Corporate plan sponsors may have regained lost ground since the recent credit-crisis-induced plunge in funded status—but few see this as a time for complacency.

Having witnessed a similarly disruptive oscillation during 2000-2001, plan sponsors are taking decisive actions to improve pension health, avoid contribution surprises and dampen the plan’s impact on the organization and its stakeholders, while continuing to meet fiduciary responsibilities. The challenge is great—and intensified by more stringent regulatory and accounting requirements, a low interest-rate environment and a modest outlook for returns.
In response to this challenge, many defined benefit (DB) plan sponsors are choosing to close their plans to new members, freeze further accumulation of participant benefits or terminate plans through lump sum payments and/or buyouts. At the same time, they are re-evaluating practices long adhered to in managing plan assets. Some plan sponsors who believe they are in a position to weather future fluctuations in funded status may continue to target higher returns as the primary lever for meeting benefit obligations. Far more, however, are charting a new course—cognizant that a mismatch in interest rate exposure between plan assets and plan liabilities represents a significant and “hedgeable” risk. Recent surveys attest to a clear shift in perspective:

- **Risk reduction** (instead of higher absolute returns) has, for many, become the dominant focus in managing plan assets (Exhibit 1A).

- **Liability-aware measures of pension investment risk and performance** are taking center stage, as the limitations of traditional asset-only benchmarks are more broadly recognized.

- **Derisking**, reallocating assets to better match the interest rate sensitivity of plan assets and liabilities, is evident in the shift in pension portfolios from equities to interest-rate sensitive fixed income assets (Exhibit 1B).

In our work with pension clients, we are seeing a story similar to that told in the charts above. We would estimate that roughly 50% of the plan sponsors we work with have implemented a liability-driven investment (LDI) strategy—shifting to higher allocations in interest rate sensitive assets—while others are searching for the most effective solution or entry point for such strategies. LDI strategies can take many forms—and the “right” strategy is ultimately the one designed to address the characteristics of the individual plan and the needs of its corporate sponsor.

Our objective in this paper is to enhance plan sponsors’ understanding of the theoretical and practical implications of implementing an LDI strategy. Our discussion highlights the approach and insights J.P. Morgan has to offer as we continue to partner with corporate plan sponsors and their advisors to develop customized derisking strategies to meet pension funding goals. In particular, we offer our perspectives on:

- What a comprehensive LDI program should encompass in order to meet both growth and risk management objectives

- The characteristics of a robust liability hedging component and the need for that liability hedge to be more customized and carefully structured as the plan approaches its ultimate funding status goal

- A case study illustrating our hedging approach in practice

(Our insights on and approach to structuring the growth component of an LDI framework will be discussed in future materials.)
Charting the LDI voyage

We view our LDI partnerships with plan sponsors as a voyage. Each sponsor’s journey is unique and each phase has its challenges. Before embarking on any voyage it is important to clearly establish the destination and time of arrival, assess the risks the “ship” may face, assemble a skilled, experienced crew—and chart an optimal course.

The analogy is obvious. LDI maps out a course for managing plan assets—one that balances two often competing goals: generating the returns required to achieve and maintain funded status goals while managing funded status risk in line with the plan sponsor’s risk tolerance.

To strike an appropriate balance between risk and return, we prepare for the LDI voyage by building a strong, coordinated partnership. We work closely with the plan sponsor, its actuaries and other advisors to:

• Define the plan’s current location and desired destination (i.e., current and target funded status).
• Establish the timeframe for reaching that funded status goal.
• Model liabilities at the cash flow level.
• Assess the plan sponsor’s capacity for making contributions and its risk tolerance in terms of funded status risk.
• Understand governance policies and how they may shape strategic asset allocation solutions.

Each of these parameters will vary among plan sponsors. For example, a 100% funded target may not be sufficient for the plan sponsor whose ultimate goal is to terminate the plan by purchasing annuities. Time frames may be shorter for a “frozen” vs. an open or closed (but accruing) plan. Additionally, liability profiles are highly individualized. The size of a plan relative to the sponsoring corporation’s balance sheet can also affect the level of tolerance for fluctuations in funded status. Each of these considerations and more must be factored into an LDI strategy.

Glide paths—A dynamic derisking approach

In developing a customized LDI strategy, we think about the asset portfolio as consisting of two sub-portfolios:

• A hedging portfolio—designed to offset some proportion of the change in liability values as a result of interest rate and spread movements, while yielding close to the liability effective discount rate. This portfolio generally consists of interest rate sensitive securities such as government and credit instruments and, if permissible, derivatives.

• A growth portfolio—structured to generate excess return over the liability effective discount rate in order to match some or all of the growth in liabilities and, where required, to close all or part of an existing funded status shortfall.

LDI strategies are, generally, not “set it and forget it” solutions. Reaching a funded status goal while addressing the risk management objectives of the plan sponsor requires a glide path—a dynamic derisking approach which, over time, helps determine the shift of assets from the growth to the hedging portfolio. Ongoing monitoring and coordinated management are essential to keep the plan on course.

Exhibit 2 depicts a generalized derisking glide path. Each “phase” of the glide path has a specified benchmark allocation.

Exhibit 2: Generalized Glide Path Design

Glide paths are designed to gradually shift assets from return generation to funded status preservation as plan sponsors approach their pension plan goals.

Source: J.P. Morgan; for illustrative purposes only.

1 Liability effective discount rate is the internal rate of return that equates the present value of the future expected benefit payments to the market value of the liabilities.
for growth and hedging assets as well as overall targets for funded status and risk. As illustrated, the glide path is designed so that as funded status improves and the need to protect these gains increases, the allocation to growth assets gradually declines, allowing a greater allocation to hedging assets. This asset shift can have the effect of simultaneously reducing two of the greatest sources of risk for many pension plans—equity risk and interest rate risk.

The movement from one phase of the glide path to the next is activated by a “trigger”—generally a specified funded status which, when reached, indicates a transition point. Our framework is flexible so that it can incorporate a combination of triggers and/or guidelines (interest rate levels, hedge ratio bands or other measures), based on what is most appropriate given the plan sponsor’s investment policy and decision-making process.

With each subsequent “phase,” the strategic allocations within the growth and hedging portfolios also change, to ensure that these two components continue to effectively fulfill their respective roles within the overall LDI strategy. We will take a detailed look at the changing strategic allocation of the hedging portfolio in a later section (See “From theory to practice—building investable hedging asset benchmarks,” facing page).

Managing funded status risk
The design and implementation of a custom glide path involves many moving parts. A comprehensive view of what drives funded status risk and the ability to quantify and monitor these risk components is essential. Simply put, what can’t be measured can’t be managed. Two key measures of risk that we rely on in designing, monitoring and managing LDI glide paths are funded status value at risk (VaR) and the hedge ratio:

**Funded status VaR** is a “holistic” measure of pension plan risk which is central to our framework. Fluctuations in funded status are, by definition, a function of both plan assets and liabilities and the way each responds to changing market conditions (interest rates, asset class returns, etc.). Given that the negative consequences of not meeting funded status goals (for example, unplanned contributions) generally outweigh the benefits of being significantly overfunded, our focus is on downside risk. Our primary risk management objective is to minimize the size of a funded status deterioration in the event of a “least worst case” market scenario (At the 95% confidence level, this implies a 1-in-20-year event, or, more precisely, the best of the worst 5% of possible outcomes). Funded status VaR captures this risk (for example, a funded status VaR of 8.6% implies that should one of the worst 5% of scenarios occur, funded status could be expected to decline by 8.6 percentage points or more). (See “What’s the ‘worst’ that could happen,” facing page.)

**Hedge ratio** is the expected change in the dollar value of plan assets for every $1.00 change in plan liabilities, given a 1-basis point (bp) change in interest rates, expressed as a percent. For example, if a plan has a 50% hedge ratio and there is a slight decline in interest rates, assets would be expected to rise only $0.50 for every $1.00 increase in liabilities, leading to a decline in funded status. While the hedge ratio is useful as a broad measure of the hedge effectiveness of an investment strategy and an important metric to monitor, it captures only interest rate risk—not the multiple sources of the plan’s risk exposure. What’s more, as defined here, the hedge ratio only captures the impact of a parallel shift in the yield curve, not of a curve steepening/ flattening or twist or an uneven change in credit spreads.

Our robust LDI glide path framework allows us to combine J.P. Morgan’s broad asset class capabilities, portfolio construction and risk management expertise with our extensive LDI reporting and analytical resources, to help plan sponsors reach their pension plan funding goals.

Hedging interest rate risk
In this section, we take a closer look at important considerations for plan sponsors regarding the management of the hedging portfolio. As observed when discussing the overall LDI glide path, the strategic allocation to hedging assets generally increases with each phase, as the plan approaches its targeted funded status and the emphasis shifts to preserving these gains. A key distinguishing feature of our dynamic derisking approach is, that in striving to systematically reduce the plan sponsor’s funded status VaR across the glide path, we not only increase the strategic hedging asset allocation at each phase, but also implement a progressively more customized hedging strategy to lock in funded status improvements.
Theoretically speaking...
Perhaps a good starting point for thinking about constructing and managing hedging portfolios is to focus on what these portfolios are theoretically intended to do, namely, mimic the change in liabilities given a change in interest rates.

If liabilities were discounted by the Treasury spot curve, then holding Treasury strips with cash flows matching the timing and size of the liabilities would, theoretically, be a fairly straightforward solution to hedging changes in the level and shape of the discount curve. In practice of course, both U.S. Generally Accepted Accounting Principles (GAAP) and the Pension Protection Act of 2006 (PPA), imply discount curves based on high quality corporate bonds, introducing the element of credit spread risk. Since not all bonds used to create discount curves are investable in the manner implied by a curve, any hedging portfolio can only approximate the change in liability value given a change in that curve.

From theory to practice—building investable hedging asset benchmarks
In practice, then, investable hedging asset benchmarks need to be structured and used in managing hedging portfolios. The process we use in developing these benchmarks involves four main structuring steps:

Step 1: Identify the discount curve to be used in evaluating funded status:
- **GAAP accounting:** A frequent choice, particularly for plan sponsors whose primary concern is minimizing balance sheet volatility
- **PPA funding:** Consistent with the objective of minimizing contribution volatility
- **Swap curve:** Appropriate when the objective is to lock in the economic cost of the plan or as a termination/buy-out proxy

Funded status VaR analysis drives the structuring of our glide paths, creation of growth and hedging benchmarks and the ongoing monitoring and managing of the pension plan from an LDI perspective.

Liability VaR and funded status VaR attribution aid in understanding a plan’s total risk exposure by examining the various components of overall funded status risk. An important element in the attribution of funded status VaR is diversification (blue bars above), a factor that reduces the sum of individual risk factors to arrive at the plan’s net risk exposure. Diversification is a measure of the risk-reduction benefit from spreading investment risk across multiple asset classes, sectors and regions. In the context of a pension plan, one aspect of that diversification benefit is best understood by considering the changes in assets and liabilities due to interest rate movements. As interest rates rise/fall liability values decrease/increase, as does the value of fixed income securities, thereby offsetting some of the risk exposures of the plan and reducing its net risk.

Source: J.P. Morgan; Rate of return assumptions from J.P. Morgan capital market assumptions; data assumptions as of September 30, 2013. Components may not sum to totals due to rounding.
Step 2: Determine the sensitivity of liability cash flow values to changes in interest rates and spreads

The characteristics of the bonds in the selected discount curve and the profile (size and timing) of the liabilities define how the liability value will respond to changes in interest rates. Liability key rate dollar durations\(^2\) measure this sensitivity and contribute to the construction of hedging asset benchmarks (See “Using key rate dollar duration to manage curve risk,” facing page).

Step 3: Construct investable hedging asset benchmarks to match the interest rate behavior of the liabilities

Ideally, benchmarks are structured by choosing indices or securities that match the key rate durations of the liabilities, such that assets and liabilities behave in a similar fashion due to changes in the level and/or shape of the yield curve. In addition, attention is given to selecting securities that are similar in credit rating/spread behavior to the bonds that comprise the discount curve. Non-interest-rate-related risks are also taken into account to determine the appropriateness of sector and security concentrations and liquidity characteristics.

The result is a glide path that is designed to help move the plan toward its funded status and risk targets over time (Exhibit 3).

As evident in the changing composition of the hedging asset benchmarks, the level of risk reduction and customization is increasingly more pronounced at each phase, as funded status improves:

- For underfunded plans and those in the early phases of derisking, the initial focus is generally on hedging pure interest rate risk. The primary objective is to add interest rate exposure to the overall pension portfolio. While not an “exact match,” this duration extension is often achieved most readily and cost-effectively through long duration instruments (e.g., long government/credit bonds, long Treasuries and derivatives [if permitted]).

- As funded status improves, the focus then shifts to managing credit spread exposure. The focus here is on hedging the credit spread risk embedded in the liabilities as a function of the corporate discount curve.

- In the later stages, when locking in funded status gains is paramount, the hedging asset benchmark needs to become highly customized. This is because hedging against yield curve shifts (a steepening, flattening or twist) by better aligning asset and liability key rate duration exposures becomes most important.

What’s in a hedge? An increasing share of assets and a more customized liability match

EXHIBIT 3: LDI GLIDE PATH WITH HEDGING ASSET BENCHMARKS AND RISK/FUNDED STATUS TARGETS

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
</tr>
</thead>
</table>
| Funded status | up to 80% | 80%-90% | 90%-95% | 95%-100%+
| Hedge ratio target | Up to 40% | 40%-60% | 60%-80% | 80%-100%
| Funded status VaR | 16.3% | 13.2% | 8.6% | 3.4%
| Hedging benchmark | Long govt/credit | Long govt/credit | Custom credit/STRIPS | Custom credit/STRIPS
| Hedging benchmark credit quality | Investment grade | Investment grade | A or better | A or better

Source: J.P. Morgan; for illustrative purposes only.

\(^2\) Key rate dollar duration measures the sensitivity of the liability (or hedging asset) value to a change in yield for a given maturity range.
Step 4: Stress test the hedging asset benchmarks within the overall LDI framework

- The final step uses our modeling and simulation framework to perform deterministic stress and effectiveness tests on the hedging asset benchmarks. Within this model, we apply a range of risk scenarios, including: curve twists, growth portfolio, interest rate, credit spread and inflation shocks, as well as changes to the hedging asset benchmark allocations themselves, to ensure a robust LDI strategy.

**USING KEY RATE DOLLAR DURATION TO MANAGE CURVE RISK**

**PORTFOLIO A: A HIGH HEDGE RATIO DOES NOT NECESSARILY IMPLY A GOOD HEDGE, DUE TO CURVE MISMATCH**

![Graph showing dollar duration mismatch for Portfolio A]

**PORTFOLIO B: CUSTOMIZATION ALLOWS FOR A TARGETED HEDGING APPROACH WITH BETTER MATCHING ACROSS THE TERM STRUCTURE**

![Graph showing dollar duration matching for Portfolio B]

Source: J.P. Morgan; for illustrative purposes only.

Key rate dollar duration ($KRD) measures the sensitivity of plan liability and asset values to a change in yield, for a given maturity range. The charts above show $KRDs for plan liabilities vs. $KRDs for two hedging portfolios (A and B), both providing a hedge ratio of 85% (implying that under a 1% parallel downward shift in interest rates, both portfolio values will increase by roughly $.85 for every $1.00 increases in liabilities). However, these portfolios are not equally effective in hedging the plan's interest rate and spread risk for other than a parallel shift in yields—due to differences in their asset/liability dollar duration matching at key rates along the discount curve.

Portfolio A has several mismatches relative to the dollar duration of liabilities:

- It is underweight duration vs. liabilities for 5-, 10- and 20-year key rates.
- It is overweight duration vs. liabilities for the 30-year key rate.

Portfolio B provides a much better dollar-duration match to liabilities for 20- and 30-year key rates. It also has greater dollar duration exposure to credit vs. government bonds relative to Portfolio A, thereby improving the spread hedge vs. the liability discount curve.

A 1% downward parallel shift of the discount curve would be expected to cause an increase in liabilities, summed across all key rates, totaling $1,300,000. Under the same curve shift, hedge assets would be expected to increase by only $1,108,000 for Portfolio A and $1,104,000 for Portfolio B, roughly 85% of the liability increase, in line with their 85% hedge ratios.

However, a steepening or twist at the long end—for example, 20-year key rates declining 1% and 30-year key rates rising 1%—would likely cause the plan’s funded status to:

- Decline in the case of Portfolio A: Assets would be expected to increase less than liabilities as 20-year rates fall and decrease more than liabilities as 30-year rates rise.
- Remain about the same in the case of Portfolio B: With its better curve match for 20-year and 30-year key rates, asset and liability values should change by roughly the same amount. Portfolio B, with a greater allocation to long credit should also provide a better hedge against a contraction in credit spreads, which can impact both the plan’s assets and liabilities.
Implementing the hedging asset glide path

An LDI glide path strategy, like that depicted in Exhibit 3, can only be successful if it is both well-designed and well-executed. Implementation requires ongoing monitoring, streamlined decision-making, seamless coordination, timely execution, and, of course, deep expertise across a broad range of asset classes, including derivatives, if permitted (See “The role of derivatives in LDI,” facing page). There are many ways to structure the process, and, like all aspects of an LDI strategy, the structure has to fit the organization behind the plan and its governance policy. Most approaches fall into one of two general models:

1. Traditional asset management model

Once an LDI glide path has been structured (by the plan sponsor, consultant and/or asset manager), plan sponsors often manage the hedging (and growth) portfolios in line with the investment management approaches they have traditionally used. For many plan sponsors this means:

- **“Sleeve” management:** The plan sponsor and/or investment consultant select a manager for each “sleeve” of the hedging asset allocation. Each manager independently manages its share of hedging assets, to a specified benchmark. Typically, the hedging asset benchmark is a standard market-based index or a weighted average of the underlying manager indices. Over time, the plan sponsor/consultant monitors and directs these managers to keep the glide path design intact.

- **Single manager:** For smaller plans, a single manager may be responsible for managing the whole hedging and/or growth assets portfolio, in accordance with an LDI mandate.

2. Completion management model (Exhibit 4)

This approach also involves multiple managers with specific mandates, generally managing to standard market-based index benchmarks. The difference is that one of those managers has the role of “completion manager.” This manager works very closely with the plan sponsor and/or consultant and has responsibility for “rounding out” the exposures across manager benchmarks so that the overall strategic hedge is maintained. As a result, any deviation from the hedging asset benchmark (due, for example, to short-term manager underperformance or the natural alpha drift from manager outperformance) can often be addressed more expeditiously, without necessarily involving a re-alignment of multiple independent manager positions. This will also help avoid unnecessary trading costs.

Completing the picture: A completion manager can manage transitions and act nimbly to keep the plan on its glide path

### EXHIBIT 4: COMPLETION FRAMEWORK — HEDGE BENCHMARK GLIDE PATH WITH MANAGER MANDATES

<table>
<thead>
<tr>
<th></th>
<th>PHASE 1</th>
<th>PHASE 2</th>
<th>PHASE 3</th>
<th>PHASE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Funded status</strong></td>
<td>up to 80%</td>
<td>80%-90%</td>
<td>90%-95%</td>
<td>95%-100%+</td>
</tr>
<tr>
<td>J.P. Morgan completion</td>
<td>50% Long</td>
<td>10% Long</td>
<td>75% Custom</td>
<td>85% Custom</td>
</tr>
<tr>
<td>manager benchmark</td>
<td>govt/credit/</td>
<td>govt/credit/</td>
<td>credit/</td>
<td>credit/</td>
</tr>
<tr>
<td></td>
<td>50% Long</td>
<td>90% Long</td>
<td>25% Long</td>
<td>15% Long</td>
</tr>
<tr>
<td></td>
<td>credit/STRIPS</td>
<td>credit/STRIPS</td>
<td>STRIPS</td>
<td>STRIPS</td>
</tr>
<tr>
<td>Manager A hedge</td>
<td>Long govt/</td>
<td>Long govt/</td>
<td>Long credit</td>
<td>Long credit</td>
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<tr>
<td></td>
<td>credit/</td>
<td>credit/</td>
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<td></td>
</tr>
<tr>
<td>Credit quality</td>
<td>Investment</td>
<td>Investment</td>
<td>A or better</td>
<td>A or better</td>
</tr>
<tr>
<td></td>
<td>grade</td>
<td>grade</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: J.P. Morgan; for illustrative purposes only. Some discrepancies in percentages may exist, due to rounding.
In fulfilling this role for clients, we continuously monitor the hedging strategy, manage the transition across the different phases of derisking and provide consolidated reporting on assets and liabilities for the total plan. Our primary focus as completion manager is to avoid a significant drift in hedging assets vs. liability exposures across the discount curve and to maintain the portfolio’s target hedge ratio. In the later phases of the glide path, when the hedging asset benchmark requires greater customization to more closely match the behavior of liabilities, the completion manager’s role in rounding out exposures across managers becomes even more critical.

While a successful derisking strategy can be implemented using either model, plan sponsors are finding significant value in having a completion manager with the authority to execute on the trigger-driven derisking glide path and to oversee the entire hedging strategy.

THE ROLE OF DERIVATIVES IN LDI

In the context of derisking strategies, derivatives are important for four reasons:

- They are very useful risk-mitigation tools, particularly in targeting longer duration segments of the yield curve that are needed to offset very long-dated liabilities.
- They enable the type of highly customized liability-based solutions increasingly required by plan sponsors.
- They do not require a large amount of capital to be deployed, allowing a larger allocation to growth assets (when hedging derivatives are used) or to the customized corporate credit component of the hedging portfolio (when growth derivatives are used).
- They help improve the efficiency of the transition from one phase to the next across a trigger-driven glide path.

Derivatives can be incorporated, in both the hedging and growth portfolios, to achieve the overall hedging strategy objectives. However, we think using derivatives within the growth portfolio can be a more efficient means of gaining exposure to growth assets, while allowing more cash to be allocated to corporate bonds (where leverage is more difficult and costly to employ).

Before employing derivatives, we work with pension committees and consultants to ensure that clients understand, and are comfortable with, these instruments (and with our procedures for minimizing associated risks such as counterparty risk).

Case study example

We recently worked with a client that wanted to implement a complete pension risk management solution. The client had a closed plan with active participants who were still accruing benefits. The components of the plan sponsor’s solution include (Exhibit 5):

- Raising debt to close the deficit, thereby converting pension debt into corporate debt
- Transferring retiree obligations to an insurance company
- Offering lump sums to deferred participants (those no longer with the firm, but entitled to future benefits)
- Funding liability growth/service cost for active participants through budgeted contributions (vs. returns from a growth portfolio) to achieve a high degree of cash flow certainty
- Ensuring that all pension assets are managed to closely align with the liabilities remaining on the corporation’s balance sheet

End-to-end: Plan sponsors need a comprehensive solution to reach the desired “endgame” for their plans

EXHIBIT 5: LDI CASE STUDY—HEDGING INTEREST RATE RISKS FOR RETIRED, DEFERRED AND ACTIVE PARTICIPANT LIABILITIES

Source: J.P. Morgan; for illustrative purposes only.
Given the various components of this mandate, we worked alongside the plan’s risk settlement advisor, actuary and investment consultant to develop and implement a customized hedging strategy designed to track the plan’s mark-to-market accounting liabilities. We also constructed a separate annuitant portfolio to hedge the interest rate risk on the retiree portion of liabilities until they were transferred to the insurance carrier. In designing an end-to-end solution for this client, our team’s wide-ranging expertise in tackling the different components involved is a testament to our broad LDI capabilities.

Conclusion

A recent survey from aiCIO found that over 70% of respondents had implemented LDI-based glide paths to help reach their funded status goals, while an additional 10% intend to do so, indicating the growing popularity of these frameworks.¹

Clearly, the formulation, implementation and ongoing management of liability-driven investing solutions involves many moving parts. A successful program requires a high level of coordination (among plan sponsors, their advisors and asset managers), a deep understanding of plan sponsors’ challenges and objectives, expertise in accounting, actuarial science and portfolio structuring, as well as experience and skill in managing a broad range of asset classes and derivatives.

J.P. Morgan’s Liability-Driven Investment Solutions Group has the expertise to partner with plan sponsors on any or all aspects of an LDI solution—from formulating the overall derisking glide path to structuring and/or managing components of the hedging and growth portfolios.

This investment strategies paper focused, in particular, on our approach to managing the hedging component within a dynamic derisking program. Our next installment will focus on our approach to shaping and managing the growth portfolio.

ABOUT: GLOBAL LIABILITY-DRIVEN INVESTMENT SOLUTIONS GROUP

The goal of our Global Liability-Driven Investment Solutions Group is to provide institutional clients with best-in-class solutions—from the management of standard long duration products to the highly customized design and implementation of liability-driven strategies.

Comprised of professionals with deep asset management, investment banking, accounting, corporate finance, actuarial, derivatives and investment consulting expertise, our team has experience in structuring and implementing strategies that focus on the complex investment needs of corporate pension plan sponsors. Whether the plan sponsor’s intent is to gradually derisk the plan over time or to better position the plan for an annuity buy-out, our dedicated team partners with clients in implementing solutions to fit their specific objectives.

In managing standard market-index-based long duration mandates, our philosophy focuses on achieving alpha targets while keeping risk to a minimum. Some of our strategies employ unique sectors of the fixed income markets that may allow clients to diversify the alpha risk in a multi-manager structure. When trying to mimic a liability in a custom liability-driven strategy, our approach typically shifts to minimizing any deviation from the strategic liability hedging benchmark.

The Global LDI Solutions Group leverages our team’s specialized expertise together with one of the industry’s broadest product offerings and the vast resources of J.P. Morgan Asset Management to deliver holistic, multi-asset class solutions for corporate pension plan sponsors.

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All case studies are shown for illustrative purposes only and should not be relied upon as advice or interpreted as a recommendation. Results shown are not meant to be representative of actual investment results. Any securities mentioned throughout the presentation are shown for illustrative purposes only and should not be interpreted as recommendations to buy or sell.

**Interest Rate Risk:** Bonds and other debt securities will increase or decrease in value based on changes in interest rates. If rates increase, the investment generally declines. On the other hand, if rates fall, the value of the investments generally increases. Your investment will decline in value if the value of the investment decreases. Securities with greater interest rate sensitivity and longer maturities tend to produce higher yields, but also are subject to greater fluctuations in value. Usually, the changes in the value of fixed income securities will not affect cash income generated, but may affect the value of your investment.

**Credit Risk:** There is a risk that issuers and counterparties will not make payments on securities, repurchase agreements or other investments held by the strategy. Such defaults could result in losses to the strategy. In addition, the credit quality of securities held by the strategy may be lowered if an issuer’s financial condition changes. Lower credit quality may lead to greater volatility in the price of a security and in shares of the strategy. Lower credit quality also may affect liquidity and make it difficult for the strategy to sell the security. The strategy may invest in securities that are rated in the lowest investment grade category. Such securities are considered to have speculative characteristics similar to high yield securities, and issuers of such securities are more vulnerable to changes in economic conditions than issuers of higher grade securities.

Derivatives may be riskier than other types of investments because they may be more sensitive to changes in economic and market conditions than other types of investments and could result in losses that significantly exceed an original investment. Many derivatives will give rise to a form of leverage. Derivatives are also subject to the risk that changes in the value of a derivative may not correlate perfectly with the underlying asset, rate or index. The use of derivatives for hedging or risk management purposes or to increase income or gain may not be successful, resulting in losses.

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