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Setting the Interest Rate Hedge for Pensions

In setting the investment strategy for a defined benefit (DB) pension plan, a decision regarding percent of liabilities to hedge must be made. There is no one right answer – different plans have different views dependent on varying circumstances. In this whitepaper, we present the strategic perspective of our philosophy when setting the hedge level of a DB pension plan.

LGIM America recommends that plans set a strategic hedge ratio equal to the plan's funding ratio (i.e., 80% hedge for an 80% funded plan). This minimizes short-term risk, which is often uncompensated due to the uncertain future level of interest rates. Rather than focus on a plan's historic hedge levels or current interest rate levels, we recommend that a plan primarily evaluate its investment strategy relative to this strategic hedge ratio target.

Plans may diverge from this strategic hedge ratio to reduce longer-term risks, as various trade-offs and cost considerations are plan specific. We will explain the rationale behind setting the strategic hedge ratio to minimize short-term risk, as well as discuss the longer-term risks many pension plans face.

Rationale for hedge liabilities

Funding ratio volatility is our risk metric, accounting for both the plan assets as well as the plan liabilities. Broadly speaking, hedging refers to the allocation of capital to assets that have similar risk characteristics to the plan liabilities. The expectation is that these assets will move in line with a portion of the plan liabilities, helping to dampen funding ratio volatility.

The main contributors to funding ratio volatility are interest rate, credit spread and equity risk. Plan assets (numerator of funding ratio) can be affected by all three risks, whereas plan liabilities (denominator of funding ratio) are affected by only two of these risks: interest rate and credit spread risk.

From an investment perspective, taking risks should be considered relative to whether the risk is rewarded in terms of higher expected returns and/or the risk provides diversification benefits within the context of the overall portfolio, including liabilities.

A risk/reward payoff over the long term is generally expected from a plan's exposure to a well-diversified return seeking asset portfolio, usually designed to help close the funding gap over a longer period of time. Although this is a source of risk, it is generally considered to be a compensated risk, especially for plans that are underfunded. Many plans may therefore accept the level of risk from their strategic allocation to return seeking assets, assuming the allocation is appropriately sized in the context of their overall investment strategy.

Pension plans can also reduce risk by reducing this allocation to return seeking assets, but are likely also reducing expected returns commensurately, which may hinder the plan's ability to close the funding deficit gap. Alternatively, pension plans can also reduce funding ratio volatility by directly hedging the risks that affect the value of the liabilities.

The aim of liability hedging is to reduce the overall risk of the pension plan that arises from uncertainty in future interest rates and credit spread movements. We specifically look at Treasury interest rate risk, typically the largest source of risk for a DB pension plan, as opposed to other market or demographic risks in the liabilities, such as participants living longer than projected by the mortality tables.

All else equal, for an unhedged pension plan, the funding position will deteriorate when interest rates fall, causing the value of the future pension promise to rise. An underfunded pension plan hurts its core business in numerous ways: lower profits, reduced free cash flow, a lower credit rating and reduced ability to borrow. Funded ratio volatility can

Figure 1: Impact of a liability shock assuming different hedging levels

	Before shock	After shock – no hedge	After shock – 60% liability hedge	After shock – 100% liability hedge
Assets (\$m)	60	60	$60 + 60\% \times 20 = 72$	$60 + 100\% \times 20 = 80$
Liabilities(\$m)	100	120	120	120
Funding ratio	60%	50%	60%	67%
Dollar Deficit (\$m)	40	60	48	40

Source: LGIMA. For illustrative purposes only.

force a plan sponsor to contribute cash into the plan when it can least afford to do so. It also puts plan participants’ benefits at risk. Absent any high conviction tactical views on the future level of interest rates, why would a plan sponsor want to take on this type of uncompensated, non-core financial risk to their main business?

Market views and hedging

When it comes to managing pension risk, prognosticating the direction of interest rates is a humbling exercise. Due to the efficiency of Treasury and interest rate swap markets, active interest rate and duration positioning presents significant volatility with low risk-adjusted returns and information ratios. A study by Ronald Kahn addresses this point and concludes that it is difficult to generate much breadth when betting on interest rates. The study deduces that while a top-quartile fixed income manager has an information ratio of 0.5, a top-quartile active duration manager can have a significantly lower information ratio – on the order of 0.10.¹

This evidence demonstrates the challenges in predicting the future direction of interest rates, even by fixed income managers. In light of the observations above, we define the strategic hedging ratio as the neutral hedge target, assuming markets are fairly priced or at least absent strong conviction of the future direction of interest rates. We understand that a plan’s preferred hedging position may differ from their strategic hedge ratio due to a number of other factors, however, this deviation must be considered as carefully as any active position.

Selecting an appropriate hedging measure

It is important to determine which metric should be used to reduce short-term risk of the plan. In particular, plan sponsors must decide to focus on either funding ratio (assets/liabilities) or deficit/surplus (asset - liabilities) risk, as well as which liability basis to target.

Funding ratio (%) or deficit/surplus (\$) risk

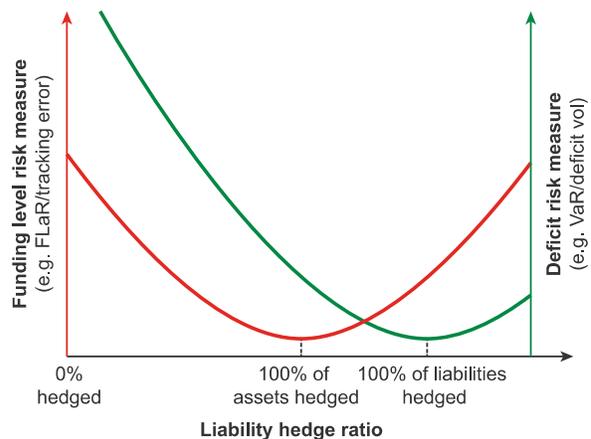
Strategically, assuming no predictable correlation between the growth assets and liability interest rate sensitivity, a plan should set its strategic hedge ratio percentage equal to

its funded ratio to minimize the risk of a fall in its funding ratio. A plan should hedge 100% of its liabilities to minimize the risk of an increase in its deficit.

As an example, we consider a plan that is 60% funded, with \$60 million in assets and \$100 million in liabilities. Let’s assume further that this plan is exposed to an instantaneous shock in interest rates that leads to an increase in the liabilities to \$120 million. Figure 1 shows the impact on the funding ratio and deficit under three scenarios – no hedge, hedging up to the funding ratio level, and hedging up to 100% of the liabilities (i.e., hedging the deficit).

As can be seen, a 60% liability hedge (funding ratio hedge) protects the funding ratio against an isolated shock in the liabilities due to rates, whereas a 100% liability hedge (deficit/surplus hedge) protects the dollar deficit/surplus. Figure 2 illustrates how deficit and funding level risk typically vary with the liability hedge ratio – FLAR stands for Funding Level at Risk.

Figure 2: Funding level and deficit risk – broad impact of liability hedge ratio



Source: LGIMA. For illustrative purposes only.

From a settlor perspective, the plan sponsor is likely to be more concerned with the dollar deficit in the plan rather than its funding ratio, since this represents the amount that they eventually owe the plan in future contributions or future

excess investment returns. For example, it is probably of secondary importance to the sponsor whether a \$40 million deficit is a consequence of assets of \$60 million and liabilities of \$100 million (a 60% funding ratio), or assets of \$10 million and liabilities of \$50 million (a 20% funding ratio).

From a fiduciary perspective, the plan sponsor may be more concerned with the funding ratio. The primary goal from this perspective is to ensure that the assets are able to fully provide for the pension benefits promised. Funding ratio is the better measure of how well the assets cover this ultimate promise. Additionally, depending on what liability measure is used, a low funding ratio could result in benefits restriction to the plan sponsor.

However, the dollar deficit is the better measure of how much the plan sponsor would need to fund from its operations in order to fully fund the obligations based upon the current actuarial liability estimate. While we believe that funding ratio is the focus of most plan sponsors, we can understand why dollar deficit could be more important for some, particularly if the size of the deficit is very large compared to the enterprise value of the business.

In some cases, leverage constraints mean that the choice of metric makes little difference to the strategic hedge ratio attainable. Where it does have an impact, different approaches may be better for different plans. In the remainder of this piece, we consider the funding ratio, but acknowledge that a focus on the dollar deficit risk may be more appropriate in many cases.

The liability basis

A plan sponsor should also consider which liability basis to target when seeking to reduce funding ratio risk. The basis should be based on a mark-to-market measure of the liability value with a discount curve reflecting current levels of interest rates rather than smoothed long-term averages/expectations. This results in a sound financial economic framework underpinning the hedge program.

Two options for liability basis are accounting measures and IRS funding measures. It seems pragmatic to base these hedges on accounting measures underpinned by a mark-to-market principle. Some of these accounting discount curves have some actuarial quirks that make perfect hedging elusive but do quite well as long as long-term tracking error expectations are managed. Hedging based on the IRS funding measures can also be viable, as long as they are based on the underlying mark-to-market curves.

How much to hedge

The consideration of risks and rewards of any investment decision should include assessment of both short-term and long-term outcomes and how these may evolve over time.

When determining the proper liability hedge, we assume that plans are able and willing to use leverage to hedge interest rate risks. In the absence of leverage, the amount to hedge becomes a simpler question of the risk-on/risk-off split which will likely be determined by broader journey plan considerations.

The appropriate hedge level can be determined in stages. We believe a reasonable starting point is to seek to minimize the short-term risk of the plan, without reducing the plan's allocation to growth assets. This creates a strategic hedge ratio, which represents the neutral position for the plan given its objectives and risk constraints. Next, we consider the below factors:

- The longer-term implications of hedging
- The costs of hedging and glidepath framework
- The forward curve
- Tail risk considerations

The Strategic Hedge Ratio

In line with the above discussion, the matrices below show strategic hedge ratios based on asset allocation mix and funding ratio. The first table in Figure 3 assumes there are no leverage constraints while the second table assumes leverage constraints, imposed by only allowing the hedging assets to be invested in physical bonds with no derivatives.² Derivatives provide significant flexibility to achieve desired hedge ratios across a range of asset allocation exposures.

For plans that do not use derivatives, a low funding ratio and/or low hedging asset allocations, the leverage constraints limit ability to achieve full spectrum of hedge outcomes. Obviously, the exact answer depends on many other factors (exact duration of the liabilities, etc.). However, the pattern in Figure 3 is typical.

Other considerations

We now work through other considerations in setting and managing to the strategic hedge ratio.

The longer-term implications of hedging

In some cases, an investment decision can be beneficial in terms of both short and long-term outcomes. In other cases, there is a trade-off involved.

Without leverage

In the absence of using leverage, choosing the hedge target comes down to the split between return-seeking assets (such as equities) versus liability hedging assets (such as bonds). This becomes a balancing-act between short-term risk and long-term risk. While the plan can reduce the short-term risk by holding a low allocation to growth assets, this may make the plan unaffordable to the sponsor over the long-term.

Figure 3: Strategic hedge ratio that minimizes short-term risk

Strategic hedge ratio (No leverage constraints)		Funding ratio								
		20%	30%	40%	50%	60%	70%	80%	90%	100%
Asset allocation mix (Growth assets/hedging assets)	90% / 10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	80% / 20%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	70% / 30%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	60% / 40%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	50% / 50%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	40% / 60%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	30% / 70%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	20% / 80%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	10% / 90%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0% / 100%	20%	30%	40%	50%	60%	70%	80%	90%	100%	

Strategic hedge ratio (Leverage constraints)		Funding ratio								
		20%	30%	40%	50%	60%	70%	80%	90%	100%
Asset allocation mix (Growth assets / hedging assets)	90% / 10%	4%	6%	8%	10%	12%	14%	16%	18%	20%
	80% / 20%	8%	12%	16%	20%	24%	28%	32%	36%	40%
	70% / 30%	12%	18%	24%	30%	36%	42%	48%	54%	60%
	60% / 40%	16%	24%	32%	40%	48%	56%	64%	72%	80%
	50% / 50%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	40% / 60%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	30% / 70%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	20% / 80%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	10% / 90%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0% / 100%	20%	30%	40%	50%	60%	70%	80%	90%	100%	

Source: LGIMA. For illustrative purposes only.

As we mentioned earlier, the risk-on/risk-off split is a complex decision that goes beyond the scope of this piece. We showed the strategic hedge ratio for a range of different growth allocations. While we frame the discussion around choosing the hedge level to minimize short-term risk for a given expected rate of return, equally the plan could maximize expected rate of return for a given level of short-term risk tolerance.

With leverage

The high opportunity cost of investing solely in bonds can be mitigated via leveraged hedging of the plan’s liabilities. This can be achieved using interest rate derivatives such as Treasury futures, interest rate swaps and total return swaps on Treasuries that are supported by utilizing the bond portfolio as collateral. At LGIM America, we believe derivatives can enhance the pension risk management for a plan by improving both the absolute level of achievable hedge and precision of the hedge across the curve. However, it is paramount that the desired exposure is managed within a comprehensive daily risk management framework supported by appropriate education and reporting.

Costs of hedging and glidepath framework

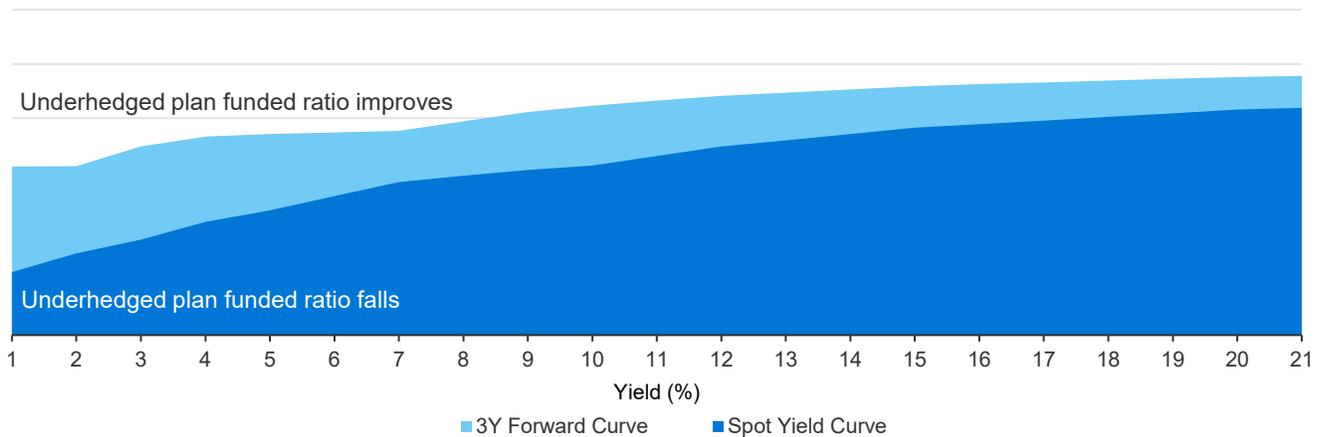
Customized hedging that uses leverage can be slightly more expensive to implement, but these incremental costs are often dwarfed by the magnitude of risk reduction and improved governance reporting framework.

Cost consideration is inherent when selecting a glidepath framework that may point to higher hedge levels as the plan matures and approaches its “end-game” objective. Transitions that shift the overall asset allocation should aim to mitigate the impact of transaction costs while maintaining targeted market exposures. As funded ratio increases, more capital is allocated to hedging assets. As a result, there will be a greater use of physical bonds than derivatives and the need for leverage will decrease.

The forward curve

The forward curve is the market’s future expectation of interest rates and can be derived from the current yield curve. In the absence of an unexpected change in yields and prices, the forward rates will be realized (i.e., the yield curve rises to the level of the forward curve) which will change the value of the plans liabilities as time passes. In

Figure 4: An underhedged plan will lose ground if rates do not rise to the level of the forwards



Source: LGIMA. For illustrative purposes only. These results are based on simulated or hypothetical assumptions that have certain inherent limitations. Unlike the results in an actual performance record, these results do not represent actual trading. Because these trades have not actually been executed, these results may have under- or over-compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated or hypothetical trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve profits or losses similar to these being shown.

fact, if the forward curve is realized, no matter if you have shorter duration instruments or longer duration instruments, all instruments as well as the plan’s liabilities will earn the same return over the same period.

If forward rates are realized, the funded ratio of the plan will remain the same all else equal. However, the funded ratio of an underhedged plan will decrease should rates fall short of forward expectations, implying a higher hedge strategy may have been more beneficial. On the contrary, should rates rise more than the forward rates, a lower hedge strategy would result in a higher funded ratio for the plan (Figure 4).

To be clear, LGIM America does not believe the forward curve is necessarily the best predictor of the future level of the yield curve. In fact, over the past 30 years, the forward curve has rarely been realized. However, forward bond yields represent the price, today, that the market would be willing to buy/sell Treasury bonds in the future. Therefore, they should play a role in the decision to hedge or not. In other words, rates must rise higher/faster than the forward curve for a plan to benefit from an underhedged interest rate position.

Tail risks

Under most market conditions, over the long-term, there is a moderately positive correlation between the return on Treasuries and the return on growth assets. One argument for this correlation is that stock is a right to ownership of the underlying assets of the business and the future cashflow stream that they generate; therefore, the stock price is theoretically the net present value of all future cashflows from the business. As the discount rate falls – Treasury yields fall, and treasury prices increase – then the value of the stock should theoretically increase as well, meaning

that, in most cases, growth assets and liabilities will move in line with each other.

However, in times of stress, there tends to be a strong negative correlation between Treasuries and equities, which can lead to a simultaneous falling of return seeking assets and increasing liabilities – this is often referred to as a “flight-to-quality” reaction, and can be disastrous for plan funding ratio.³ To the extent that a consideration of such scenarios should be over-weighted, there is an argument to hedge more of the plan’s liabilities than implied by the strategic hedge ratio. In general, it is helpful to test any potential investment strategy against a range of stress scenarios.

Conclusion

A seemingly simple question – how much of the liabilities should be hedged – can be a surprisingly thorny issue. As with any investment decision, short and long-term plan objectives, costs and the impact on both risk and return should be considered carefully.

In summary, there is a strong rationale to set the interest rate hedge to equal to the plan’s funding ratio from a strategic perspective (i.e., 80% hedge for an 80% funded plan). This hedge level minimizes uncompensated risk due to changes in interest rates and helps plan sponsor manage funded ratio volatility.

Behaviorally, we recommend that plans primarily evaluate the investment strategy relative to this strategic target, rather than focus on where hedge level has been historically or where interest rates are currently. Additional considerations for establishing the strategic hedge ratio relative to the funded ratio include leverage costs, glidepath

framework, forward curves and tail risk. Managing interest rate risk within a well-defined liability driven investment (LDI) strategy can help plan sponsors effectively manage funded ratio outcomes and minimize volatility.

For further information about LGIM America, find us at www.lgima.com

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LGIM America (LGIMA) was founded in 2006 with the purpose of helping people achieve their long-term financial goals. We offer a range of strategies to help our institutional clients (corporations, healthcare agencies, non-profit, education, public plans and Taft-Hartley) manage their investment objectives, which can range from market-based alpha-oriented strategies, derivative overlays, equity solutions and those that are designed to be more liability-centric. Encouraging a diverse and inclusive environment coupled with a solutions-focused culture allows us to increase our breadth of knowledge and the likelihood of improved client outcomes and stronger financial performance. We have teams of experienced, innovative professionals committed to helping plan sponsors meet their pension promises, managing investment exposures efficiently to seek enhanced returns while mitigating risks, and working to generate returns while making a positive societal difference

1. Kahn, Ronald N. "Bond Managers Need to Take More Risk." *Journal of Portfolio Management*, Spring 1998, pp. 70-76
2. Assume bond portfolio can achieve a maximum duration of 2x of the liability's duration without derivatives. This may be 1.5x to 3x depending on the liability profile and other considerations for the bond portfolio mandate.
3. This may not be fully captured in stochastic analysis.

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