

LDI FOR CASH BALANCE RETIREMENT PLANS



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LDI for cash balance retirement plans

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Cash balance (CB) retirement plan sponsorship has surged over the last 25 years. In fact, about a fifth of defined benefit (DB) plans now include a CB benefit formula,¹ and for many non-frozen plans, it is the part of the liability that is growing. At the same time, most corporate DB plan sponsors embrace liability-driven investing (LDI) strategies in their efforts to preserve plan health on behalf of participants and to manage the plans' financial impact on the sponsoring organizations. In this paper we address how these two trends align with each other to meet plan sponsors' risk-management objectives.

CB plans operate differently than traditional DB plans and can present a distinct challenge to sponsors seeking to hedge liabilities. Depending on how the formula is designed and on the degree of grandfathering of traditional benefits, the expected benefit payments can change dramatically from year to year, which complicates the liability-hedging process.

Key factors influencing investment strategy for a CB plan are:

1. Whether account balances or reported liabilities are being hedged
2. Lump sum experience and assumptions
3. Interest Crediting Rate (ICR) formula provisions (fixed versus floating; reference rate; floors, etc.)
4. The forward-looking ICR assumption used by the actuary

While liability-hedging will perhaps be less precise than with LDI in a traditional DB plan, due to the more variable nature of some CB cash flows, it is still possible to manage and reduce the interest rate risk of reported liabilities within most CB plans.

We will explore the mechanics of CB plans and their liabilities, how they differ from traditional DB plans, and what opportunities exist to manage associated risk through investment strategy.

Background

The first CB plans emerged in the 1980s. This new design was attractive to plan participants for its DC-like features, such as its account balance-type formula and benefits portability through lump sums. At the same time, it offered some sponsors the opportunity to reduce costs by cutting overall benefit levels in a new plan design. While large sponsors were the first to adopt CB plans, over time other sponsors took hold as well. Many smaller companies eventually latched on in the early 2000s², and the trend has increased steadily since then. The Pension Protection Act of 2006 (PPA), which mostly became effective in 2008, cleared up some regulatory concerns regarding CB plans, thus helping increase their sponsorship.

Most DB plan sponsors have adopted some form of LDI. At the most basic level, LDI strategies attempt to coordinate market-driven liability changes (due primarily to changes in rates and credit spreads) with portfolio changes. Sponsors adopt LDI to manage funded status volatility, and to some extent related factors such as contribution requirements and PBGC premiums.

Despite their DC-like features, CB plans are still legally DB plans, and thus the sponsor bears most of the plan risks. As trends toward CB and LDI for DB plans persist, naturally more plan sponsors will seek ways to manage this risk through investment strategy.³

LDI hedging goals: The difference between reported liabilities and account balances

Cash balance plans are “hybrid” DB plans, since they build in attributes of both DB and DC plans. As with a DC plan, sponsors define and communicate the participant’s benefit as an account balance payable as a lump sum. Employers provide pay credits⁴ (resembling employer contributions) and interest credits (analogous to investment earnings), usually on an annual basis. However, unlike in a DC plan, there is no requirement to fund the account balance dollar for dollar as it grows. The balance is merely hypothetical (or notional), meaning the physical assets for each account do not necessarily exist in full until paid (though the participant is still entitled to the full benefit). The sponsor pools all plan assets together, and the pension asset’s gains or losses do not usually affect the amounts of the benefits.⁵

To determine liabilities for a CB plan, the actuary projects the current account balance to the estimated year of payment, based on the ICR assumption. Then, that amount is discounted to the current year using the assumed discount rate. This value is the reported liability. If the ICR assumption is lower than the discount rate, the reported liability will be less than the sum of all participant account balances.⁶ In other words, the reported liability will generally be lower than the benefit amount that could, theoretically, be paid out immediately.

We show this in **Exhibit 1** below assuming a participant terminates at age 50, the ICR assumption is 4%, and the discount rate is 5%.

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Exhibit 1: Cash Balance Liability Example

AGE	CASH BALANCE AMOUNT (PROJECTED @ 4%)	LIABILITY (DISCOUNTED AT 5%)	LIABILITY / BENEFIT
Current (50)	100,000	86,562	86.6%
55	121,665	110,562	90.9%
60	148,024	141,108	95.3%
65	180,094	180,094	100.0%

In this example, the liability is only 86.6% of the current account balance; meaning if this participant terminated immediately, the plan would have to pay a higher benefit than the stated liability. This poses a risk for the sponsor that participants will take benefits earlier than forecast by the actuary, which will lead to a funded status loss and lower funded status.⁷

This risk is much more pronounced for CB plans considering termination. The assets of a plan considered “fully funded” on a reported liability basis may be grossly insufficient for benefit paid at termination unless the actuarial assumptions reflect the near-term expected payments. For terminating CB plans, the assets required will typically need to be at least as high as the current account balances.⁸

A sponsor might consider the investing objective for a CB plan as keeping up with the nominal account balances. This benefit amount will eventually need to be paid, and it seems logical to maintain a portfolio of assets that mimics the changes in those benefits. While appealing in theory, in practice this proves to be a challenging task that few pursue with great effectiveness.

For CB plans not tied to portfolio returns, the account balances only increase, never losing value. Contrast this to the plan’s portfolio of assets, which will always maintain some risk of investment loss (unless completely in cash investments). As with traditional DB plans, the sponsor bears the investment risk, and participants do not usually share in portfolio losses.⁹

Even if a portfolio could be managed to move in lockstep with nominal account balances, the hedging problem would not necessarily be solved. Contribution requirements and balance sheet disclosures are not based on the participant’s account balances. They are based on the reported liability we described above.¹⁰ This creates a dilemma in deciding what exactly to hedge. If maintaining the account balances is the sponsor’s sole objective (and they are willing to bear liability-related risks as they come), the best strategy is to out-earn the pay and interest credits with return-seeking assets. Over the long-term, this may work, but significant contribution and balance sheet volatility will still occur in the interim. And there is no guarantee plan assets will keep up with account balances at any given time.¹¹

The goal for many sponsors is to reduce surplus volatility. If this is the case, then hedging the reported liability would usually be the objective. Since liabilities are heavily dependent on assumptions, sponsors must evaluate whether their reported liabilities are an adequate reflection of the economic value of the liabilities.¹² Overly simple assumptions related to the ICR, or the timing and form of payments as described below can only hinder the effectiveness of the sponsor’s strategy if it creates excessive actuarial losses as time passes. In particular, the ICR assumption ought to be well thought-out, with all the relevant options considered. Plan sponsors or LDI managers could also insist that their actuaries revisit assumptions regularly and ensure they reflect the best estimates of employee trends, payment patterns, etc., and that the LDI strategy is designed relative to these most up-to-date expected cash flows.¹³

Lump sum experience and assumptions

A key challenge in hedging CB plan liabilities is the uncertainty of future cash flows. Traditional DB benefits, payable as annuities, usually do not deviate significantly from actuarial estimates, particularly if the plan has been closed long-term or is frozen.¹⁴ Benefits are deferred to a future, predictable range of years, then paid as level annuities for life. This makes the benefit stream quite reliable, in most cases. When the expected benefits are reasonably fixed, hedging interest rate risk by use of traditional LDI methods is straightforward.

Expected benefit payments for CB plans are different. Their reliability is less certain and will depend on payments being made each year and a few important assumptions. For instance, consider the form-of-payment assumption (i.e., how



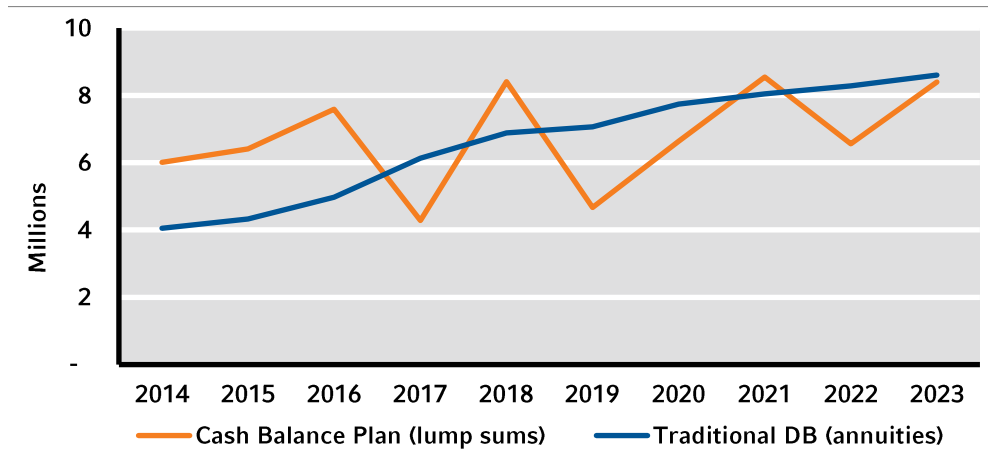
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many participants will elect an annuity versus a lump sum). CB participants usually take their benefits as lump sums. The year-to-year pattern of lump-sum benefit payments for CB plans tends to be volatile and much less predictable than for traditional DB plans where only annuities are paid. Annuities are paid over 20-plus years, whereas lump sums are paid once to each participant. To illustrate this point, [Exhibit 2](#) compares the benefit payment history of two actual plans, one that almost exclusively pays lump sums, and the other that pays only annuities.

Exhibit 2: Benefit Payment Pattern of Cash Balance versus Traditional DB Plan



Setting an assumption to predict the CB payment pattern is nearly impossible, and this presents a legitimate challenge to plan actuaries. While, clearly, no assumption will prove perfectly accurate, some will be superior to others. For instance, the actuary could assume that every participant will take a lump sum at age 65. Considering the importance of accurately projected benefit payments, this overly simple and unrealistic assumption hampers the LDI manager’s ability to hedge interest rate risk. On the other hand, while due diligence should be afforded this assumption, sponsors should bear in mind that there will always be some deviation from this assumption in reality. This makes regular monitoring of the liabilities of a CB plan critical in the management of an LDI strategy in case adjustments need to be made.

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The interest crediting rate (ICR) formula

The pay crediting rate is typically a flat percentage of pay (e.g., 5%), which can vary by age. Older employees sometimes receive higher pay credit rates. The ICR can also be a fixed rate, but more commonly, it floats based on a market-driven metric, such as a Treasury rate. Sponsors may also use a Treasury rate plus a fixed spread (e.g., 50 bps), or even an equity-based index.

In some cases, the sponsor establishes an ICR floor (or possibly a ceiling) to a set percentage (e.g., 4%). This prevents the ICR from falling below a certain threshold. In effect, this guarantees at least a 4% increase in the account balance each year.

If the sponsor freezes the plan, pay credits cease, but interest credits continue until the participant receives the pension benefit. Participants usually take benefits as lump sums, but they may also elect to receive an annuity.¹⁵

The ICR formula indicates how the account balances change each year, which directly ties to the ICR assumption, and that informs us of how liabilities change each year. Both components are important to understand when developing an LDI strategy.

The forward-looking ICR assumption

Duration measures the sensitivity of an asset or liability to interest rate changes, and it is commonly used to develop liability-hedging strategies. For a traditional DB plan, the spot and key rate liability durations can be derived directly from the expected benefit payments. This is not necessarily the case for a CB plan. As the discount rate changes, the ICR assumption may change at the same time (in addition to the actual ICR). To illustrate this point, and its effects on liability duration, Exhibit 3 below shows three simple scenarios of discount rate and ICR assumption changes. The discount rate increases by 100 bps in each scenario, while the ICR assumption changes in varying degrees. (Calculations assume that the discount rate and ICR assumptions are effective on the same date as the baseline.)

As the discount rate changes, the ICR assumption may change at the same time (in addition to the actual ICR).

Exhibit 3: Cash Balance Liability Interest Rate Sensitivity Example

	BASELINE	SCENARIO 1: FIXED	SCENARIO 2: FLOATING	SCENARIO 3: PARTIALLY FLOATING
ICR assumption	4%	4%	5%	4.5%
Discount rate assumption	5%	6%	6%	6%
Current account balance	100,000	100,000	100,000	100,000
Liability	86,628	75,147	86,746	80,753
% change from baseline (duration)	N/A	(13.3%)	0.1%	(6.8%)

In **Scenario 1**, the discount rate increases 100 bps while the ICR assumption remains level – in other words, the ICR is “fixed” or static. In this case, the liability decreases by around 13% – similarly to traditional DB plan– and hence the LDI strategy to hedge that interest rate risk would be similar to that of a traditional DB plan.

In **Scenario 2**, the discount rate and ICR assumption increase by the same amount (a parallel shift) and the ICR assumption is “floating,” meaning the assumption changes each year based on market factors. Here the liability remains relatively flat, with the effects of a rising discount rate offsetting the increase in the ICR assumption, and the duration of the liability is very close to zero. In this case the LDI strategy would be quite different from a traditional DB plan, and in fact the optimal hedge would have, on average, virtually no interest rate risk.¹⁶

In **Scenario 3**, the discount rate increases 100 bps, and the ICR increases just 50 bps, a partially floating ICR assumption, meaning the assumption changes each year based on market factors, but not to the full extent as fully-floating assumptions. In the cases we have worked on with clients, this is probably the most common scenario, where actuarial assumptions tend to be at least partially responsive to current market conditions, but still do not fluctuate fully with market rates, because they are long-term in nature. The end result is that the liability decreases, but only

by about half as much as in Scenario 1. Hence the LDI strategy is likely to have a shorter duration, to match this shorter-duration exposure.

Options for setting the ICR assumption when the underlying rate is floating generally fall into four categories:¹⁷

- 1. Fixed single rate** – Some sponsors and actuaries take a stable, perhaps static long-term view on the ICR assumption (similar to the expected long-term return on assets). This typically translates to a single rate that is expected to remain fairly constant year-to-year. Since this rate is not an observable factor in the market, two different actuaries can determine two distinct, though ostensibly reasonable rates.
- 2. Partially floating rates** – Some set an ICR assumption that attempts to reflect expected future changes in the underlying rate. For example, the ICR assumption can be a single rate that may change slightly when the actuary re-evaluates the assumption each year. The changes are market-driven, but somewhat subjective. We would expect that changes in the ICR assumption would be less volatile than changes in the actual ICR.
- 3. Floating single rate** – The assumption can be reset each year based on the underlying ICR basis (e.g., 30-year Treasury yield) in effect at the time of the actuarial valuation. While this approach is market-based and straightforward to implement, it fails to incorporate any expected future rate changes.
- 4. Floating table of rates** – The actuaries can use a table of ICR rates in the valuation. This would be based on either an observable market forward curve or long-term capital market assumptions.

The last two approaches lead to the best reflection of economic liability for the CB plan. They not only account for current rates, but also use market-based measures for future ICR rates at a more granular level.

It is absolutely critical for sponsors designing an LDI strategy for a CB plan to understand the ICR assumption, as it will significantly impact how reported liabilities change each year. Rather than being reactive to the ICR assumption already in place, sponsors can proactively set the ICR assumption to be more conducive to an LDI approach.

Bringing it all together

Each CB plan is unique, and there is no one-size-fits-all strategy. At a high level, the key development drivers of an investment strategy for a CB plan are:

- 1. LDI hedging goals** – Sponsors typically attempt to hedge either the reported liability or the account balances. We find that it is more straightforward to hedge the interest rate risk of the former, although the asset allocation strategy needs to take account of the latter.
- 2. Lump sum experience and assumptions** – The ratio of participants electing to take annuities versus lump-sum retirement benefit payments; the actuarial basis for converting lump sums to annuities; and the actuary's assumptions regarding these factors.
- 3. The interest crediting rate (ICR) formula** – This rate can be fixed (e.g., 4%), but is commonly a floating rate based on a market factor (e.g., 30-year Treasury yield), and it often has a floor. The ICR affects the "hurdle rate" for the plan and the effectiveness of the hedge.¹⁸

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4. The forward-looking ICR assumption – Set by the actuary as an input into projected benefit payments, this assumption can be either floating (moving directly with market factors), sticky (long-term view) or fixed. This assumption has a direct impact on the interest rate sensitivity of the liability and thus affects the LDI strategy used to hedge that risk.

Many CB plans began as traditional DB plans. In these cases, some participants (particularly retirees) will still be entitled to traditional, annuity-like benefit payments. Transitions to a CB formula can either be abrupt, with all current benefits for active and terminated vested plan participants changing to CB, or more gradual, with prior benefits frozen, and the CB benefit added on.¹⁹ Exhibits 4 and 5 below illustrate how long this transition could take.

Exhibit 4: Gradual change to cash balance

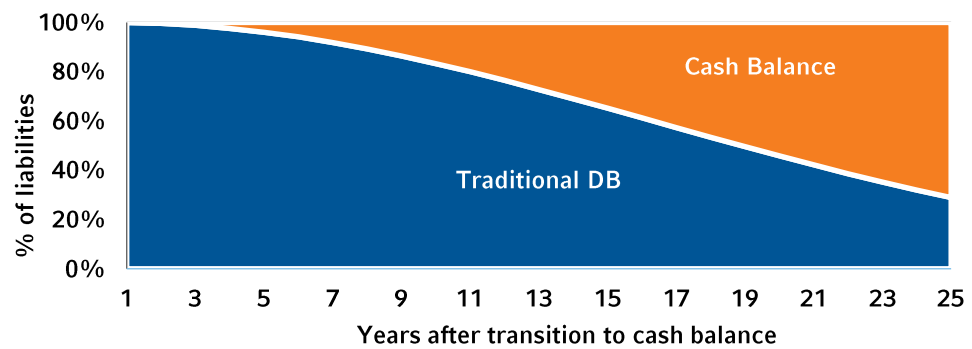
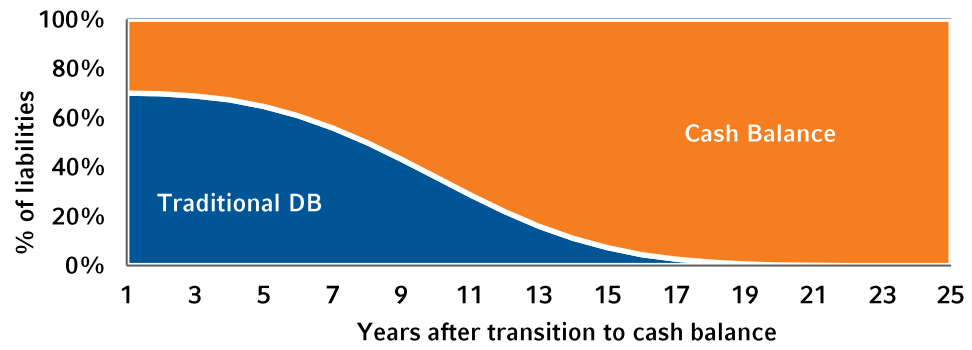


Exhibit 5: Abrupt change to cash balance



However, over time, as legacy benefits slowly wear away in favor of CB benefits, sponsors should pay greater attention to CB-specific strategies.

Plans with a significant majority of liabilities (more than 90%) in legacy benefits would likely see little marginal benefit to addressing CB liabilities any differently from other liabilities. A traditional LDI approach would likely be most appropriate in this case, until the percentage of legacy benefits diminishes. However, over time, as legacy benefits slowly wear away in favor of CB benefits, sponsors should pay greater attention to CB-specific strategies. By the same argument, plans that are predominantly CB (more than 80%) may choose to address only the CB liabilities. Plans that fall in between can choose to either devise an appropriate strategy for the entire plan, or notionally “split” the plan into two separate pools with separate strategies. Individual facts and circumstances will determine which of these approaches makes the most sense.

Many CB plans have very high lump sum take rates. In fact, it is common to assume that 100% of participants take the lump sum rather than an annuity. However, in cases where many participants take annuities, an added layer of cash flow uncertainty develops. An additional factor – the actuarial basis for annuity conversion – adds to the liability noise in future cash flows. In most cases, this impairs the sponsor’s ability to hedge the liabilities.

Most investment strategies described in this paper focus on the simple goal of hedging duration or basic interest rate sensitivity. Two other important components of interest rate risk not addressed in this paper are the credit-spread duration and curve risks of reported liabilities. Notwithstanding the unique way that benefits accrue, CB plans value liabilities by use of corporate yield curves; hence, credit risk still should be hedged in the LDI portfolio – its weight often influenced by the proportion of equity exposure in the investment portfolio. Similarly, CB liabilities often exhibit unusual curve risks relative to a traditional plan; therefore, curve exposure may also need to be customized relative to the plan’s unique characteristics.

Exhibit 6 below summarizes at a high level, the possible investment approaches to various CB liabilities.

Exhibit 6: Comparison of LDI Approaches for Cash Balance Plans

PLAN FORMULA	APPROACH TO LDI FUND OPTIMIZATION
Traditional DB	Traditional LDI – Improve the hedge ratio based the duration implied from the liability cash flows, prioritizing the longest dated cash flows first.
Cash balance Fixed ICR provision Fixed ICR assumption	Very similar to traditional LDI, since expected cash flows are fixed.
Cash balance Floating ICR provision Partially floating ICR assumption	Moderate-duration portfolio. The sensitivity of liabilities to interest rate shocks can be calculated from the assumed ICR provided by the plan’s actuary; therefore, align fixed income portfolio duration, credit and curve exposures relative to these calculations.
Cash balance Floating ICR provision Floating ICR assumption	Short-duration portfolio. The sensitivity of liabilities to interest rate shocks can be calculated from the assumed ICR provided by the plan’s actuary; therefore, align fixed income portfolio duration, credit and curve exposures relative to these calculations.

It is important we note the impact of ICR floors on these strategies. Cash balance plans will often have an ICR minimum in place (usually between 2.5% and 5%). When the ICR is below the floor, this rate will begin operating more like a fixed ICR, which could introduce duration to plan liabilities if the ICR assumption also shows a tendency to being more fixed over time. This can be particularly challenging to navigate and maintain an interest rate hedge when the ICR is close to the floor. In the current interest rate environment, many plans have ICR’s above the floor, which has reduced liability duration exposure. But plan sponsors should carefully consider how to be nimble with their LDI strategy to adjust for changes in liability duration over time depending on ICR levels relative to floors. The implementation of an LDI overlay can be particularly useful in addressing more frequent liability duration adjustments without adversely affecting the remainder of the portfolio.

Most investment strategies described in this paper focus on the simple goal of hedging duration or basic interest rate sensitivity.

¹ Based on 5500 filings for the 2022 plan year.

² The motivations for establishing cash balance plans can be different for smaller sponsors, who are often attempting to set aside more retirement funds than would otherwise be available on tax-preferred basis.

³ Methods exist to manage CB plan risks through plan design (shared investment risk), but that is not the focus of this paper.

⁴ Also known as “principal credits” since they do not technically have to be based on pay.

⁵ An increasing number of CB plans link asset performance to benefit amounts.

⁶ This idea holds when the ICR assumption is a single rate. If the ICR assumption varies by year, this relationship would depend on the weighted average of the ICR assumption.

⁷ In contrast, if the actuary assumes a participant will take the benefit immediately, and the participant does not, a gain would result.

⁸ An important side note for terminating plans is that not all participants will take the lump sum. Some will not elect at all, and therefore an annuity contract must be purchased, which will require an additional premium.

⁹ The exception to this when the plan design incorporates shared investment risk. The ICR can be based on asset performance, rather than on a single market rate. In all cases, however, at the very least the account balance cannot fall below the sum of the pay credits accrued.

¹⁰ In most cases, the reported liability will be lower than the account balances. Therefore, if the plan is funded to at least the account balances, in most cases they will also be fully funded on a reported liability basis.

¹¹ In general, the provisions of PPA and ASC 715 (FAS 158) employ a mark-to-market basis, which compares current asset and liability values. These provisions are generally unforgiving to asset-liability mismatches, although the provisions of the Moving Ahead for Progress in the 21st Century Act (MAP-21) have temporarily obscured this distinction.

¹² The *reported liability*, used for funding or accounting purposes, is often different from the *economic liability* for a CB plan. For the economic liability, each future ICR rate (assuming the ICR is floating) is calculated based on current interest rate expectations (assuming the ICR is keyed off interest rates). For example, if the 30-year Treasury yield were the basis for the ICR, it would be unreasonable to expect that in each future year the rate would stay the same as in the current year. In most cases, this is what the actuary assumes. A more accurate reflection of the economic liability would use implied future rates derived from the forward curve observed in the market.

¹³ Note that greater attention is placed on the accuracy of the expected cash flows, rather than just the liability. An actuary may argue that a simple assumption will lead to accurate reflection of the liability (which is their primary responsibility), but when the sponsor has elected to use an LDI strategy, the accuracy of future cash flows is also of critical importance and is less likely to be achieved when using overly simple assumptions.

¹⁴ This will depend on how well the actuarial assumptions line up with actual experience over time. Expected cash flows may not change much in the short term, but over the long term, they can vary substantially.

¹⁵ CB plans must offer annuities, since they are usually qualified as DB plans under ERISA. The only exception to the annuity requirement is in the case of de minimis lump-sum amounts, which can be automatically cashed out.

¹⁶ Depending on the ICR formula, curve risk may still be present, and in particular we are aware of some cases where cash flows beyond the reference ICR rate have negative duration (i.e., value rises as interest rates rise). To keep the examples simple, we reference an average duration in this paper.

¹⁷ If the ICR is fixed, or is floating with a floor that is significantly higher than the current rate, then the assumption will be fixed as well.

¹⁸ In plain terms, the hurdle rate is the sum of the discount rate, the service cost accrual rate (service cost / PBO), plus an amortization of the unfunded liability (e.g., funding the plan over 7 years).

¹⁹ Many possibilities exist for converting traditional plans to CB. For example, the CB formula could apply only for new participants, or only for participants under a certain age. Even if existing benefits are converted to an “opening balance,” the benefits must be tested to ensure that they are at least as much as the legacy benefits.

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