

Pension derisking: Start with the end in mind

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Joseph M. Wolfram, CFA, senior investment consultant, Vanguard Institutional Advisory Services
Brett B. Dutton, CFA, FSA, lead investment actuary, Vanguard Institutional Advisory Services

- For pension plans, the balance between risk and return is a key element in determining any investment strategy. The asymmetric risk of pension surplus offers a compelling reason to reduce risk as the funding status of a plan improves.
- One common approach to derisking a pension plan is to create a glide path—a disciplined approach whereby a plan sponsor predefines a precise set of target asset allocations that adjust as the plan’s funding ratio improves.
- Recognizing that all plans are different, the formulation of each plan’s glide path should begin by determining the funding-level objective at which the plan sponsor wishes to minimize volatility of funding status. Once that level of funding is identified and a matching end-state asset portfolio has been designed, a gradual path based on funding level and asset allocation can be mapped.

Acknowledgment: This paper is an update of Vanguard research published in 2014 under the same title and authored by Jeffrey Sparling.

The adoption of liability-driven investing (LDI) strategies has become increasingly common for corporate pension plans over the past decade. Although the industry definition of LDI may vary, the consensus is that it includes the concept of liability hedging—that is, linking the duration of the fixed income portion of the assets to that of the liability duration.¹

A related concept, considered by many to be an important component of a robust LDI strategy, is dynamic asset allocation, commonly referred to as a **glide path**. (For our purposes, this dynamic asset allocation is not a tactical strategy based on a specific set of market conditions. Rather, it involves adjusting the asset allocation based on the achievement of predefined funding-status targets regardless of market conditions or the means of achieving the desired targets.) Many corporate pension plans, particularly frozen plans, have implemented a glide-path strategy in recognition that funding-status risk is asymmetrical. The risk/return trade-off diminishes as a plan gets better funded because it is difficult to realize the full value of surplus pension assets that remain after all benefits are paid. Because the value of additional return lessens as funding status improves beyond a certain point, the role of a glide path is to reduce asset-liability risk as a plan's funding level increases.

Where should the pension derisking journey begin? At the final destination, of course. Like any good road map, derisking strategies for pension plans should start by defining the desired **funding-level objective** and identifying the low-risk portfolio that should be in place when that funding level is reached. This portfolio is often referred to as the **end-state portfolio**. With both the funding-level objective and end-state portfolio established, a step-by-step path to guide the plan from its current asset allocation and funding status toward its ultimate objective can then be mapped. Given the unique nature of each plan, the final allocation and intermittent glide-path steps will vary, in large part by its status—open, frozen, or closed. This paper summarizes Vanguard's approach to designing glide paths for pensions, outlining a strategy to help achieve the right balance between a plan's risk and return at all levels of funding.

What does derisking mean?

In pension-plan jargon, derisking can have several meanings but can generally be segmented into two categories: (1) liability-driven investing (LDI) strategies and (2) pension risk transfer (PRT) strategies. LDI strategies focus on managing the assets inside the plan, while PRT strategies generally involve transferring the assets (and associated liabilities) outside the plan, either by purchasing an annuity or paying lump sums to terminated vested employees.² This paper focuses on the first of the two categories.

Notes on risk

All investing is subject to risk, including possible loss of principal. Investments in bonds are subject to interest rate, credit, and inflation risk. Be aware that fluctuations in the financial markets and other factors may cause declines in the value of your account. 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.

¹ See Bosse (2018) and Dutton and Plink (2018) for in-depth discussions on best practices for constructing a liability-hedging portfolio.

² IRS Notice 2015-49 prevents offering current retirees an option to replace any annuity currently being paid with a lump-sum payment or other accelerated form of distribution.

A look at derisking glide paths from a historical context

Glide paths are quite common today, thanks in large part to the impact of the 2008–2009 global financial crisis. Declining interest rates coupled with equity losses reversed the surpluses enjoyed by many plan sponsors before the crisis (as they also did with the bursting of the dot-com bubble in 2001). Many plan sponsors, faced with sudden deficits, turned to derisking glide-path strategies. The sudden lower funding-status conditions (which can translate to higher future costs for plan sponsors) and the increasingly complex regulatory environment led many sponsors to close or freeze their plans. A 2015 Vanguard survey of defined benefit plan sponsors found that the percentage of frozen plans jumped from 16% in 2010 to 37% in 2015.³

In addition, the wider availability of daily funding-status monitoring made implementing a glide-path approach more efficient, leading to further growth in the strategy. Vanguard’s survey showed an uptick in the adoption of glide paths from under 50% in 2010 to 62% in 2015. More recently, according to a study by Chief Investment Officer, 75% of the 222 qualified respondents had a glide path in place in 2017.⁴

The basics of derisking glide paths

Although many strategies can be used to implement a glide path, almost all start with funding-status triggers as their basis. This is because pension surplus risk is not proportionately rewarded; except in limited situations, plan assets must be used only to fund plan liabilities or increase plan benefits. At lower funding levels, and absent large contributions, plan sponsors may choose to adopt higher-risk portfolios in hopes of realizing a higher expected return to improve their funding level. At those lower levels, the reward for this—potentially reduced required contributions or Pension Benefit Guaranty Corporation (PBGC) insurance premiums—is proportionate to the risk of not meeting return expectations.

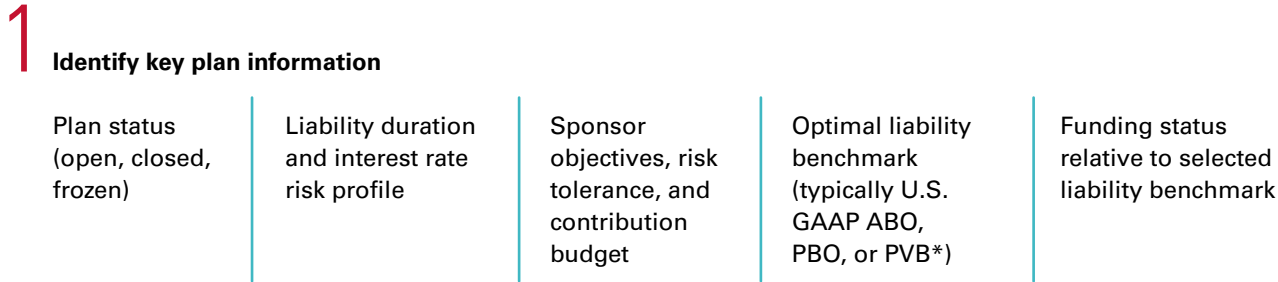
As plans approach full funding, however, the risk begins to outweigh the potential benefit of higher returns. For a frozen pension plan, surplus can become “stranded,” while the downside risk remains, so the primary investment objective should be to maintain (rather than improve) funding status. (**Stranded surplus** refers to the excess assets of an overfunded plan upon termination. Those excess assets are of limited use to plan sponsors, and unused assets are generally subject to an excise tax—a “penalty” tax imposed atop the ordinary income tax imposed on excess plan assets that are not used to benefit plan participants.) This asymmetry of pension risk highlights the importance of an integrated approach to manage plan assets and liabilities. Glide paths provide a systematic way to adjust the asset allocation to reflect the evolving relationship between risk and return as funding status improves.

Both the investment objective and glide-path design will be unique to different plans and plan sponsors, depending on a few variables that include plan status (open, frozen, or closed), funding level (high, medium, or low), and duration of the liability. **Figure 1**, on page 4, provides an overview of the process.

³ See Stockton (2016).

⁴ See Chief Investment Officer (2017).

Figure 1. The glide-path process, step by step

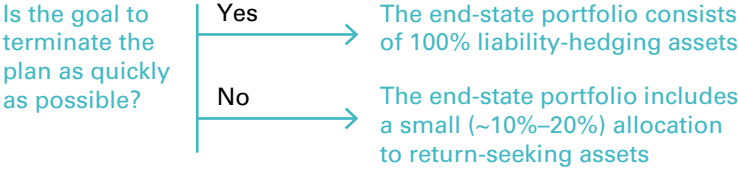


* U.S. Generally Accepted Accounting Principles Accumulated Benefit Obligation, Projected Benefit Obligation, or Present Value of Benefits

2 Determine the funding-level objective (may vary by plan; general rules of thumb shown below)

Open 100% + 10x annual service cost	Closed 100% + 5x annual service cost	Frozen 105%
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3 Determine the end-state portfolio



4 Determine the ending liability-hedging portfolio

That portfolio should optimize the duration hedge and minimize surplus volatility

5 Create a glide path based on the previous steps
Work backwards from the end-state portfolio toward the current asset allocation

Example	CURRENT	Funding level →				TARGET OBJECTIVE
Allocation	<85%	85% to 89%	90% to 94%	95% to 99%	100% to 104%	≥105%
Return-seeking assets	60%	50%	40%	30%	20%	10%
Liability-hedging assets	40%	50%	60%	70%	80%	90%

Source: Vanguard.

Frozen plans: Derisking makes the most sense

Establishing a glide path is most valuable for frozen plans, as compared with open or closed plans, because frozen plans are most at risk for stranding assets and further have little use for being hyperfunded. Because frozen plans are closed to new entrants, and current participants no longer accrue benefits, the estimation of the terminal liability is somewhat more predictable than for an open or closed plan. Many sponsors of frozen plans will eventually seek to terminate them because the plans no longer add value to the overall compensation/benefits package for current employees and become too expensive to maintain (requiring investment and actuarial fees as well as PBGC premiums).

As such, we typically recommend a funding-level objective no greater than 105% for a frozen pension plan (see the box on the right).

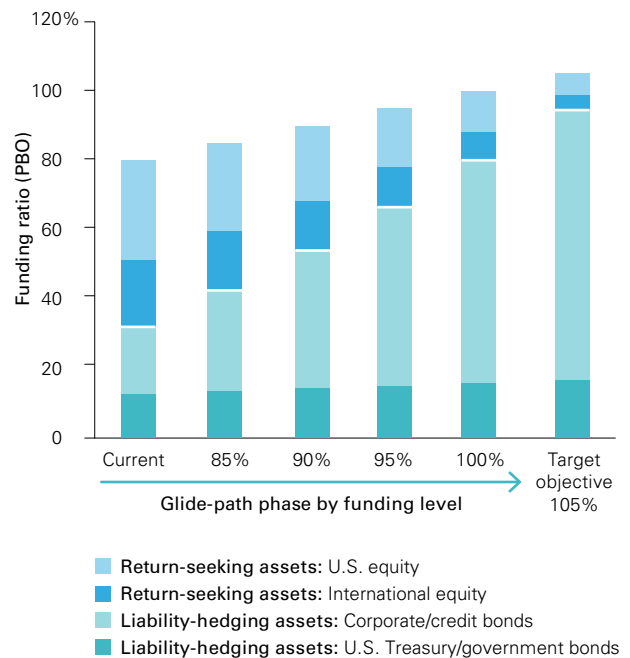
What is the right funding level?

All plans are different—and actuarial advice should be sought when estimating the level of funding required to terminate a particular frozen plan—but most frozen plans can terminate with a funding level that is about 105%–115% of the pension liability measured at market interest rates. Because targeting an exact termination funding level is challenging, and given the high tax on excess assets, it is generally better to be slightly conservative in estimating the funding-level objective and contribute upon termination rather than make the contribution too early and risk overfunding the plan. Therefore, we use the 105% target throughout. In practice, actual targets could be higher.

Figure 2 illustrates a sample glide path for a typical frozen plan. Please note:

- Asset allocation shifts from return-seeking (equities) to liability-hedging (fixed income) as the plan’s funding status improves.
- The final phase of the glide path is implemented at the plan’s funding-level objective of 105%; at this point, the plan should be invested in a portfolio consisting primarily of fixed income assets that closely mirror the interest rate sensitivity of the liability.⁵ The equity allocation at this point is included to overcome the impact of plan expenses and yield-curve impacts from downgrades and defaults.
- Note that the proportional weighting across bonds also changes at each step. In earlier phases of the glide path, the duration of the fixed income assets may be longer than the liability duration, to maximize the plan’s duration hedge ratio,⁶ and the fixed income portfolio may be weighted more heavily toward U.S. Treasury bonds.⁷

Figure 2. Sample derisking glide path for a frozen plan



Note: The asset progression shown is hypothetical and for illustrative purposes only; it is not based on any particular portfolio.

Source: Vanguard.

5 See Bosse (2018).

6 Duration hedge ratio refers to the percentage of the pension liability duration that is hedged by the assets. It can be calculated using the following formula: Duration hedge ratio equals the product of funding status, percentage of assets in fixed income, and fixed income duration, divided by liability duration.

7 See Dutton and Plink (2018) and also Bosse and Paradise (2017).

Open plans: More options

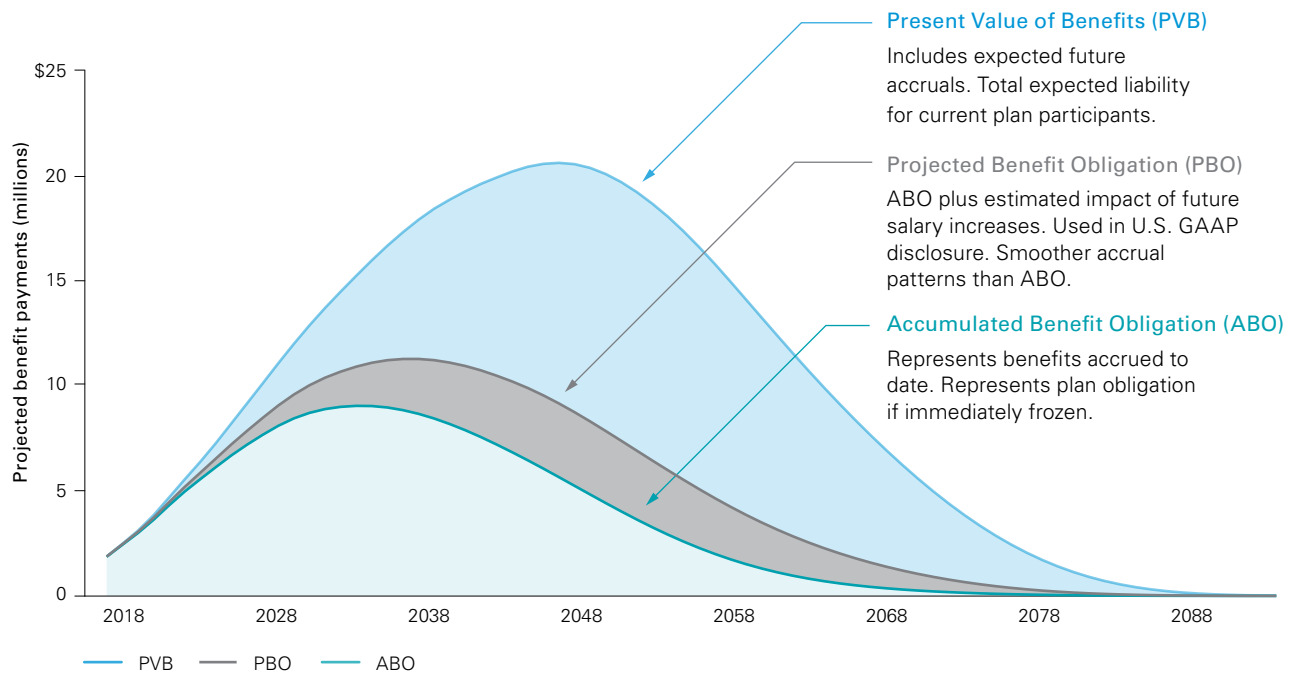
The liability characteristics of open plans differ from those of frozen plans. Open plans generally have a long time horizon, and participants continue to earn benefits with each year of service. Stranding assets is of lesser concern because excess assets can be used to offset future contributions or to fund accruing benefits. Compared with closed or frozen plans of the same funding status, an open plan will generally have a higher allocation to return-seeking assets and therefore less incentive to implement precise hedging strategies.

According to the Chief Investment Officer survey previously cited, only 63% of open plans had glide paths in place in 2017, compared with 84% for frozen plans and 80% for closed plans. For open plans that do implement a glide path, we suggest that the funding-

level objective could be as high as 100% plus ten years of future service cost. In other words, for a plan whose current service cost (the annual cost of benefit accruals) is 3%, the plan's funding-level objective could reasonably be as high as 130%. As with frozen plans, some plan sponsors choose a more conservative approach, setting a lower funding-level objective to prioritize the stability of the plan's funding status.

For an open plan that implements a glide path, a related question is: Which liability measure should be used as the basis for investment decisions? As a starting point, we generally recommend selecting from among the three different but related U.S. Generally Accepted Accounting Principles (GAAP) liability measures, all of which use current yields on high-quality (AA-rated) corporate bonds for discount rates (see **Figure 3**):

Figure 3. Projected benefit payments for a sample open pension plan



Notes: The example shown, with projections covering 2018 to 2093, is hypothetical and for illustrative purposes only. The figure shows the estimated future benefit payments by year for a plan that is still open.

Source: Vanguard.

Accumulated Benefit Obligation (ABO) is a measure that reflects only the benefits actually earned to date. It represents the plan sponsor's minimum legal obligation to participants and the total plan obligation at any point in time if the plan were to freeze immediately. If a sponsor might freeze the plan in the future, then ABO may be the most appropriate liability measure to use for investment decisions (to minimize the possibility that the plan would be significantly overfunded upon a plan freeze).

Present Value of Benefits (PVB) is the most conservative (highest) of the three measures.⁸ It includes estimated liability for future years of service and salary increases for current plan participants (but no liability for future new entrants). We have clients who use PVB as the liability measurement for investment management purposes, but it is not common. Because PVB already includes the estimated value of all future service costs, we recommend that the funding-level objective be no higher than 105% or 110% if PVB is selected as the liability basis for glide-path management.

Projected Benefit Obligation (PBO) will usually be higher than ABO, but lower than PVB, for any plan with future benefit accruals. PBO is sometimes viewed as an "artificial" liability measure; generally speaking, it reflects accrued benefits (ABO) plus the projected impact of future salary increases (but not future years of service).

PBO is the liability measure used in U.S. GAAP corporate balance sheet and income statement accounting (because it tends to lead to more level accrual patterns than ABO). As such, it may be an appropriate liability to

use for investment decisions when the plan sponsor's primary objective is to manage the volatility of accounting results. In the absence of specific guidance from a plan sponsor, we typically use PBO as the baseline liability measure because of its direct relevance to balance-sheet risk.

Note that, for a frozen plan, ABO, PBO, and PVB will all be equal—that's why the sponsor of a frozen plan need not be concerned about choosing among these liability measures.

Closed plans: Somewhere in the middle

When a plan closes to new entrants (but does not completely freeze), the population of participants continuing to earn benefits dwindles gradually for perhaps decades, until all participants have left active employment with the plan sponsor. Over that same period, the plan's annual service cost also declines gradually, and the plan evolves from being very similar to an open plan (with perhaps a large service cost) to being frozen (with no service cost, and heightened risk of stranded surplus).

Because a recently closed plan will be more similar to an open plan, the same investment considerations as described in the previous section above can be applied. In other words, if a glide path is employed, a recently closed plan's funding-level objective could reasonably be anywhere up to 100% plus ten years of service cost.

⁸ The name of this liability measure is less standardized than ABO or PBO. We typically refer to it as PVB, while some other professional firms use other names, including Present Value of Future Benefits (PVFB) or Expected Benefit Obligation (EBO).

On the other hand, a plan that has been closed for a considerable time is likely to behave more like a frozen plan and should focus on risk over return. At this point, there is also considerably less difference among the three liability measures previously discussed. **Figure 4** shows the projected annual benefit payments and liabilities for a plan that has been closed for a longer period. The funding-level objective for this type of plan would be closer to that of a frozen plan (about 105% of PBO).

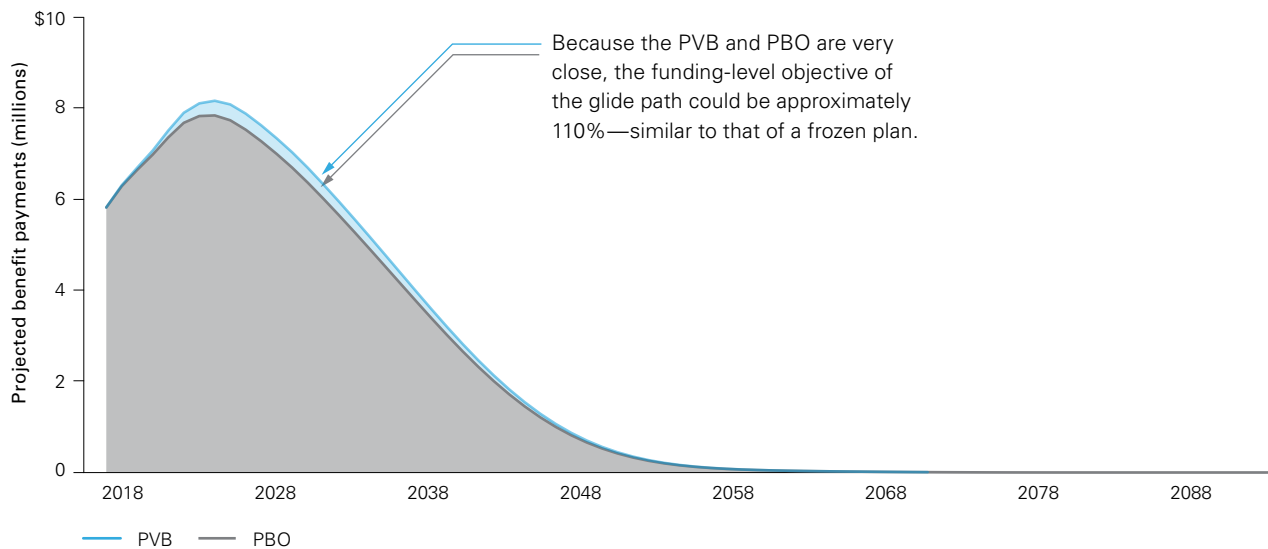
To facilitate the transition between “almost open” and “almost frozen” status, one reasonable approach for a plan that has been closed for several years could be to adjust the funding-level objective down from 100% plus

ten years of service cost to 100% plus five years of service cost. This adjustment guides the plan to a lower risk allocation and reduces the likelihood of ending up with a surplus.

Another reasonable approach for a closed plan could be to use PVB, described earlier, as the liability basis for glide-path management (and set the funding-level objective no higher than 105% or 110% of PVB). As the active population and annual service cost decline, the plan’s PVB will gradually converge with its ABO and PBO; when the plan finally reaches its frozen state, the plan’s funding-level objective will already be appropriate for a frozen pension plan.

Figure 4. Projected benefit payments and liabilities for a sample longer-term closed plan

Estimated as of December 31, 2017	Assets (millions)	Liability (millions)	Discount rate	Duration (years)	Funding ratio
Present Value of Benefits (PVB)	\$100	\$115	3.3%	10.1	87%
Projected Benefit Obligation (PBO)	\$100	\$111	3.3%	10.0	90%



Note: The example shown, with projections covering 2018 to 2093, is hypothetical and for illustrative purposes only.
Source: Vanguard.

Other considerations

Glide paths in cash balance plans

Cash balance pension plans, whether open or closed, have risk profiles that vary significantly from those of traditional plans, which require different approaches to reducing funding-status volatility. Among other things, lump-sum provisions and interest crediting rate formulas can make it difficult to precisely hedge the liability. Regardless of these differences, it still makes sense in our view for cash balance plans to follow the general approach of reducing risk as funding status rises by shifting the allocation from return-seeking assets to fixed income as funded status improves; after all, the same concerns about surplus assets expressed earlier exist for cash balance plans.⁹

One-way vs. two-way glide paths

A question we commonly hear is whether glide paths should be “one-way” or “two-way”; in other words, should asset allocation be adjusted after a plan’s funding status declines below a trigger point, or only after it rises above a trigger point? We suggest that, under typical circumstances, a one-way glide path is more appropriate. Although the step-by-step process may be suggestive of a two-way process, we think those plan sponsors who are committed to derisking as the primary objective should decide to maintain the lower-risk allocation even if the funding ratio moves adversely to avoid any potential negative impact from market timing. Special considerations should be made for a plan whose funding status declines because of changes in the underlying characteristics of the liability (such as those caused by pension risk transfers or significant changes in actuarial assumptions). Other sponsors may prefer to increase expected return when the funding status drops.¹⁰

Other types of triggers

The dynamic asset allocation approach described in this paper suggests a smooth transition from return-seeking assets to liability-hedging assets based on a simple interpolation between funding-status trigger points. We sometimes receive questions about other types of triggers—for instance, triggers based on rising interest rates (where it will be “cheaper” to buy more bonds).

We see a key difference between funding-ratio triggers and other triggers based on market conditions (for instance, interest rates, credit spreads, or equity levels):

- Funding-ratio triggers are based on the foundational principle that, for a U.S. corporate pension plan, any remaining surplus assets upon termination do not typically revert in full to the plan sponsor, as they are typically instead subject to heavy federal excise tax in addition to normal corporate income tax. For this reason, reducing asset-liability risk as a plan nears fully funded status is a natural response to the asymmetric risks faced by fully funded plans—little to gain, much to lose.
- Triggers based on market conditions, on the other hand, are essentially a market-timing strategy, an attempt to take advantage of perceived temporary mispricing in certain asset classes.

Although Vanguard relies on current conditions to construct forecasts and model potential long-term portfolio solutions, we believe that making tactical shifts based on market-timing considerations may hinder a plan’s ability to reach its stated objectives.

Revisiting a plan’s current asset allocation

The discussion in this paper presumes that a pension plan’s current asset allocation is appropriate for its objectives, but that is not always the case. We often find there is an unintentional mismatch between a plan sponsor’s risk tolerance and its current investment allocation. For instance, a plan might be subject to a higher level of funding-status risk than the sponsor is aware of or willing to tolerate. If the fixed income portion of the asset portfolio has a duration significantly different from that of the pension liability, the plan may be taking on unintentional and uncompensated interest rate risk. For reasons such as these, we recommend that the design and implementation of a glide path always include a review of the plan’s current asset allocation to ensure that it is well-suited to the plan sponsor’s circumstances and objectives.

⁹ See Gannon and Dutton (2018).

¹⁰ See Bosse and Klein (2011).

Conclusion

All plan sponsors have to weigh the risk-return trade-offs inherent in a pension plan, but the asymmetric risk of pension surplus favors reducing risk as the funding status improves. Glide paths provide a dynamic derisking approach to formulating an asset allocation by gradually moving assets from return-seeking classes to liability-hedging ones as the plan becomes better funded and has less need to take equity risk. Glide paths should be determined by first considering the funding-level objective where the plan sponsor wishes to minimize the volatility of funding status. Once that funding level is defined and a corresponding end-state asset portfolio has been determined, a glide path can be designed.

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P.O. Box 2600
Valley Forge, PA 19482-2600

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