges. First, derivatives “overlay” another asset, and that other asset likely has tracking error in addition to what the derivatives bring. Second, execution of derivative strategies (e.g., posting margin, monitoring, instrument rolls) can be quite complex and may require hiring a manager. Finally, swaps are currently trading “rich” to Treasury bonds, meaning the swap will have a lower yield.

Conclusion

Liability-hedging portfolios are the last step of a successful glide-path strategy. They can help a sponsor leave the pension business or reduce the pension’s impact on a company. Because *perfect* liability hedging is most likely impossible to achieve, we encourage those considering this strategy to stay flexible, keep costs low, and focus on the final execution of their plan.

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