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Pension cashflow matching: Addressing flexibility and challenges

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Introduction

Since the 1990s, public and multi-employer pension plans have been operating in an environment fraught with challenges. Treasury yields have been in near continuous decline for three decades, falling from a peak of 9% in early May 1990 (10-year treasuries) to present-day lows of 1%-2%. Return targets of 8%, once considered conservative, now carry greater risk. To respond to rising risk premiums, plans are trying to mitigate their exposures more adroitly by focusing on cashflow.

Cashflow matching is one such strategy. Portfolio assets are invested in fixed income instruments that would produce inflows to the plan (through coupons, maturity, or both) equal to its expected outflows (benefit payments).

This paper takes a deep dive into cashflow matching strategy. It examines the justification for its time horizon, the reasons for its projected strength in a relevant drawdown/rebound economic scenario, and it comments on the impact of cashflow negativity on plan outcomes.

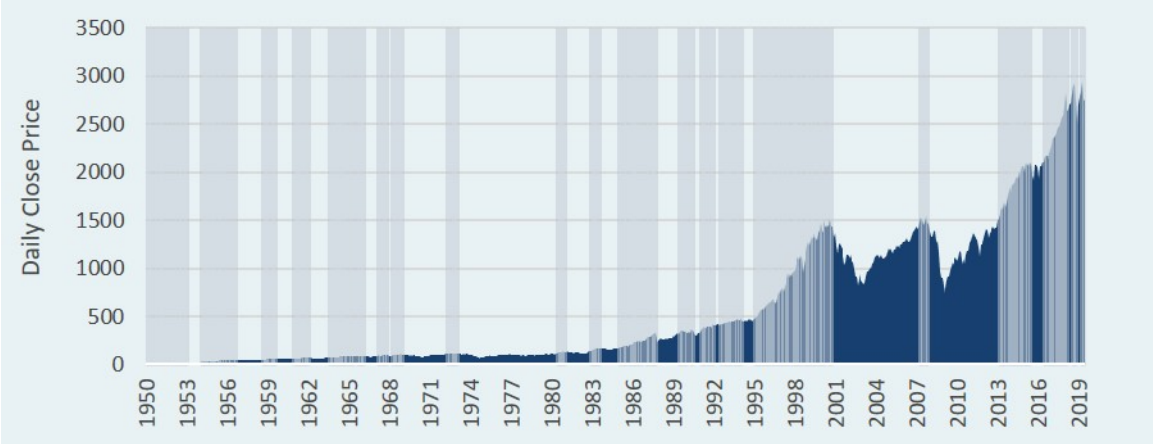
Drawdown risks

Many public and multi-employer pension plans operate with negative cashflow, requiring a portion of plan assets to be liquidated in order to

fulfill benefit payment obligations. As a result of non-cashflow neutrality, the financial outcomes of these plans are partially dependent on return timing.

The cashflow matching strategy is positioned to assist with more effective methods of portfolio rebalancing and to hedge against these return timing considerations. Exhibit A below shows the history of the S&P 500 Index since 1950, shading regions which would be considered a historic high.

EXHIBIT A – S&P 500 HISTORIC HIGH LENGTHS (1950-CURRENT)

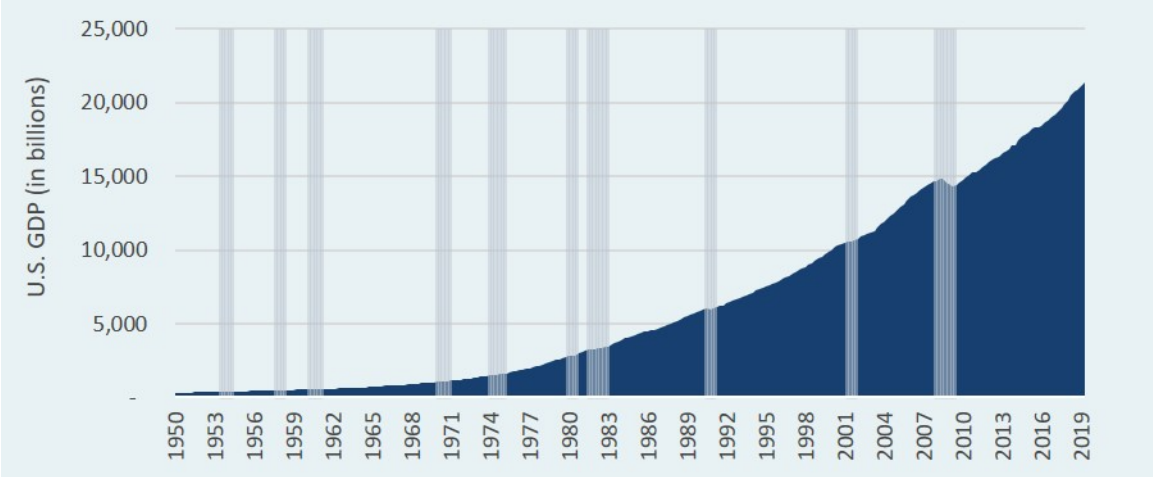


Source: Verus

For the S&P 500, there have been three protracted periods when the index did not achieve historic highs: 1973-1980 (7.5 years), 1999-2007 (7.2 years), and 2007-2013 (5.5 years). If the historical behavior of the S&P were to be predictive and broadly representative of performance for pension funds, then cashflow matching of approximately 5-8 years would allow the plan to avoid having to sell assets during a down market.

Economic data from the National Bureau of Economic Research (NBER) provides another way of identifying the duration of depressed economic conditions as shown in Exhibit B below.

EXHIBIT B – NBER U.S. RECESSIONS AND GDP (1950-CURRENT)



Source: Federal Reserve and NBER

Judging from historical NBER data, U.S. economic growth from peak to peak has exhibited a duration of six years on average. Two economic periods remain as outliers, 1990-2001 (10.7-year expansion) and the most recent expansion beginning in 2009.

While the past is not necessarily predictive of the future, one can make broad statements with respect to the duration of a cashflow matching portfolio, should it be employed. Within the historical context described above, cashflow matches of approximately 5-8 years appear to be prudent.

Portfolio construction

From a risk tolerance perspective, engaging in cashflow matching makes intuitive sense; whether the strategy should be deployed or not will ultimately boil down to cost. There is a relationship between the foregone return due to cashflow matching and the additional risk necessary to achieve a plan's objectives.

To illustrate, let's assume a fully open pension plan with associated projected benefit payments and actuarial liability (see Section 1 in the Appendix for more information). Given this information, can the plan afford to lock in 3, 5 or 7 years of benefit payments? Table 1 below gives an overview of the amount of assets necessary to engage in cashflow matching, assuming the plan is approximately 75% funded today.

TABLE 1: PERCENT OF TOTAL ASSETS: BY QUALITY AND LOCK IN PERIOD

	Cash	A+ Securities	BBB+ Securities
Lock in Period	**0.0%**	**2.5%**	**3.5%**
3Yr	22.5%	21.4%	21.0%
5Yr	38.9%	36.1%	35.0%
7Yr	56.9%	51.4%	49.4%

Source: Verus

Table 1 shows the percentage of total assets that would be needed to lock in benefit payments for various time periods (3 years, 5 years, and 7 years) under a variety of risk categories (cash, A+, BBB+). For example, assuming a 5-year cashflow match utilizing A+ securities, the plan would need to invest roughly 36% of total plan assets to engage in the strategy.

Choosing between any element in the above figure is an iterative process that depends on risk tolerance and the plan's broader objectives. Let's assume that the investment objective is to become 90% funded over a 10-year period and that A+ securities are preferred. Let's also assume a 5-year cashflow match. Implementing this strategy is accomplished by splitting the portfolio into two parts, referred to in practice as the "functional portfolio," the "alpha-beta portfolio," or some other variant.

- Part One: The return-seeking portfolio, it is comprised of return-seeking assets like equities, hedge funds, private equity, real estate, etc. Since a majority of the plan's liquidity needs are locked in with the hedge portfolio, the use of illiquid assets or increased risk (or both) becomes easier to justify.

- Part Two: The hedge portfolio, it is comprised solely of the fixed income cashflow matching assets.

Performance considerations

In our example, a pension plan is considering a 5-year cashflow match that is expected to earn 2.5% annually, and an investment objective of 90% funded status over a period of 10 years. By using the required return framework[1], one can calculate the contributions and return necessary to achieve these objectives to see if they are feasible.

TABLE 2: RETURN AND CONTRIBUTION NECESSARY FOR 90% FUNDING IN 10 YEARS

Annual Contribution	1,193M	1,029M	875M	746M	577M	475M	387M	305M	205M	141M
Return-seeking required return	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	11.0%	12.0%
Hedge return	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Blended return (discount rate)	2.8%	3.5%	4.1%	4.7%	5.4%	6.0%	6.7%	7.3%	7.9%	8.6%

Source: Verus

Table 2 shows the contributions and return necessary for the sample plan to become 90% funded over 10 years while maintaining the 5-year cashflow match throughout. It shows the split between the necessary return of the return-seeking portfolio given a hedge portfolio return of 2.5%. This includes changing the discount rate to account for lower (or higher) return expectations as depicted in the last row titled "blended return".

The relationship between the contributions and the return necessary to achieve the plan's objective are dependent on affordability and risk tolerance. Can a return-seeking portfolio be reasonably expected to achieve 8% or 9% over a 10-year time period? Is the volatility implicit in such an allocation outside the plan's risk tolerance (even after incorporating its cashflow matching allocation)? Are the contributions associated with a lower return target (in this case, $577 million in order to target 7% in the return-seeking portfolio) affordable?

The answers to these questions, which are difficult to ascertain quantitatively, will ultimately depend on the plan sponsor's unique situation. However, by using the above framework it is possible to isolate these decision points and make educational observations about the costs and risks implicit in each alternative. It is through this framework that the plan will be best equipped to navigate the challenges that lie ahead.

Risk implications: Stress tests

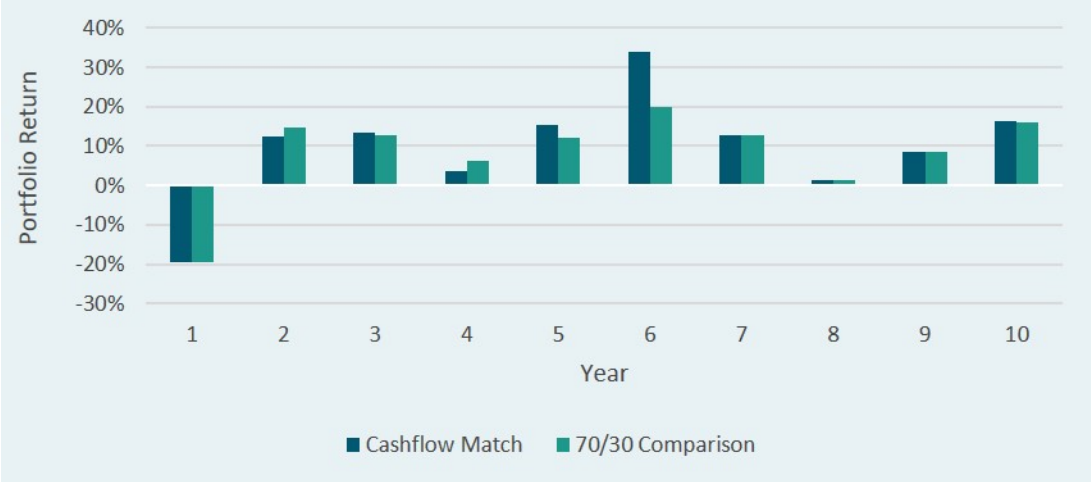
The strength of the cashflow matching approach lies in its presumed resilience to drawdown events, allowing the plan to continue making benefit payments without the need to liquidate the return-seeking portfolio. When analyzing the results of a cashflow matching strategy, there are two key points to consider.

1. The method one uses to determine if a plan should "true-up" its hedge portfolio has a material impact on the plan's financial results. Details of the method employed by this paper are found in Section 2 of the Appendix.

2. The cost of a five-year cashflow is time dependent. It is based on the projected benefit payments of the plan which are not flat. In the case of this paper's example, the cost of the five-year cashflow match becomes slightly cheaper relative to the total assets in the portfolio during the first half of the projection and more expensive in the latter half. Each plan will have unique costs associated with a cashflow matching strategy.

Exhibits C and D below show the cashflow matching strategy in a drawdown scenario versus a comparative 70/30 allocation during a return scenario similar to 2008-2018.

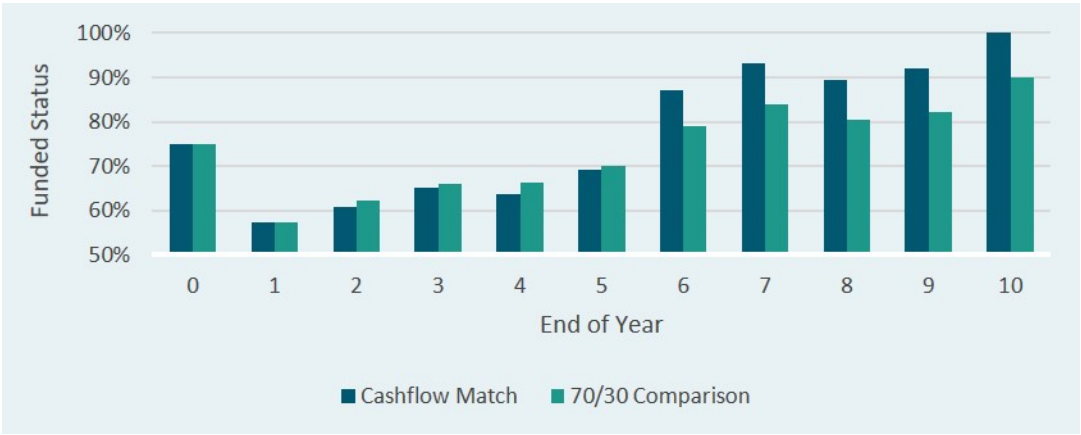
EXHIBIT C –DRAWDOWN DETERMINISTIC PROJECTION: ANNUAL RETURNS



Source: Verus

Details of the return breakout for the return-seeking and hedge portfolios in Exhibit C are found in Section 3 of the Appendix. The differences in return streams displayed above are best understood by the continued ability of the plan to draw from its hedge portfolio, which allows the return-seeking portfolio to increasingly dominate the plan on a capital basis (reaching 80%-90% of plan market value by years 5-6).

EXHIBIT D –DRAWDOWN DETERMINISTIC PROJECTION: FUNDED STATUS

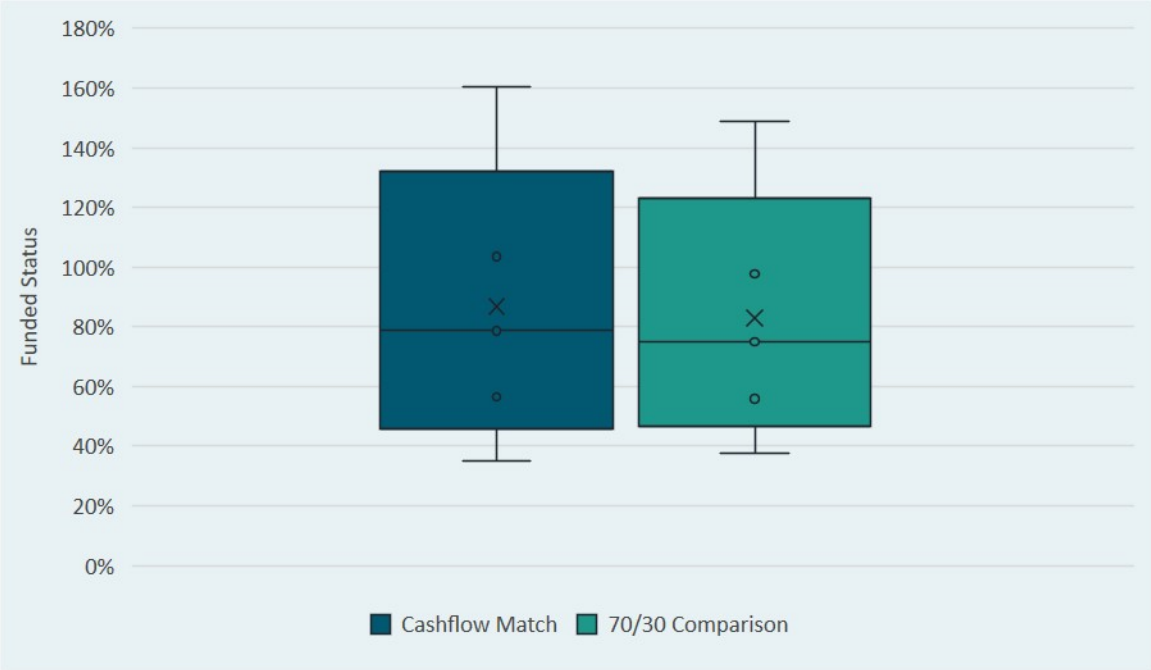


Source: Verus

Exhibit D shows the end-of-year funded status for the two portfolios, noting that the largest divergence occurs in year 6. The return-seeking portfolio returns, caused by not rebalancing to the hedge portfolio, provide the added return that allows for substantial outperformance. However, if the plan had rebalanced to the hedge portfolio just one year earlier, then the gain would not be captured and the cashflow strategy would struggle to compete with the 70/30. Therefore, for a cashflow matching strategy to be effective for plans that are not fully funded, the timing of rebalancing the hedge portfolio becomes a critical concern.

Under a stochastic modeling framework, risk seeking behavior is typically rewarded. As a result, the cashflow matching strategy that allows the hedge portfolio to drawdown over time will position itself to capture the upside of higher median returns. Exhibit E below displays the percentile outcome of 1,000 Monte Carlo stochastic simulations on the 95th, 75th, 50th, 25th, and 5th percentiles (from top to bottom respectively).

EXHIBIT E –STOCHASTIC SIMULATION: FINANCIAL OUTCOMES



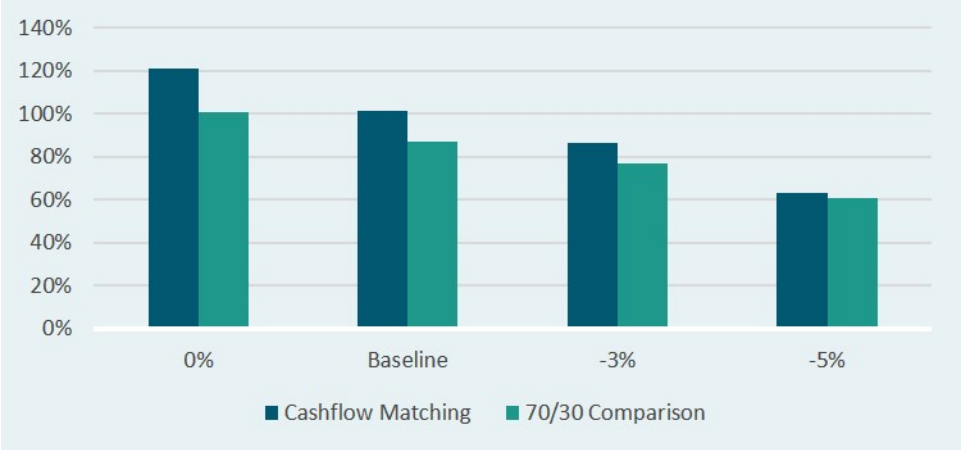
Source: Verus

In Exhibit E above, the median funded status outcome for the cashflow matching strategy is approximately 4% greater than in the 70/30 comparison portfolio. Further information on the stochastic simulation assumption methodology is available in Section 4 of the Appendix.

Cashflow impacts

The cashflow matching strategy for underfunded plans is (at least partially) employed to assist with liquidity concerns. A typical public or multiemployer pension is roughly 2%-3% cashflow negative. On a traditional allocation, this causes an annual strain on the plan as 2%-3% of plan assets need to be liquidated annually to meet obligations. The exhibits below compare the ending financial outcome for the cashflow matching strategy over various contribution commitment levels.

EXHIBIT F – DRAWDOWN DETERMINISTIC PROJECTION: END OF YEAR 10 FINANCIAL OUTCOME

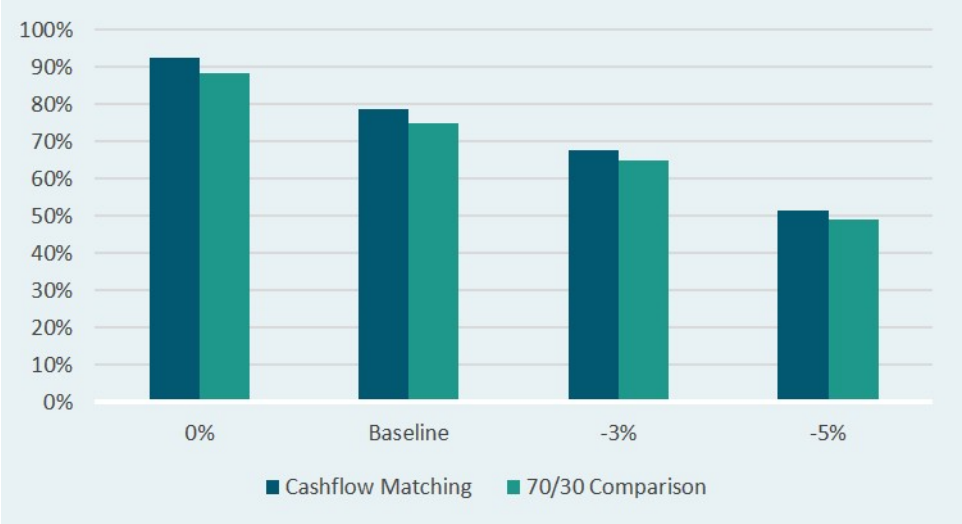


Source: Verus

Exhibit F above shows the impact of increased contributions on the year 10 funded status of the plan under the simulation shown in Exhibits C and D. The baseline relates to the assumed contribution made in the prior exhibits (roughly $387 million which is approximately -1% cashflow negative). The 0% section refers to a contribution level that would make the plan cashflow neutral (expected benefit payments equal contributions) in year one, and so on for -3% and -5% cases. In the given drawdown, the more cashflow neutral the plan is, the stronger the ending financial position of the plan becomes under a cashflow matching strategy (relative to the 70/30 comparison portfolio).

The driver for this outperformance lies in the dynamic nature of risk capture that the cashflow matching strategy employs. Recalling the outperformance found in Exhibits C and D, these deviations compound as more capital is placed into the plan. Additionally, as the plan becomes more cashflow neutral, the impetus for engaging in a cashflow matching strategy diminishes. Exhibit G below shows a stochastic simulation with a similar relationship.

EXHIBIT G – STOCHASTIC PROJECTION: END OF YEAR 10 MEDIAN OUTCOME



Source: Verus

Like the baseline stochastic projection depicted in Exhibit E, Exhibit G shows that on a median basis the cashflow strategy surpasses the 70/30 approach. However, as the cashflow position of the plan declines from its baseline toward -5% annually, the difference between the cashflow matching strategy and the 70/30 comparison portfolio diminishes.

The projected superiority of the cashflow matching approach is derived from the nature of the projection itself, as risk is rewarded over a stochastic simulation where the median expected return of an asset grouping attains or exceeds the assumed rate (in this case, 7%). As a result, the nearly automatic re-risking that the cashflow matching approach implies stronger performance to a comparison portfolio that keeps risk relatively constant.

Summary

The implementation of a cashflow matching strategy is a complex fusion of plan goals, risk tolerance, market outlook, and other considerations. What the strategy can do is to enable a plan to have better risk hedging by reducing the strain on liquidity and adopting a more formulaic approach toward portfolio rebalancing and asset allocation. Regulatory or risk tolerance considerations aside, the efficacy of the strategy as compared to a traditional approach will depend largely on the timing by which the plan reallocates into its hedge portfolio and if that timing is rewarded by the market.

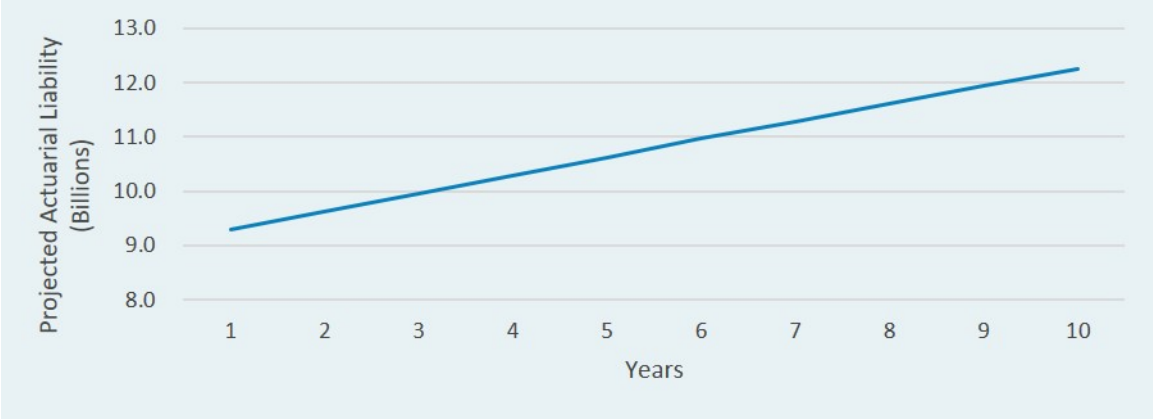
The cashflow matching strategy produces a buffer that enables the plan to gain more flexibility in making (or delaying) its strategic asset allocation decisions. This enhanced flexibility may be the best reason why a plan sponsor should consider the strategy.

APPENDIX

Section 1: Liability assumptions

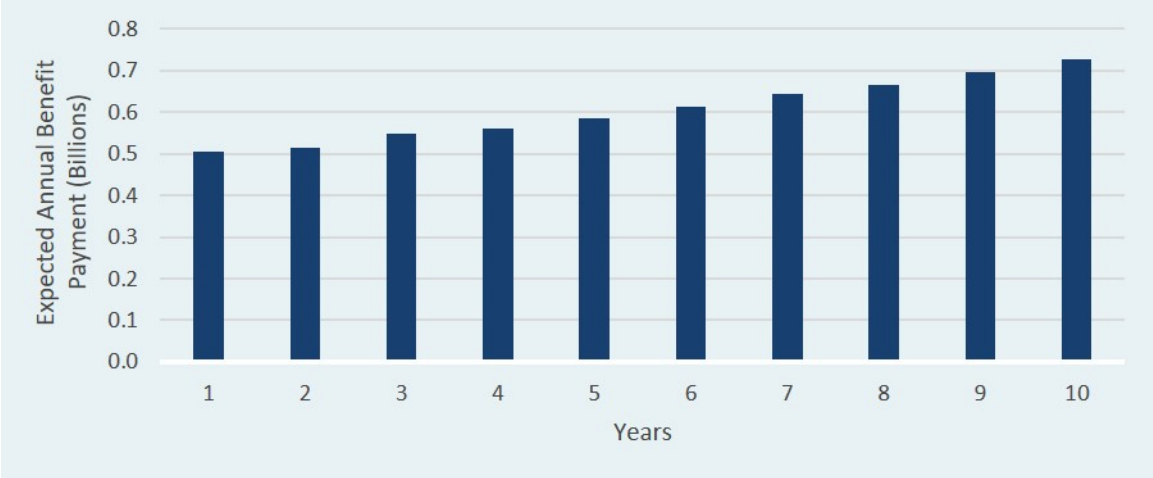
Exhibits A and B below display the liability information for this paper's hypothetical, fully open pension plan.

EXHIBIT A – PROJECTED ACTUARIAL LIABILITY



Source: Verus

EXHIBIT B – PROJECTED BENEFIT PAYMENTS



Source: Verus

Section 2: Modeling assumptions

An overview of the broad modeling assumptions for the simulations in this paper are provided below:

— Model assumes cashflows and portfolio returns occur on an annual basis, with contributions and benefit payments occurring at the start of the simulated year and returns occurring at the end.

— Exhibits C, D, and E assume that the plan under both alternatives contribute $387 million each year, irrespective of simulated performance.

— Cashflow matching assumptions:

- The cashflow matching simulation assumes all benefit payments are drawn from its hedge portfolio, whereas contributions flow into its return-seeking portfolio.
- Logic for the hedge portfolio re-allocation (or "true-up") trigger is displayed below
    - Year 1 of projection assumes no true-up.
    - Year 2+ will engage in a true-up (funded by the return-seeking portfolio) if one of the following conditions are met:
        - The rolling, 5-year geometric return on portfolio is greater than its return target of 7%. For time periods where simulated history is not available (years 2-4), model assumes plan returns achieved its target of 7%.
        - If the hedge portfolio has an asset value of <= 0.
- When a hedge re-allocation is triggered the plan calculates the assets necessary to match 5 years of projected future benefit payments given the assumed return (2.5% in these examples). The hedge portfolio assumed return does not vary in this context.
- Any deficit in the hedge portfolio (should a true-up occur) is funded by the return-seeking portfolio at the beginning of the simulated year, before cashflow and before any return is attributed.

— Comparison portfolio assumptions:

- Assumes benefit payments and contributions are drawn proportionally from plan assets (70% from "return-seeking" and 30% from "hedge").
- Assumes plan rebalances annually after year-end returns are attributed.

Section 3: Exhibit E modeling assumptions

EXHIBIT C – UNDERLYING RETURN ASSUMPTIONS FOR:
EXHIBIT G, RETURN-SEEKING AND HEDGE

Source: Verus

In the chart above, the return-seeking performance is equal to the S&P500 Index nominal returns during the 2008-2018 period. Hedge performance is equal to the 10-year U.S. Treasury return for the same period. The 70/30 comparison portfolio takes an equal weighting of 70% return-seeking and 30% hedge in which to calculate the return. The 2008-2018 period was selected as an illustrative example of the benefits of a cashflow matching portfolio. Similar periods can be selected wherein the cashflow matching portfolio underperforms the 70/30 comparison portfolio.

Section 4: Stochastic modeling assumptions

Stochastic simulation results are created by doing 1,000 Monte Carlo trials on the Verus 2019 Capital Market Assumptions. The return-seeking portfolio is assumed to be 50% US large cap equity and 50% international developed. The hedge portfolio is assumed to be core fixed income.

Notes & Disclosures

1. *See Verus Investments, April 2018 Topic of Interest, "Introduction to Required Return." https://www.verusinvestments.com/introduction-to-required-return/*

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