

# SIMPLIFYING THE LDI STORY



BY FOCUSING ON THE  
THREE DB HEDGE RATIO LEVERS



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# Simplifying the LDI story: By focusing on the three DB hedge ratio levers

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Interest rate risk is often the most significant risk faced by defined benefit (DB) plan sponsors. A simple metric for showing how much of this risk is being managed is the hedge ratio. The hedge ratio is the product of the plan's funded status, the percentage allocated to liability-driven investments (LDI), and the ratio of LDI duration and liability duration. Plan sponsors can improve their hedge ratio by pulling one or more of the following three levers:

1. Contribute to the plan, thus increasing the plan's funded status and allocation to LDI
2. Increase the allocation to LDI (either physically or synthetically)
3. Increase the LDI duration


While all three levers can increase hedge ratio, the third lever tends to have the most immediate impact on hedging interest rate risk. While there are other aspects of LDI that a portfolio manager may choose to focus on, the most important decisions a sponsor can make relate to the three levers described above.

## Hedge ratios explained

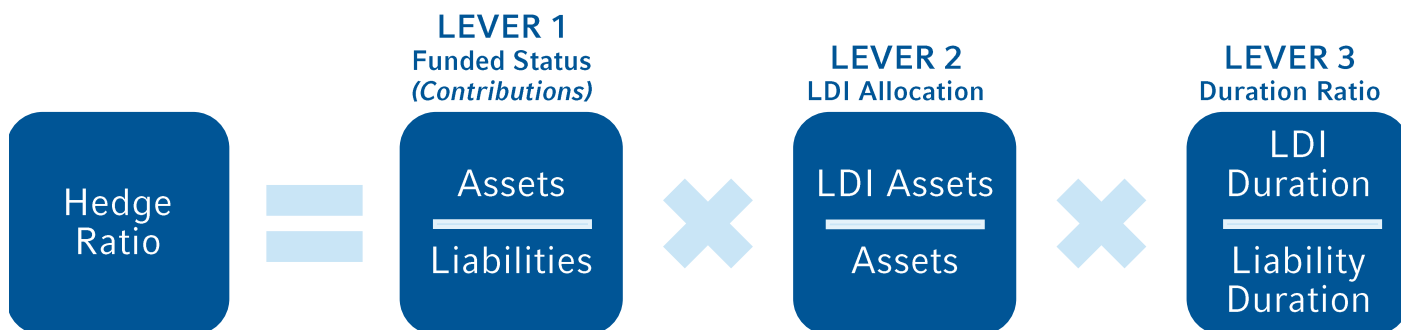
Defined benefit (DB) plan sponsors face a wide variety of risks. Equity risk and longevity risk are common across most types of retirement plans, but the largest single risk for many corporate DB plan sponsors is interest rate risk. This risk is present in DB pension plans due to corporate financial statements (and to some extent, to funding standards) being tied to corporate bonds rates.<sup>1</sup> Without hedging, interest rate movement can expose sponsors to significant funded status risks, which could impact the sponsor through balance sheet volatility and increased contributions. The simplest measure of how much interest rate risk is being hedged is the hedge ratio.

The hedge ratio measures the sensitivity of the assets to a change in interest rates relative to the sensitivity of the liabilities to the same change. With a fully hedged (100%) DB plan, the assets and liabilities respond in the same direction and magnitude to an interest rate change (assuming a parallel yield curve shift), thus significantly reducing interest rate risk. For a plan with a 50% hedge ratio, the direction would be the same and the magnitude would be about 50% of the liabilities' change due to an interest rate change.

The hedge ratio formula can be broken down into three components: funded status, percentage of plan assets invested in liability-driven investments (LDI) and the ratio of the LDI portfolio duration to liability duration (i.e., duration ratio). Sponsors can influence each of these factors with specific actions, or "levers."

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## Exhibit 1: Hedge ratio formula



### Lever 1: Improve funded status through contributions

Contributions always improve funded status, and they can increase the dollar amount invested in liability-hedging fixed income, which improves the hedge. Other benefits to improved funded status include reduced Pension Benefit Guaranty Corporation (PBGC) variable rate premiums and lower chances of benefit restrictions and filings.<sup>2</sup> However, while immediate improvement to funded status through contributions is desirable, it only marginally increases the plan's hedge ratio and can represent a large financial commitment from the plan sponsor. This is why the other two levers are so important.

### Lever 2: LFI allocation

LFI usually consists of an investment in long duration high quality U.S. fixed income (both credit and treasury). It may also include the notional exposure to interest rate derivatives (e.g., treasury futures). Increasing the allocation to LFI, all else equal, will increase the hedge ratio, and is a key decision point for plan sponsors. However, increasing the allocation to fixed income typically comes at the expense of an allocation to a higher returning asset class (e.g., equities). This allocation change would typically lower the plan's long term expected return and is usually reserved for plans with higher funded status. Sponsors on de-risking glide paths already have long-term objectives to shift more assets into fixed income as funded status improves, particularly if the plan is closed or frozen.

Generally, open and ongoing plans would not allocate more than 60% of assets to LFI,<sup>3</sup> and if a higher hedge ratio is desired after reaching that point, the first lever (contributions) or, especially, the third lever (extending duration) ought to be considered as an alternative. Frozen pension plans can tolerate a higher allocation to LFI – to at least 80%, particularly if termination is imminent.<sup>4 5</sup>

### Lever 3: Duration ratio

The ratio of the LFI portfolio duration to liability duration is perhaps the most potent, versatile and too-often overlooked of all the levers in managing the hedge ratio. This lever requires no immediate cash<sup>6</sup> and does not necessarily lead to a lower long-term expected return. While a common strategy for LFI managers is to match the LFI duration with liability duration (thus trying to minimize the liability tracking error of LFI assets to liability), the sponsor could have much to gain by extending the LFI duration much further. Particularly for plans with a more modest funded status (on an accounting basis), extending fixed-income duration beyond that of the liability duration can be a more efficient way to improve the plan's hedge ratio. As the plan's funded status and hedge ratio improves, it becomes possible to prioritize the hedge of other liability characteristics, such as key rate durations (i.e., curve risk), spread risk, etc.<sup>7 8 9</sup>

As the plan's funded status and hedge ratio improves, it becomes possible to capture other characteristics of the liabilities' cash flows, such as key rate durations, spread risk, etc.

## Exhibit 2: Case study<sup>10</sup>

	1: FUNDED STATUS	2: LDI ALLOCATION	3: DURATION RATIO	HEDGE RATIO	EXPECTED RETURN	SURPLUS VOLATILITY
Current	80%	40%	14/14 = 100%	32%	6.9%	13.6%
Lever 1: Contributions	90%	40%	14/14 = 100%	36%	6.9%	12.7%
Lever 2: +10% LDI	80%	50%	14/14 = 100%	40%	6.6%	11.4%
Lever 3: LDI Duration +7	80%	40%	21/14 = 150%	48%	6.8%	11.8%
Lever 3: LDI Duration +15	80%	40%	28/14 = 200%	64%	6.6%	10.7%

### Case study

Now let's review an example to illustrate the impact each of these levers can have on the hedge ratio. Assume a DB plan is currently 80% funded with \$100 million in liabilities and \$80 million in assets. Forty percent of the assets are invested in high quality U.S. fixed income with duration of 14. In Exhibit 2, each row illustrates the impact of pulling a specific lever. In the case of the Lever 3 (LDI duration), two scenarios are shown for illustrative purposes.

As mentioned, contributing to the plan (Lever 1) helps funded status, but this action has little overall impact on hedging the interest rate risk (just a 4% increase in hedge ratio for a contribution of 10% of the plan liabilities) unless additional steps are taken.

Shifting some return-seeking assets to LDI (Lever 2) certainly helps, and it is a necessary step in the process of glide-path de-risking, but its overall effect pales in comparison to simply increasing the duration of the fixed-income portfolio (Lever 3). In the scenario of increasing LDI duration from 14 to 21, the hedge ratio increases by 16% and the return expectation changes minimally.

Extending duration even further pushes the hedge ratio above 60% while sacrificing just 30 basis points<sup>11</sup> in long-term expected return rate. Sponsors hesitant to give up their return-seeking allocation ought to consider whether to extend the duration of their LDI allocation to help mitigate the significant interest rate risk they are still exposed to.

While extending duration is a potent lever, there are limits to how high sponsors can reasonably extend duration. There is also the risk of overhedging at key points along the yield curve, which should be done with caution. Over time, all three levers ought to be used to improve the plan's funded status and interest rate hedge. No single lever ought to be the entire solution.

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### Hedge ratio caveats

While the hedge ratio does capture the most important elements of an interest rate hedging strategy, it is not necessarily a perfect or complete measure. It helps in designing the key elements of a hedging strategy, but, admittedly, it does not provide all the details an LDI manager may use to construct an LDI portfolio. The hedge ratio gives the sponsor an idea for how much risk it's exposed to, but there will always be some actuarial "noise" that can distract a sponsor from realizing the hedge ratio in practice.

Despite its limitations, the hedge ratio helps the sponsor maintain a big picture perspective and focus on key decisions. For plan sponsors still in the early stages of their liability hedging glide paths (with hedge ratios below 50%), these caveats are notably secondary to the three key levers we have discussed.<sup>12</sup>

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<sup>1</sup> Accounting liabilities are required to be valued based on high quality corporate bond rates. As originally written, the Pension Protection Act (PPA) intended liabilities to be based on the 24-month average of high quality corporate bond rates, but since MAP-21 in 2012 (and its subsequent extensions), the discount rate used is limited to a corridor around the 25-year average of these rates, making them much less tied to current market rates.

<sup>2</sup> Consequences of underfunding can include limited lump sum offerings, "at-risk" status, additional PBGC filings and required quarterly contributions.

<sup>3</sup> Allocations are typically not above 60% for this group since return-seeking assets can be used to help compensate for new benefit accruals over time. For frozen plans, the expected cash flows are more certain and therefore more hedgeable.

<sup>4</sup> See Owens, Justin, "Investment strategy for DB plan terminations," Russell Investments, 2015.

<sup>5</sup> We refer only the LDI fixed income assets for this calculation, but there may be hedging potential in other asset classes, particularly the spread component of the liabilities by means of equity assets. This calculation, however, is less precise and should be evaluated on a case by case basis for clients, rather than generalized.

<sup>6</sup> Aside from transaction costs due to transition, these could potentially be minimized by adjusting the mandate already in place.

<sup>7</sup> Phillips, Gannon, Collie, Sylvanus, "Hedge Long First," Russell Investments, 2015.

<sup>8</sup> While the primary focus of this lever is investing in physical fixed-income exposures, the second and third levers could potentially be affected synthetically through the use of derivatives.

<sup>9</sup> One other point that is worth making is that increasing the hedge ratio by increasing the LDI duration can be scaled to the specific plan liabilities. This will prevent the hedging strategy from leveraging the hedging program relative to the plan liabilities, removing the risk of introducing leverage relative to the plan liability.

<sup>10</sup> Notes on Exhibit 2:

- Current asset allocation assumes 60% global equity & 40% U.S. long corporate fixed income. Lever 1 and Lever 2 scenarios assume the same asset classes, prorated as needed.
- Lever 3 with LDI duration of 21 scenario assumes 60% global equity & 20% long U.S. corporate fixed income, 20% in 25+ Treasury STRIPS. Level 3 with LDI duration of 28 scenario assumes 60% global equity & 40% 25+ Treasury STRIPS.
- Surplus Volatility calculated as of July 31, 2023
- 20-year average return based on Russell Investments capital market assumptions as of June 30, 2023.

<sup>11</sup> This decrease is due to the reduction in spread yield from lack of corporate/credit bonds at this maturity level.

<sup>12</sup> Often LDI portfolio managers can give special attention to hedging nuances like credit/treasury split and exclusion of service cost.

# QUESTIONS?



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