

Simplifying the LDI story



By focusing on the three DB hedge ratio levers

Russell Investments Research / Viewpoint



Justin Owens, FSA, CFA, EA, Director, Investment Strategy & Solutions

Brandon Wilson, CFA, EA, Director, Institutional Investment Solutions

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
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

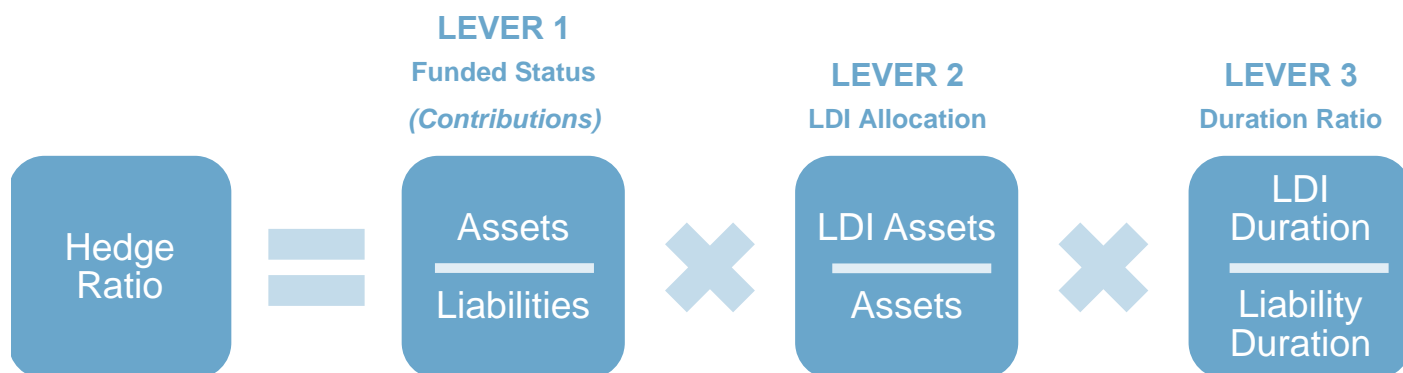
Defined benefit (DB) plan sponsors face a wide variety of risks. Equity risk and longevity risk are common across all types of retirement plans, but the largest single risk for many corporate DB plan sponsors is interest rate risk. This risk is present in DB pension plans due to corporate financial statements (and to some extent, to funding

standards) being tied to market yield on corporate bonds.¹ 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 is 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 similar directions and magnitude to an interest rate change, 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."

Exhibit 1: Hedge ratio formula



Lever 1: Improve funded status through contributions

Contributions always help 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 fewer benefit restrictions and filings.² 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: LDI allocation

LDI 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. Increasing the allocation to LDI, 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 (i.e., 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 LDI,³ 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 LDI – to at least 80%, particularly if termination is imminent.^{4 5}

Lever 3: Duration ratio

The ratio of the LDI 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 cash⁶ and does not necessarily lead to a lower long-term expected return. While a common strategy for LDI managers is to match the LDI duration with liability duration (thus trying to minimize the liability tracking error of LDI assets to liability), the sponsor could have much to gain by extending the LDI duration even 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 capture other characteristics of the liabilities' cash flows, such as key rate durations, spread exposure, etc.^{7 8 9}

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 exposure, etc.

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 5. 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.

Exhibit 2: Case study¹⁰

	1: FUNDED STATUS	2: LDI ALLOCATION	3: DURATION RATIO	HEDGE RATIO	EXPECTED RETURN	SURPLUS VOLATILITY
Current	80%	40%	5/12 = 42%	13%	5.7%	12.7%
Lever 1: Contributions	90%	40%	5/12 = 42%	15%	5.7%	11.8%
Lever 2: +10% LDI	80%	50%	5/12 = 42%	17%	5.7%	11.6%
Lever 3: LDI Duration +7	80%	40%	12/12 = 100%	32%	5.7%	11.1%
Lever 3: LDI Duration +15	80%	40%	20/12 = 167%	53%	5.5%	9.7%

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 2% 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 5 to 12, the hedge ratio increases by 19% (more than doubling it) and the return expectation does not change. Extending duration even further pushes the hedge ratio above 50% while sacrificing just 20 basis points¹¹ 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. 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.

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. Given the majority of DB plan sponsors are still in the early stages of their liability hedging glide paths, often with hedge ratios well below 50%, these caveats are notably secondary to the three key levers we have discussed.¹²

¹ 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, HATFA 2014 and BBA in 2015 passed, 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.

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

³ 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.

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

⁵ We refer only the LDI assets as we don't view return-seeking assets as enhancing a hedge ratio. See Gannon, "Does equity have duration? If so, is it useful for LDI?" Russell, 2010.

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

⁷ Phillips, Gannon, Collie, Sylvanus, "Hedge Long First," Russell Investments, 2015.

⁸ 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.

⁹ 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.

¹⁰ Notes on Exhibit 2:

- Current asset allocation assumes 60% global equity & 40% U.S. aggregate fixed income. Lever 1 and Lever 2 scenarios assume the same asset classes, prorated as needed.
- Lever 3 with LDI duration of 12 scenario assumes 60% global equity & 40% long U.S. corporate fixed income. Level 3 with LDI duration of 20 scenario assumes 60% global equity & 20% long U.S. corporate fixed income & 20% 28-29-year Treasury STRIPS.
- 20-year average return based on Russell Investments capital market assumptions as of June 30, 2016.

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

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

About Russell Investments

Russell Investments is a global asset manager with a unique set of capabilities that we believe is essential to managing your total portfolio and to meeting your desired outcome. At Russell Investments, we stand with you, whether you're an institutional investor, a financial adviser, or an individual guided by an advisor's personalized advice. We believe the best way to reach your desired outcomes is with a multi-asset approach that combines: asset allocation, capital markets insights, factor exposures, manager research and portfolio implementation.

For more information

Call Russell Investments at [800-426-8506](tel:800-426-8506) or visit russellinvestments.com/institutional

Important information

Nothing contained in this material is intended to constitute legal, tax, securities, or investment advice, nor an opinion regarding the appropriateness of any investment, nor a solicitation of any type. The general information contained in this publication should not be acted upon without obtaining specific legal, tax, and investment advice from a licensed professional.

Liability-driven investment (LDI) strategies contain certain risks that prospective investors should evaluate and understand prior to making a decision to invest. These risks may include, but are not limited to; interest rate risk, counter party risk, liquidity risk and leverage risk. Interest rate risk is the possibility of a reduction in the value of a security, especially a bond or swap, resulting from a rise in interest rates. Counter party risk is the risk that either the principal or an unrecognized gain is not paid by the counter party of a security or swap. Liquidity risk is the risk that a security or swap cannot be purchased or sold at the time and amount desired. Leverage is deliberately used by the fund to create a highly interest rate sensitive portfolio. Leverage risk means that the portfolio will lose more in the event of rising interest rates than it would otherwise with a portfolio of physical bonds with similar characteristics.

Forecasting represents predictions of market prices and/or volume patterns utilizing varying analytical data. It is not representative of a projection of the stock market, or of any specific investment.

Russell Investments' ownership is composed of a majority stake held by funds managed by TA Associates with minority stakes held by funds managed by Reverence Capital Partners and Russell Investments' management.

Frank Russell Company is the owner of the Russell trademarks contained in this material and all trademark rights related to the Russell trademarks, which the members of the Russell Investments group of companies are permitted to use under license from Frank Russell Company. The members of the Russell Investments group of companies are not affiliated in any manner with Frank Russell Company or any entity operating under the "FTSE RUSSELL" brand.

Copyright © 2017-2020. Russell Investments Group, LLC. All rights reserved. This material is proprietary and may not be reproduced, transferred, or distributed in any form without prior written permission from Russell Investments. It is delivered on an "as is" basis without warranty.

First used: February 2017. Revised: April 2020

AI-28193-04-23