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An investment strategy framework for cash balance pension plans

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- The ideal investment approach for a cash balance pension plan may differ substantially from the typical liability-driven investment (LDI) strategy employed by many traditional pension plans.
- Using an LDI strategy to hedge a final average pay plan's interest rate sensitivity has a definite economic benefit, because the amount at which the liability can be immediately settled through the purchase of an annuity changes with interest rates. With a cash balance liability, however, the benefit can typically be settled only through the payment of the account balance, which is not interest rate sensitive.
- We review two strategies to managing the investments in a cash balance plan. The first is to adopt a total-return strategy that would likely target a long-term rate-of-return goal in excess of the plan's interest crediting rate. The second is to include elements of an LDI strategy while accounting for the crediting rate's significant impact on the liability's interest rate sensitivity.

Introduction

A cash balance pension plan is a defined benefit (DB) pension plan that is designed to look, to participants, like a defined contribution (DC) plan. In a cash balance plan, the benefit amount is communicated as an account balance that grows over time with pay credits and interest credits. From a legal perspective, a cash balance plan is indeed a DB plan, just like a traditional pension plan that defines the benefit amount in the form of an annuity based on the participant's compensation and/or years of service. It is for this reason that cash balance plans are often referred to as "hybrid" plans.

Because a cash balance plan is a DB plan, the plan sponsor faces investment risk that must be managed. In other words, a cash balance plan can become underfunded, just like a traditional pension plan (and unlike a DC plan), requiring the plan sponsor to make additional contributions. The very nature of a cash balance liability, however, is different than that of a traditional pension liability, both because of the way cash balance benefits accrue and the impact markets can have on a cash balance liability. For this reason, the ideal investment approach for a cash balance plan may differ substantially from the typical LDI strategy employed by many traditional pension plans.

Relatively few plans are purely cash balance. Although cash balance plans are common,¹ many were converted from traditional pension benefit formulas.^{2,3} In these transition cases, only a portion of plan liabilities operates as a cash balance plan, with the remainder operating as a traditional benefit formula. Both the provisions and timing of the conversion are important to the plan's investment strategy. This paper explores two investment approaches for cash balance plans; the appendix discusses how various conversion provisions could impact investment strategy.

Notes on risk

All investing is subject to risk, including possible loss of principal. When interest rates rise, the price of a bond or bond fund will decline. Bonds are subject to credit risk and inflation risk. Credit risk is the risk that a bond issuer will fail to make timely payments of interest and principal. Inflation risk is the possibility that increases in the cost of living will decrease or eliminate the returns of an investment. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income. U.S. government backing of Treasury or agency securities applies only to the underlying securities and does not prevent share-price fluctuations. Unlike stocks and bonds, U.S. Treasury bills are guaranteed as to the timely payment of principal and interest.

1 See Table S-34 of the PBGC Databook, which states that 23% of all pension plans are classified as hybrid plans. Cash balance plans are the most common type of hybrid plan, with the other being a pension equity plan. Available at <https://www.pbtc.gov/sites/default/files/2015-pension-data-tables.pdf>.

2 See the February 2018 edition of Willis Towers Watson Insider, where Figure 4 shows that 100 of the 233 traditional DB plans in its study (beginning in 1998) have converted to a hybrid benefit formula. Available at <https://www.towerswatson.com/en-US/Insights/Newsletters/Americas/insider/2018/02/evolution-of-retirement-plans-in-fortune-500-companies>.

3 An exception to this is a recent trend for law firms, medical offices, and other professional partnerships to start new cash balance plans because the structure has a tax favorability compared with a DC plan.

How a cash balance pension formula works

As previously mentioned, a cash balance plan communicates the benefit amount in the form of an account balance. In reality, this account balance is notional (i.e., hypothetical); participants do not have a segmented account of assets that are earmarked directly for them (again, unlike a DC plan). Instead, the assets of the plan are commingled in a trust and invested in a strategy chosen by the plan sponsor.

Figure 1 illustrates how, in a typical cash balance plan, a participant's account balance accumulates based on two components:

- **The pay credit**, similar to a company contribution, which is typically a percentage of the participant's compensation (5% in this example); and
- **The interest credit**, similar to investment earnings, which is often tied to a market-based reference rate (i.e., the yield on 30-year U.S. Treasury bonds) or defined as a constant rate (3% in this example).

Figure 1. How a typical cash balance account increases during a plan year

Account balance at beginning of year	\$5,000
Pay credit (e.g., 5% of \$50,000 compensation)	\$2,500
Interest credit (e.g., 3% x \$5,000 balance)	\$150
Account balance at end of year	\$7,650

Source: Vanguard, 2018.

Since a cash balance plan is legally a DB plan, the pay credit and interest credit are defined by the terms of the plan document and generally are not subject to the volatility of the underlying investments.⁴ The plan sponsor chooses the asset allocation for the pension fund and assumes the associated investment risk. At any point, the plan may be under- or overfunded relative to the sum of the participant’s account balances (or, as we explain later, relative to the liability value assigned to those account balances for financial reporting purposes).

Calculating the liability for a cash balance account

To calculate the liability for each participant’s cash balance account for financial reporting or other purposes, the plan’s actuary must make forward-looking assumptions for the timing of future payments to participants, the future interest crediting rate (to determine the projected account balance at the payment date), and the discount rate (to determine the present value of the projected account value as of the measurement date).

With this information, calculating the liability for an individual participant has two steps, as illustrated in the example in **Figure 2**:

- **Step 1.** Project the account balance from current age to the assumed payment date (age 65) using the assumed interest crediting rate. For our example, a constant interest crediting rate of 3% will be used.⁵
- **Step 2.** Discount the projected account balance back to the current age using the discount rate. For our example, the discount rate will be 4%.

As shown, the liability can be considerably less than the account value. This will be the case when the discount rate is greater than the interest crediting rate, which is common because the discount rate for financial reporting purposes is based on corporate bond yields, whereas the interest crediting rate is frequently based on Treasury yields. This could result in a cash balance plan being seen as “fully funded” (i.e., where the plan’s assets equal the plan’s financial reporting liabilities), even though it is actually underfunded relative to the current sum of participant account balances.

Figure 2. Calculating the liability of a cash balance account

Age	Account value	Years until estimated payment	Step 1: Project the account balance to the payment date at the interest crediting rate (3%)	Step 2: Calculate liability by discounting the projected account balance at the discount rate (4%)
45	\$100,000	20	\$180,611	\$82,429
50	\$115,927	15	\$180,611	\$100,287
55	\$134,392	10	\$180,611	\$122,014
60	\$155,797	5	\$180,611	\$148,449
65	\$180,611	0	\$180,611	\$180,611

Source: Vanguard, 2018.

⁴ An exception to this is an emerging trend where the interest credit is tied directly to the return on the underlying investments.

⁵ The projection of the account balance to the assumed payment date includes only future interest credits; it does not include future pay credits, which would be for service beyond the valuation date.

Approaches to selecting an investment strategy for a cash balance pension plan

In our view, there are two main approaches a cash balance pension plan sponsor can use when selecting an investment strategy:

1. Seek to match, keep pace with, or exceed the plan's defined interest crediting rate.
2. Seek to match the interest rate sensitivity, or duration, of the cash balance liabilities.

These approaches are not mutually exclusive. Depending on objectives and risk tolerance, a plan sponsor may decide to exclusively focus on one approach or the other, or the sponsor may seek to strike a balance between the two. As discussed in greater detail below, the implications of the investment strategy decision are significant.

Approach 1: Seek to match, keep pace with, or exceed the plan's defined interest crediting rate

One question often asked is, why not just set the asset allocation return target so that it equals, either over the short term or long term, the interest crediting rate?

The answer: This strategy may either be not possible or not desirable. As previously mentioned, the interest crediting rate is frequently defined as a fixed percentage (3%) or equal to the yield on a particular bond maturity (e.g., annual yield on 30-year Treasury bonds). In the case of a fixed percentage, an investment portfolio may be able to target a particular rate of return over a long investment horizon, but it cannot match that return over a short horizon. The best one could hope for would be to target a long-term rate of return near or above the interest crediting rate and then absorb the year-to-year volatility—and associated contribution requirements—that come with either meeting or not meeting that target.

The second case (bond yield) is shown in **Figure 3**. Unfortunately—and perhaps surprisingly—there is no asset available that achieves a return equal to a bond's annual yield (except perhaps if the bond has one year or less to maturity). This is because investing in a bond not only gives holders the yield throughout the period, it also exposes them to the price change from any underlying change in yields during the year. In **Figure 3**, the cash balance account would earn 3% (beginning-of-year yield), but the asset would lose 14% (a combination of the yield and the price change on the bond during the year as the yield increases from 3% to 4%).

Figure 3. Why there are no matching assets in a typical cash balance structure

	Cash balance account value	Value of 30-year Treasury bond investment with 3% yield
Beginning of year, 30-year rate = 3%	\$100	\$100
End of year, 30-year rate = 4%	\$103	\$86

Source: Vanguard, 2018.

This simple example shows that assets are generally not available to exactly match the interest crediting rate. Furthermore, interest crediting rules in cash balance plans frequently come with "floors" (minimum values) and/or "ceilings" (maximum values); under these circumstances, the return profile becomes even more complex and the construction of a matching portfolio less feasible.

It's important to note that keeping pace with the plan's interest crediting rate may not be enough. As illustrated in **Figure 4**, a plan that is fully funded (relative to the financial reporting liability), with assets earning the interest crediting rate, will fail to keep pace with liability growth over the long term. That is because the liability increases each year by the discount rate, which, as previously discussed, is often higher than the interest crediting rate.

A fully funded plan (on a financial reporting basis) that matches the interest crediting rate will decline in funding status each year and will fail to meet the final account value. That difference will eventually need to be funded with company contributions. For this strategy to work over the long term, a sponsor would have to start by being 100% funded on an account balance basis—a higher standard than 100% funded on a financial reporting basis.

To summarize Approach 1, a cash balance plan sponsor can build an investment strategy with regard to the plan's defined interest crediting rate. In practice, investing to achieve exactly the interest crediting rate is difficult to impossible (because of a lack of available instruments, in most cases) and possibly undesirable. A plan sponsor pursuing this strategy would want to adopt a total-return portfolio with a traditional asset-only efficient frontier analysis and would likely target a long-term rate-of-return goal in excess of the interest crediting rate. The higher the return goal, the better the expected funding progress over the long term, relative to both the account balances and the pension liability. However, the sponsor must realize that there will be significant year-to-year volatility relative to that goal and that the goal may only be achieved over a long investment horizon (if at all). Under this strategy, any excess return above the interest crediting rate can be used to fund the shortfall between liability and account balance and/or to fund the cost of future benefit accruals (i.e., annual pay credits).

Figure 4. Why it may not be desirable to earn the interest crediting rate

Age	Account value	Liability value	Asset value	Funded status relative to account balance	Funded status relative to liability
45	\$100,000	\$82,429	\$82,429	82%	100%
50	\$115,927	\$100,287	\$95,557	82%	95%
55	\$134,392	\$122,014	\$110,777	82%	91%
60	\$155,797	\$148,449	\$128,421	82%	87%
65	\$180,611	\$180,611	\$148,875	82%	82%

Note: This example shows a plan initially fully funded on a liability basis with assets earning a 3% interest crediting rate and a liability discount rate equal to 4%.
Source: Vanguard, 2018.

Approach 2: Seek to match the interest rate sensitivity, or duration, of the cash balance liabilities

Many traditional pension plan sponsors employ an LDI strategy, in which some or all of the assets are deployed to offset, or “hedge,” the interest rate sensitivity in the pension liability. (The assets used for this purpose are often called “liability-hedging” assets.) Best practices for constructing LDI strategies for traditional pension plans are generally well-understood within the investment industry; see, for instance, Bosse (2018) and Dutton and Plink (2018).

Cash balance plans can also use an LDI strategy, although a cash balance liability’s interest rate sensitivity, or duration, can be challenging to evaluate. One way to measure the interest rate sensitivity of a cash balance liability (or any pension liability) is to remeasure the liability using a different discount rate, then calculate the rate of change. For a cash balance liability, however, the discount rate (which is based on high-quality corporate bond yields) isn’t the only assumption that is important in this remeasurement. The assumed future interest crediting rate is equally important, and it is critical to understand how the plan sets the future interest crediting rate assumption each year. It is also important to recognize that those setting assumptions have much more flexibility over the choice of the interest crediting rate than they do over the discount rate, which is often defined by statutes.⁶ That choice may determine whether, and how much, the plan liability is sensitive to interest rate movements.

For instance, if the interest crediting rate is fixed at 3%, then the plan’s assumption for future interest credits should also be 3%. However, if the interest crediting rate is variable (e.g., based on 30-year Treasury bond yields), then a reasonable assumption for future interest credits could be any of the following:

- The current yield as of the measurement date (i.e., an assumption that yields will not change in the future);
- The forward rates based on the yield curve as of the measurement date (i.e., an assumption that yields will evolve over time based on prices embedded in the market); or
- An equilibrium assumption based on the plan sponsor’s past experience and/or long-term views. These could be views of the sponsor’s organization or views the sponsor arrives at through working with its advisors and consultants.

All three of these have a reasonable foundation, but regardless of choice, the interest crediting rate assumption and its relationship to the discount rate assumption have a large impact on perceived cash balance liability interest rate sensitivity, as illustrated in Figure 5.

Figure 5. Calculating the liability of a cash balance account

Scenario	Interest crediting rate	Discount rate	Current account balance, age 45	Projected account balance, age 65	Liability	Interest rate sensitivity
A. Baseline	3.0%	4.0%	\$100,000	\$180,611	\$82,429	—
B. Discount rate rises 1%	3.0%	5.0%	\$100,000	\$180,611	\$68,070	-17.4%
C. Discount rate rises 1% because Treasury curve increases 1%	4.0%	5.0%	\$100,000	\$219,112	\$82,581	0.2%
D. Discount rate rises 1% because Treasury curve and credit spread each change 50 basis points	3.5%	5.0%	\$100,000	\$198,979	\$74,993	-9.0%

Note: A basis point is equal to one-hundredth of a percentage point.

Source: Vanguard, 2018.

⁶ Note that although the methodology for choosing the assumption of future interest crediting rate is left up to the discretion of the plan and its advisors, the actual interest rate credited is defined in the plan document.

Rows B, C, and D show how a cash balance liability might be remeasured after a 100 basis point (1%) increase in the discount rate and how this remeasurement (compared with the baseline liability measurement in Row A) determines the interest rate sensitivity. As shown in the right-hand column, the interest rate sensitivity for this cash balance liability could range from near zero to over 17%.

Row B: Changing the discount rate without changing the interest crediting rate assumption

In this case, increasing the discount rate by 100 basis points, to 5%, would lower the liability to \$68,070 (or 17.4%) relative to the baseline measurement in Row A. In this example, the liability amount is very sensitive to discount rate changes and therefore would be a good candidate for a liability-hedging allocation with a similar interest rate sensitivity (i.e., with a duration of approximately 17.4 years).

This example is consistent with how a cash balance plan sponsor might think about liability hedging under the following circumstances:

- The interest crediting rate is fixed (e.g., 3%).
- The interest crediting rate is variable based on a bond yield, but the effective interest crediting rate is constrained by a floor (i.e., minimum) or cap (i.e., maximum) and is expected to be constrained for the foreseeable future. In this case, the interest crediting rate essentially behaves like a fixed rate.
- The interest crediting rate is variable based on a bond yield, but the actuary's interest credit assumption is defined as a fixed long-term assumption that does not fluctuate from year to year.⁷

Rows C and D: Interest crediting rate assumption changes with the discount rate

When the interest crediting rate is based on a bond yield (e.g., the 30-year Treasury yield), there is likely to be a positive correlation between changes in the interest crediting rate and the discount rate. Row C illustrates the impact of a perfectly correlated move between the two rates. The liability after increasing both rates by 100 basis points is \$82,581, virtually the same as the baseline measurement in Row A, implying that the liability has little or no interest rate sensitivity (i.e., the liability duration is near zero). However, in the case where the two rates are partially, but not perfectly, correlated—illustrated in Row D, where the discount rate rises by 100 basis points and the interest crediting rate rises by 50 basis points—the liabilities are about half as sensitive to discount rates as they are in Row B (i.e., duration near 9 years).

This example is primarily relevant to circumstances where the plan's interest crediting rate is variable based on a bond yield and the actuary's interest credit assumption changes from year to year, either based on current market observations (e.g., the current interest crediting rate) or on a fixed spread from the discount rate (e.g., the discount rate minus 100 basis points).

To summarize Approach 2, if the actuary's assumption for the interest crediting rate is fixed, then a cash balance plan could have interest rate sensitivity similar to that of a traditional pension plan, and a liability-driven approach can help reduce volatility of the plan's funding status. However, if the interest crediting rate assumption moves in relation to the discount rate, as sometimes happens when both are based on bond yields, there may be little to no predictable interest rate sensitivity to hedge, meaning that Approach 2 may be less useful.

⁷ Even in this case, there is a chance that the interest crediting rate will have to be updated if there is a substantial change in the markets such that the long-term assumption needs to change. This will distort interest rate sensitivity for the year of the assumption change.

A caveat to Approach 2: Don't lose sight of the cash balance account value. Notice in Figure 5 that the changes in the assumptions (discount rate and interest crediting rate) have no impact on the account value payable to the participant, which is \$100,000 in all cases. In the Row B example, if we constructed a liability-hedging portfolio to match the sensitivity of the cash balance liabilities, and if the plan was fully funded (on a financial reporting liability basis) before the rate increase, then the plan would still be fully funded after the increase. Both assets and liabilities would decline from \$82,429 to \$68,070. But now we would have only \$68,070 to back an account balance of \$100,000. Whereas there is a definite economic benefit to tracking interest rate movement for a final average pay plan—because the amount at which the liability can be immediately settled through the purchase of an annuity changes with interest rates—that is not the case for cash balance liability. The amount at which the benefit can be immediately settled is typically the account balance, and therefore, sponsors should be careful about whether they want to track a liability value that is not representative of the amount at which the benefit can be immediately settled.

Where the cash balance liabilities may have interest rate sensitivity, as discussed at length above, the account value itself does not. Typically, the account value is what ultimately must be paid to participants in a cash balance plan, so it can often be thought of as the true economic liability—a liability with no interest rate sensitivity.

Evaluating a decision

The sponsor of a cash balance pension plan should decide which of these two objectives should be prioritized:

- Managing the relationship between the assets and the sum of participant account balances in a total-return-type approach, as described in Approach 1; or
- Managing the relationship between assets and measured liability for financial reporting (which may diverge from the sum of account balances for long periods of time), as described in Approach 2.

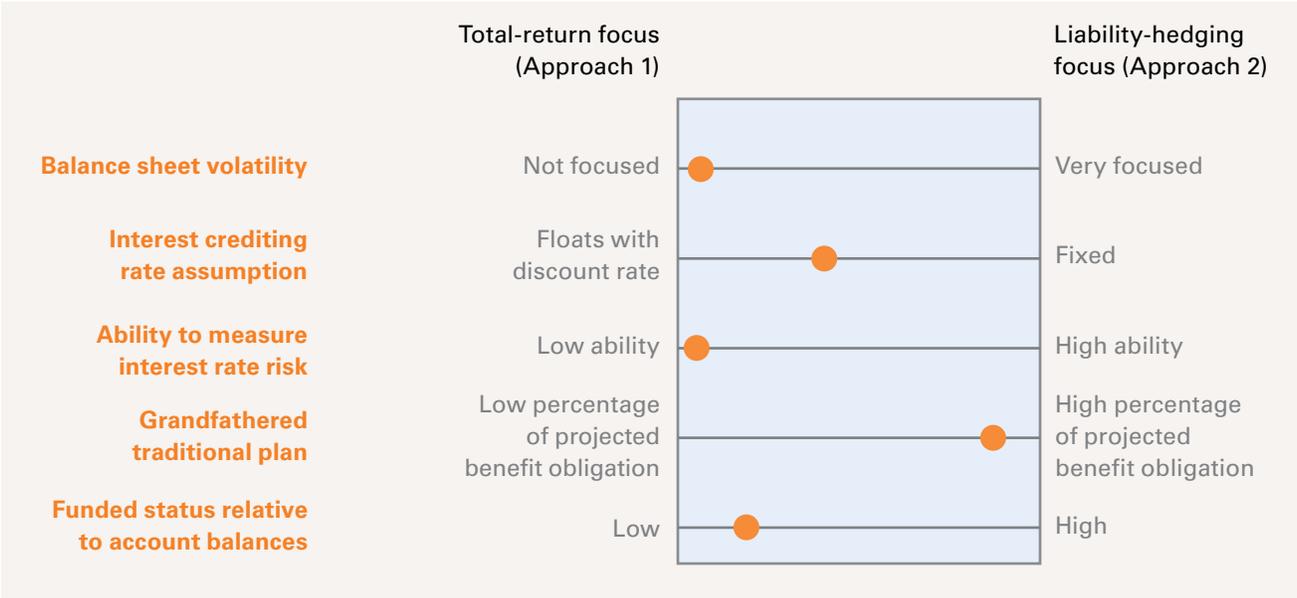
Many cash balance plan sponsors will want to construct an investment strategy that strikes a compromise between the two objectives (i.e., a strategy that targets a long-term rate of return based to meet or exceed the interest crediting rate, as described in Approach 1, but that also provides some degree of hedging for the financial reporting liability, as described in Approach 2). Furthermore, it is also possible to employ a “glide-path” construct to adjust the portfolio allocation to increasingly prioritize liability-hedging objectives to protect a plan’s funding status gains.

Figure 6 sets up a list of key characteristics—though there are certainly others—that could be used to place the investment decisions for a cash balance plan along the spectrum of deciding between being a total-return-focused investor (Approach 1) and a liability-driven investor (Approach 2). For instance, if the cash balance plan sponsor is not focused on balance sheet volatility, it may be more likely to pursue a total-return investment strategy (as described in Approach 1). However, if the cash balance plan has a high percentage of plan liability attributable to a traditional plan in the form of grandfathered or retiree benefits, or if the plan has a fixed interest crediting rate (and therefore more ability to determine the interest rate risk), the sponsor may be more focused on a liability-driven investment strategy (Approach 2).

Conclusion

There is not necessarily a “right” answer to the question of which strategy to use when managing the liability in a cash balance plan. For a traditional pension plan, as discount rates rise, the value of the amount that must be paid to the participant decreases (i.e., the value of the annuity that can be purchased falls with rising rates), which supports the liability-driven investment approach. This is not true of a cash balance plan, as the value of what must be paid to a participant (i.e., the account balance) does not typically change when interest rates change. This could create an argument to hedge the account balance or at least treat that balance as the economic value of the plan liability. However, annual contributions and annual balance sheet volatility could fluctuate with interest rates. Those looking to minimize the volatility of those metrics may wish to use cash balance plan liability as their hedging goal instead.

Figure 6. Deciding between investment approaches



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Appendix

Impact of grandfathered traditional plan benefits in a cash balance plan

The discussion in this paper about interest rate sensitivity and investment strategy for a cash balance plan would apply at a total plan level if all participants (both active and inactive) are covered (and have only been covered) under a cash balance-type formula. However, a significant number of cash balance plans were converted, at some point, from final average pay or other traditional benefit formulas. The benefits promised under prior benefit formulas are often called grandfathered benefits and can significantly impact the pension plan even decades after the transition. Depending on how the transition was handled and how long ago it took place, a significant portion of a cash balance plan's pension liability may actually have more in common with the liability of a traditional pension benefit formula. We have seen some cases where the transition from traditional formula to cash balance occurred more than a decade ago, yet the liability for grandfathered benefits still accounts for 80% to 90% of the total plan liability.

Thorough research should be conducted into the liabilities of a cash balance plan with the intention of separating the liability by benefit formula when measuring the interest rate sensitivity and selecting an investment strategy for the pension plan. A separate investment strategy could be created for the liability associated with grandfathered benefits versus the liability associated with the cash balance benefit formula.

Key things to consider regarding grandfathered benefits:

Retirees. All retiree liability, whether from a traditional benefit formula or from a participant who elected to receive the cash balance benefit as an annuity, is typically combined with the grandfathered benefit liability. This is because retiree liability represents a stream of monthly annuity payments. The bond-like nature of these payments makes them good candidates for a traditional LDI strategy.

Participants who terminated prior to cash balance conversion. Similar to retirees, this liability is derived using a traditional benefit formula and represents a deferred annuity payment. The bond-like nature of this payment pattern lends itself to a traditional LDI strategy.

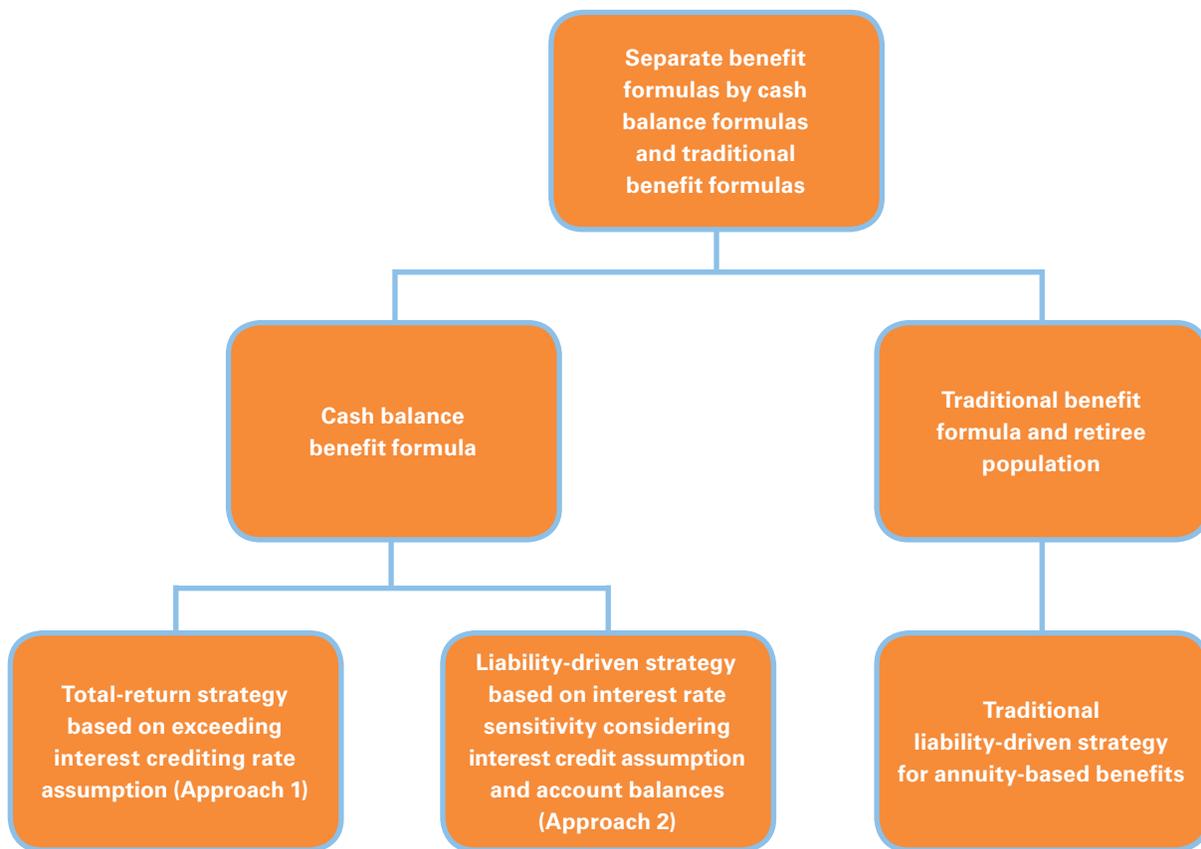
Participants who entered the plan under the traditional benefit formula but terminated after the cash balance conversion. This depends on the nature of the conversion. In some cases, these participants might have been fully grandfathered into the traditional benefit formula, so they have an annuity benefit that could be managed using a traditional LDI approach. In other cases, participant benefits at the time of conversion may have been converted fully to a cash balance account (with the grandfathered benefit at the time of conversion remaining as a legally protected minimum), or participants could have even received some type of "greater-of" arrangement where the benefit payable could be from either an ongoing traditional pension formula or a cash balance formula.

In these latter cases, further research should be done (perhaps on a participant-by-participant basis) to see which benefit formula is applicable today and which is more likely to be applicable in the future.

Participants who entered the plan after the cash balance conversion. These benefits are earned under a cash balance formula; the investment principles discussed in this paper should drive the investment strategy decision.

In summary, a plan whose current benefit structure is a cash balance formula may still have a significant proportion of benefits that are stated in terms of a traditional benefit formula and therefore may deploy an investment strategy that looks very similar to an LDI strategy for a traditional pension plan. Further, it may take years for the accruing cash balance liability to become the predominant form of liability. As illustrated in **Figure A-1**, plan sponsors should consider various subgroups of the overall plan separately when selecting an overall investment strategy.

Figure A-1. Investment decision tree for cash balance plans with grandfathered benefits



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