LIABILITY-DRIVEN INVESTING

Russell Investments

LDI: OUR APPROACH TO THE DESIGN, CONSTRUCTION AND MANAGEMENT OF LIABILITY-HEDGING PORTFOLIOS FOR U.S. DB PLANS

RUSSELL INVESTMENTS RESEARCH

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LDI: Our approach to the design, construction and management of liability-hedging portfolios for U.S. DB plans

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Liability-driven investing (LDI) has been around for decades and has many applications. From a pension perspective, LDI is used to hedge or offset certain market-related risks held in the pension liabilities that could impact a defined benefit (DB) plan's funded status (the ratio of assets to liabilities). A plan's funded status affects the sponsor's balance sheet, contribution requirements[1] and Pension Benefit Guaranty Corporation (PBGC) premiums, among other important measures. The absence of LDI could leave corporate plan sponsors severely exposed to interest rate risk; a risk that we generally do not expect to be compensated for over time.

When considering pension LDI, long duration fixed income may come to mind since it has many similar pricing inputs to pension liabilities. But while long bonds may be part of an LDI portfolio, an effective LDI strategy can leverage a customized blend of hedging tools to address and prioritize factors that impact the discount rate. The successful implementation of LDI can meaningfully reduce asset/liability risk, leading to a more efficient and effective investment strategy that aligns with plan sponsor goals.

Over the last several decades, we have completed extensive research on LDI portfolio design for our DB clients. Not all LDI is created equal, and no two plans are identical, making it essential to customize a solution that prioritizes LDI with the most impact for each individual plan situation. In addition, LDI needs to adapt over time. In this paper, we attempt to simplify a complex topic by sharing key considerations in designing, constructing and managing an LDI program to optimally manage risk.

Background

We group our clients' pension portfolios into two broad categories:

1. Return-seeking assets (public equities, real assets, private equity, etc.), and
2. Liability-hedging assets[2] (investment grade fixed income, interest rate derivatives, etc.).

While this categorization provides simplicity in communicating asset allocation, we recognize it is an imperfect sorting. For example, certain asset classes, like high yield fixed income, provide some limited liability-hedging potential due to their duration and credit spread exposure, but they also can generate returns above liabilities and have higher tracking error to liabilities than other more traditional liability-hedging assets. We view the portfolio's hedging ability holistically, considering how all asset classes behave together in relation to liabilities.

LDI portfolio design

LDI portfolio design considers the interaction of the total investment portfolio and the associated liabilities and how external factors impact those relationships.

Pension liabilities are simply the present value of a series of future benefit payments, usually referred to as cash flows. The liability is calculated by discounting the cash flows with a yield curve, based on high quality corporate bond yields. When the yield curve changes, so do the liabilities.

With LDI, we describe unhedged interest rate risk as "uncompensated" because taking this risk is not expected to improve long-term outcomes. Positive expected outcomes depend on the prediction that interest rates will rise faster and higher than the market expects. Historically it has been nearly impossible to make consistently correct predictions on this. Contrast this with equity risk, which is significant, but over the long term we expect to lead to commensurate returns that should improve funded status.

Unlocking what factors lead to the yield curve changing is the key to designing an optimal LDI strategy and hedging the risk introduced by changes in discount rates.[3] These factors fall into three general categories:

1. U.S. government bond interest rate changes
2. Credit spread changes
3. Yield curve shifts

While changes in all these factors occur constantly, their impact on the liability differs. We design LDI portfolios based on an efficient prioritization of these factors.

> *Our research suggests that the single largest and most important liability risk factor is the change in U.S. government bond interest rates.*

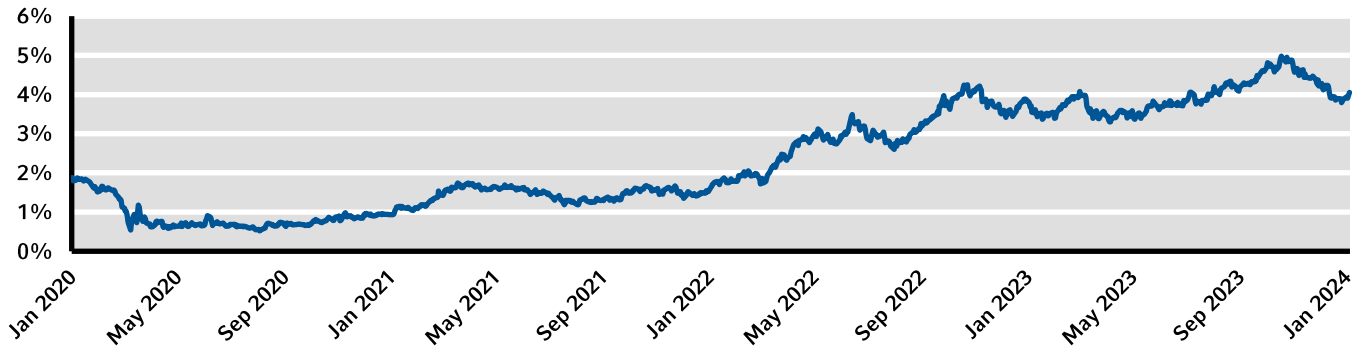
1. U.S. government bond interest rate changes

Our research suggests that the single largest and most important liability risk factor is the change in U.S. government bond interest rates. Our research concludes that this factor alone makes up 75 to 80% of the market-driven liability-related risk. Given this outsized risk attribution, it must be prioritized first. Usually, this risk is abbreviated to "interest rate risk" and the portion of it that is hedged as "hedge ratio."

What causes U.S. government bond rates to change? They are heavily influenced by the Federal Reserve's actions (both actual and anticipated), including the adjustment of the very short-term federal funds rate. While the Fed doesn't directly change rates along the curve, changes to the short-term rate do tend to influence the full yield curve. Supply and demand in the bond market also impact bond interest rates.

Interest rate levels have varied significantly over time. Just since 2020 the 10-year U.S. Treasury rate has closed from as low 0.52% to as high as 4.98%, as shown in Exhibit 1.

Exhibit 1: U.S. 10-Year Treasury Yield since 2020[4]



What kind of an impact does this have on a pension plan's liabilities? An average U.S. DB plan has a liability duration of around 12 years. Oversimplifying a bit, this means that for every 1% fall in rates, the liability increases by 12%. In 2022, when rates rose by about 250bps, liabilities of this duration would have decreased by about 30%. A similar *decline* in rates would have a corresponding impact on the liability in the opposite direction. Considering the propensity for rates to change — sometimes dramatically — over time, it does make intuitive sense that this component would encapsulate most of the risk.

Interest rate risk can be effectively hedged through physical fixed income assets, which reduce risk but have limited potential to add returns above interest growth on the liability. While hedging interest rate risk may be a priority for the sponsor, they must also balance competing priorities such as generating additional return to become fully funded, or to cover ongoing benefit accruals. For plans managing these objectives simultaneously, the portfolio will need an allocation to return-seeking assets like equities.

Sponsors with a limited allocation to physical fixed income that are trying to hedge as much of the interest rate risk as possible ought to seek out the most capital efficient means of gaining rate/duration exposure in their portfolio, or in other words, get the most "bang for their LDI buck." By extending the duration of the fixed income, the sponsor's ability to hedge is enhanced. For this reason, we often use STRIPS (a zero-coupon version of Treasury bonds) to target exposure to the longest-duration government bonds. Longer-duration credit fixed income is also effective and has spread exposure, which holds both additional return potential and credit spread hedging.

The best of both worlds may be to retain the return-seeking assets you need while gaining additional interest rate exposure through interest rate derivatives. These financial instruments act as a powerful lever to reduce risk without taking up much space in the portfolio.[5]

A word of caution: extending duration as much as possible has a potential to lead to over-hedging at the long end of the curve. To manage yield curve risk (which we discuss later), we typically recommend limiting the hedge to 100% at each point on the curve, but going beyond that may be appropriate with an understanding of the applicable trade-offs.

As funded status improves, more assets are allocated to fixed income, and as liability duration decreases (particularly for frozen plans on a glide path) sponsors do not necessarily need to lean heavily on the longest-dated bonds and derivative instruments to achieve a full interest rate hedge, and they can focus on fine-tuning other liability risks.

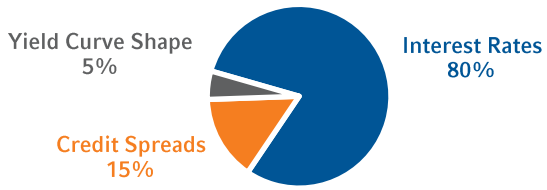
> *While hedging interest rate risk may be a priority for the sponsor, they must also balance competing priorities such as generating additional return to become fully funded, or to cover ongoing benefit accruals.*

2. Credit spread changes

The next important liability risk factor is credit spread changes. More specifically, the risk to plan sponsors that U.S. investment grade corporate bond spreads tighten, leading to lower discount rates, higher liabilities and lower funded status for a plan that is less than 100% hedged to changes in spreads.

As shown in Exhibit 2, if rates are 75% to 80% of the liability risk, spread changes are 15% to 20%. While not as significant as interest rates, spread risk requires attention.

Exhibit 2: LDI risk factor attribution[6]



Like interest rate risk, spread risk can be hedged with certain types of fixed income investments, and importantly, is correlated with a wide variety of asset classes. While in theory the most precise match to this liability risk is U.S. investment grade corporate fixed income (since this is a similar basis to the associated liability yield curve), the hedge will not be exact, mainly because the yield curve used for setting discount rates for liability calculations is not subject to "credit migration" that impacts the assets in the portfolio.

That is, the yield curve will only use bonds with a certain credit rating in their universe, while fixed income assets run the risk of loss from credit downgrades or defaults. To avoid funded status deterioration driven by this dynamic, this asset/liability mismatch must be made up for through other return sources, such as active credit management (to lessen the impact of credit migration) and return-seeking assets that will tend to generate higher returns than liabilities over time. Sponsors can also consider an allocation to LDI assets that are less subject to widening credit spreads than public fixed income (like credit diversifiers described later).

Other asset classes are correlated to credit spread exposure and should be considered in designing an LDI portfolio. Equities in particular — which tend to make up a substantial part of portfolios for underfunded pension plans — are correlated with spreads. Public fixed income credit spreads tend to tighten when equities are performing well (since the risk of default is lower) while spreads tend to widen when equities do poorly.

Exhibit 3 shows the correlations of public credit spread returns to the returns of various asset classes, using market data since 2008.

Exhibit 3: Correlations between the returns of public credit spreads[7] and other asset classes

ASSET CLASS	CORRELATION TO U.S. PUBLIC CREDIT SPREAD RETURNS
Global High Yield Credit	0.67
Global Equity	0.51
U.S. Large Cap Equity	0.47
U.S. Long Credit	0.19
U.S. Aggregate Fixed Income	-0.15
U.S. Long-term Government Fixed Income	-0.30

Source: MSCI World Index, Merrill Developed Markets High Yield Index, Bloomberg Barclays LDI 14 Index, U.S. Aggregate Index and U.S. STRIPS 25+ Yr. Russell Investments calculations as of May 31, 2024.

> *The main takeaway is that several asset classes offer correlation to credit spread returns which can be beneficial in hedging this risk…*

In this exhibit, high positive correlations demonstrate more spread-like exposure, although the magnitude and precision of these spread exposures should be considered. Beyond public equity, other asset classes, such as high yield credit, have high positive correlations to investment grade credit spread returns. The main takeaway is that several asset classes offer correlation to credit spread returns which can be beneficial in hedging this risk; or, possibly, lead to over-hedging of this risk.

Also consider the impact of changes in credit spreads to monthly global equity returns, as shown in Exhibit 4. On average, as spreads tighten, global equity returns increase on average. The opposite occurs when spreads widen.

Exhibit 4: Equity returns and AA OAS Option Adjusted Spread (OAS) Changes

SPREAD CHANGE	MONTHLY CHANGE IN AA OAS	AVERAGE MONTHLY GLOBAL EQUITY RETURN
Tighten	Decreases > 5 bps	3.9%
	Decreased < 5 bps	1.8%
Widen	Increases < 5 bps	-0.3%
	Increased > 5 bps	-3.8%

Source: LSEG Datastream, years 1999-2024

Of the three major market-related liability risk factors (rates, spread and curve), the spread is the most challenging to match with precision. It is also the exposure that sponsors are most likely to have in excess since much of their portfolio may be correlated with it.

From a total portfolio perspective, the inclusion of equities can reduce the overall asset/liability ("funded status") risk by adding equity return when spreads tighten (increasing the liabilities), but this may also lead to over-hedging spread exposure. In fact, some plans may find themselves far under-hedged on interest rates while far over-hedged on spread exposure. As the allocation to fixed income increases in the portfolio, these factors can be hedged with more precision.

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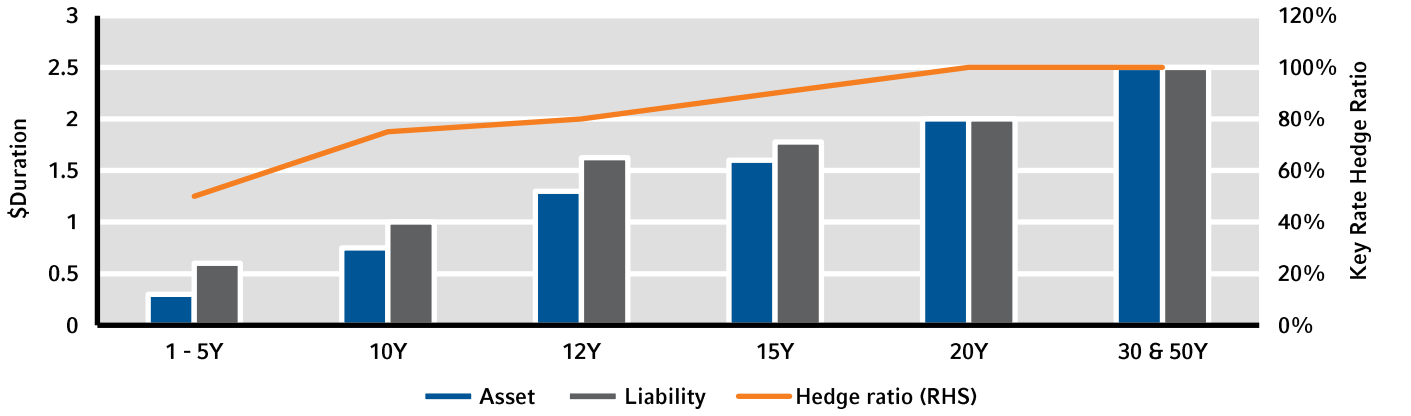
3. Yield curve shifts

The last major factor to consider in designing a liability hedging portfolio is the impact of changes in the shape of the yield curve. While the overall dollar duration of rate and spread risk can be hedged, they implicitly assume that shifts in the yield curve occur equally across the curve ("parallel shifts"). But what if the yield curve steepens (when the gap between short and longer-dated yields widens), or flattens? Focusing the liability hedging on one point of the curve could lead to over-hedging those rates and leave other portions of the curve underexposed. Even if the hedge ratio is 100%, there is risk of non-parallel yield curve shifts misaligning the assets and liabilities.

This may be best explained and understood using liability and asset key rates that view duration exposure along various duration groupings (i.e., key rate durations, known as KRDs), as illustrated in Exhibit 5.

Exhibit 5: Comparison of assets and liabilities at key rates, along with hedge ratio at each key rate[8]



In Exhibit 5, the later key rates ("20Y" and "30 & 50Y") are fully hedged, while some of the earlier key rates are underhedged. Over time, if a higher amount is allocated to fixed income, the hedge ratios in the early key rates can be filled out. Skilled LDI advisers and managers can conduct analysis on existing LDI fixed income to align LDI and liabilities, and the KRD hedge ratios can be further aligned through the use of interest rate derivatives in an LDI overlay strategy.

Constructing an LDI portfolio

As mentioned, market-related liability risk factors can be hedged in a variety of ways. Most public asset classes have some correlation to liability-related factors. The focus of a skilled LDI adviser or manager is to understand and analyze the individual plan's risk exposures in the existing portfolio and design an asset allocation that synthesizes all associated risks to reduce overall surplus volatility within existing return needs.

We group LDI building blocks into four broad components that could have a place in the LDI portfolio for different reasons:

1. U.S. Government Bonds

Often implemented with Treasury STRIPS, investing in U.S. government bonds is a cost efficient, highly liquid way to attain duration exposure at varying maturities. Given the largest liability risk is interest rates, we find that this asset class is highly effective for plans with limited allocations to fixed income that are trying to maximize the impact on the asset/liability match.

2. Investment Grade (IG) Public Credit

Given pension liabilities are discounted using U.S. corporate bond yield curves, intuitively IG public credit would be a natural component of an effective LDI strategy, and it often is, particularly for well-funded plans. IG public credit offers duration at various points along the curve, but beyond 15 years, the issuance is sparser. Liquidity and cost are more challenging than with STRIPS, but this asset class does offer opportunities for more return. We recommend implementing credit allocations with skilled active credit managers, which can help mitigate some of the credit migration impact, as mentioned.

3. Interest Rate Derivatives

Plan sponsors are not limited to physical fixed income assets to address liability-related risks. Derivatives can be an efficient solution for addressing the interest rate and curve components. Interest rate derivatives (e.g., Treasury futures) are particularly attractive for underfunded plans with a limited amount of physical income assets since they can effectively extend the duration of the assets without reducing the return seeking portfolio or introducing yield curve risk. While credit spread can be achieved through derivatives, spread exposure is usually more efficiently attained through other assets in the portfolio. Derivatives can also be effective at reducing yield curve risk by filling in gaps. However, using derivatives solely for yield curve matching has limited risk reduction benefits and can be overly costly and complex. Their use for duration exposure is most impactful and may also allow for a more balanced approach to yield curve matching with the physicals in the portfolio.

4. Credit Diversifiers

While the interest rate and curve components of the liabilities are best addressed by the building blocks as mentioned, spread exposure can come from a variety of asset classes. Some asset classes that could add diversification benefits and incremental return above liabilities, while still adding some duration, include securitized fixed income, private placement fixed income and even high yield fixed income. Securitized and private placement fixed income may also buoy returns in stressed credit scenarios where public credit spreads widen and deviate meaningfully from liability returns. Each of these should be evaluated in the context of the total portfolio and hedging objectives.

The focus of a skilled LDI adviser or manager is to understand and analyze the individual plan's risk exposures in the existing portfolio and design an asset allocation that synthesizes all associated risks to reduce overall surplus volatility within existing return needs.

Exhibit 6 shows a summary of assets typically used in an LDI portfolio and a comparison of their characteristics from a variety of perspectives.

Exhibit 6: Comparison of LDI building blocks used to address liability risks[9]

	LDI BUILDING BLOCKS			
	U.S. GOVERNMENT BONDS	IG PUBLIC CREDIT	INTEREST RATE DERIVATIVES	CREDIT DIVERSIFIERS[10]
Duration	✓✓✓	✓✓	✓✓	✓
Spread		✓✓		✓✓
Excess Return		✓		✓✓
Liquidity	✓✓✓	✓	✓✓✓	✓
Simplicity	✓✓✓	✓✓	✓	
Low Cost	✓✓✓	✓✓	✓✓	✓

Our funded status tracking system allows the portfolio to be adjusted in near real-time as funded status target thresholds are reached.

Managing an LDI portfolio

The management phase of an LDI program involves the ongoing monitoring of asset and liability risk and dynamic portfolio repositioning. Russell Investments has full visibility into our clients' assets and liabilities, allowing us to monitor funded status, interest rate and credit hedge, and yield curve positioning daily. Based on this visibility, we can reposition the portfolio to maintain hedging targets or take advantage of opportunities in the markets as they arise.

Knowing the funded status of the plan daily is especially crucial for plans on a de-risking glide path. Our funded status tracking system allows the portfolio to be adjusted in near real-time as funded status target thresholds are reached. This speed of implementation is especially beneficial in volatile markets, helping to further reduce our clients' exposure to liability-related risk over time.

Summary

The LDI process is a powerful tool for managing corporate defined benefit plans. By carefully designing, constructing, and actively managing the portfolio, plan sponsors can navigate the complexities of pension liabilities while aiming for long-term stability and risk reduction.

[1] The magnitude of LDI impacting contribution requirements will depend on whether they have elected the Full Yield Curve for funding liabilities. See Owens, J., (2024). "Synchronize your Pension Liabilities", Russell Investments Research.
[2] Within this paper, we tend to use "LDI" and "liability-hedging assets" interchangeably for simplicity, but in reality, liability-hedging assets are just the implementation of a liability driven investing (LDI) strategy.
[3] Liabilities can also change for reasons such as adjustments to participant data, actuarial assumption changes, and plan design changes. These types of changes to future cash flows are generally not hedgeable with investments but can be mitigated through pension risk transfer.
[4] Source: U.S. Treasury.
[5] Some physical assets will need to be held as collateral.
[6] Source: Russell Investments calculations.
[7] Proxied with credit default swaps, AA rated, 5-year
[8] Source: Russell Investments calculations.
[9] Source: Russell Investments research.
[10] Credit diversifiers is a broad category with sometimes distinct characteristics that do not neatly fall into these groupings.

QUESTIONS?

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