Pension Deficit Disorder

A framework for establishing and maintaining plan health
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This publication was edited, designed and produced by the Institutional Americas marketing group at J.P. Morgan Asset Management.
Executive Summary
The past decade was a difficult one for plan sponsors. The debilitating markets of 2001-2002 brought on a wide-spread case of "pension deficit disorder (PDD)." Then, just as plans recovered from this outbreak of PDD, they suffered a credit crisis-induced relapse—complicated by a set of major regulatory reforms.

Approaching the end of the third quarter of 2011, most U.S. corporate plans remain under-funded and challenged by volatile markets and a lumbering recovery. Many are revisiting pension investment strategies, faced with the competing objectives of enhancing returns while mitigating funded status volatility. Even those who are fully funded are concerned with maintaining that healthy status.

Of course, every pension plan, sponsor and participant population is unique. There is no single remedy or preventative program that fits all plans and this paper does not pretend to offer a panacea. Instead, it is designed to provide:

1. **Three fundamental tenets of pension health** that we believe are broadly applicable across pension investors:
   - Plan assets should be managed with reference to their true benchmark—plan liabilities. Even when plan assets beat their strategic “asset” benchmarks, they may still not keep pace with the growth of liabilities.
   - The biggest risk position held by most pension plans is having assets that are less sensitive to interest rates (shorter in duration) than their liabilities. Plan sponsors concerned with the volatility of funded status and contributions should seriously consider narrowing this duration gap in order to mitigate at least some portion of this risk.
   - Pension investment strategies should include both a duration strategy for managing interest rate risk and a diversification strategy to enhance returns and mitigate asset volatility.

2. **A diagnostic framework** incorporating both external factors (regulatory, accounting and capital market-related) as well as plan-specific dimensions (funded status, liability profile, size of the plan relative to the sponsor and other sponsor-specific circumstances) to help plan sponsors clearly identify and prioritize investment objectives.

3. **Case studies** illustrating the above tenets and framework as applied to two plan sponsors faced with pension deficit disorder (Though not actual examples, case studies are based on J.P. Morgan’s experience in working with a broad range of defined benefit plans). These plan sponsors, while similar in their degree of underfunding, differ in their core businesses, size, liability profiles (open, closed), financial health and other dimensions. Not surprisingly, their pension investment objectives and priorities also differ, as do their chosen investment solutions.

It is impossible to cover the wide range of investment challenges facing plan sponsors today in one short paper, but we hope each reader will find these guidelines and assessment tools of value and will identify with and benefit from relevant aspects of these illustrative case studies.
Corporate plan sponsors suffered two major market setbacks in the first decade of this century. First, in 2001-2002, declining equity markets and falling interest rates diminished assets, swelled liabilities and caused a wide-spread outbreak of “pension deficit disorder (PDD).” The prescribed treatment was a mega-dose of pension reforms not seen since the passage of ERISA over 35 years ago. And just as plans had, on average, regained fully funded status, the credit crisis caused a relapse, sending 2008 average funded status back to 2001-2002 levels.

This time, however, plan sponsors had to deal, not only with extreme left-tail market events, but also with the side effects of the regulatory medicine designed to protect their long-term health. Under the Pension Protection Act of 2006 (PPA), plan sponsors faced more market-based valuations, less smoothing, a seven-year objective for reaching fully funded status and, for many, higher contribution requirements at a time when the “Great Recession” was sapping corporate earnings and cash flow. SFAS 158 (which put pension funded status on corporate balance sheets, inextricably linking the health and performance of the plan to that of the corporation) intensified the challenge. Plan sponsors and their treasurers now had to worry, not only about meeting pension benefit obligations in the long term, but also about the shorter-term implications of plan management for their balance sheets, earnings and cash flows. (See Appendices A and B)

As markets began to recover in 2009-2010, plan sponsors looked forward to a period of recuperation. Portfolio performance did improve and the Pension Relief Act of 2010 eased (or at least postponed) some of the pain. However, an accommodative Fed kept rates low and, as investors’ risk appetites returned, credit spreads tightened, boosting liabilities. The end result was a modest improvement in funded status (from 78% in 2008 to 84% at the end of 2010, Exhibit 1) but one masking considerable intra-year volatility. Market-driven fluctuations in funded status, a symptom plan sponsors can no longer ignore, have continued into the current year. In fact, funded status has already touched 2008 crisis levels several times in 2011. Clearly, challenges still abound for plan sponsors and their treasurers as the economy continues along its slow course to recovery.

1 H.R. 3962: Preservation of Access to Care for Medicare Beneficiaries and Pension Relief Act of 2010
Lessons Learned

The “2000s” offered stark reminders to those managing pension plans:

- Liabilities matter—and interest rates and credit spreads are extremely hard to predict.
- Events deemed to be of low probability do, indeed, occur.
- In a severe downturn, even the components of a well-diversified portfolio can move together.
- Liquidity is an important part of the risk equation.

In view of these lessons and the evolving regulatory environment, plan sponsors are revisiting asset allocations, re-thinking the measurement and management of risk and re-assessing the liquidity characteristics of investments. More than ever, they are focusing on both the long- and near-term implications of their pension investment decisions. Here are some of the key questions we are frequently hearing today in our work with plan sponsors:

- How can I enhance returns while mitigating the risk of major contribution surprises?
- Is now the time to extend duration and reduce the plan’s interest rate risk, given that our board anticipates rising rates?
- My plan is severely underfunded. Can I afford to de-risk my pension portfolio now and potentially depress future investment returns?
- I’d like to further diversify my portfolio and enhance returns with an allocation to alternatives. But what is the best way to build out an allocation to hedge funds and private equity given limited internal resources? How do I think about liquidity issues surrounding that increased allocation?
- How can I mitigate the risk to my pension plan, benefit participants and the corporation of another extreme negative event?
- How can we position ourselves to act quickly enough to seize the opportunities that volatile markets can present, in a risk-controlled fashion?
**Fitness Fundamentals**

These are complex questions with complex answers and, of course, the “right” solution will depend on the characteristics and circumstances of the individual plan sponsor. However, we believe that there are a few general rules of good health that apply to pension investors across the board:

1. **Manage plan assets against their true benchmark—pension liabilities:**
   - Funded status (pension surplus or deficit) is a function of both assets and liabilities. Pension portfolios can outperform their strategic “asset” benchmark and still grow more slowly than plan liabilities.
   - A focus on both assets and liabilities is now more important than ever, given regulatory and accounting changes that tie the pension plan’s funded status to corporate financials.

2. **Recognize that the biggest risk position held by most pension plans—“short-duration assets vs. long-duration liabilities”—has a payoff that depends entirely on the direction of interest rates:**
   - In funded status terms, having short duration assets (vs. liabilities) is rewarded only when rates rise. If interest rates decrease, funded status can decrease rapidly (Exhibit 2A).
   - This interest rate risk can be mitigated to varying degrees by narrowing the duration gap (i.e., increasing the duration hedge ratio\(^3\) (duration of assets to duration of liabilities), (Exhibit 2B).

\(^{3}\) Note: A duration hedge ratio measures the dollar change in asset value relative to the dollar change in liabilities, given a small change in interest rates. A hedge ratio of 12.3% implies that, for a given small decline in interest rates, assets will increase by roughly $12.30 for every $100 increase in liabilities.

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**Biggest risk position held by pension plans—assets with less interest rate sensitivity (duration) than liabilities**

**EXHIBIT 2A: CHANGES IN ASSETS VS. LIABILITIES FOR SAMPLE PLAN WITH 12.3% DURATION HEDGE**

![Graph showing changes in assets vs. liabilities for a sample plan with a 12.3% duration hedge.](image)

- Liabilities are very sensitive to interest rate movements...
- While assets are much less sensitive.

**Increasing the duration hedge helps mitigate the impact of interest rates on funded status**

**EXHIBIT 2B: SENSITIVITY OF FUNDING SURPLUS/DEFICIT FOR SAMPLE PLAN WITH 12.3% VS. 60% DURATION HEDGE**

![Graph showing sensitivity of funding surplus/deficit for a sample plan with 12.3% vs. 60% duration hedge.](image)

- A higher hedge ratio leads to more downside protection...
- Than the upside offered by a lower hedge ratio.

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**Duration Hedge Ratio**

\[
\text{Duration Hedge Ratio} = \left( \frac{\text{Assets} \times \% \text{ fixed income} \times \text{duration of fixed income}}{\text{Liabilities} \times \text{duration of liabilities}} \right)
\]

Source: J.P. Morgan Asset Management

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Plan liabilities: $100 million, Duration=13 years, Convexity=2.6
Portfolio A: $80 million, 60% equity/40% Agg bonds with duration=5 yrs, convexity=0.02; **Duration Hedge Ratio**=$80 \times 40\% \times 5 \text{ yrs}/($100 \times 13 \text{ yrs})=12.3\%$
Portfolio B: $80 million, 22% equity/78% Long Gov’t Credit with duration 12.5 yrs, convexity=2.6; **Duration Hedge Ratio**=$80 \times 78\% \times 12.5 \text{ yrs}/($100 \times 13 \text{ yrs})=60\%$
3. Consider both a duration strategy to manage interest rate risk and a diversification strategy to mitigate asset volatility, while striving to improve/maintain funded status (Exhibit 3):

- **Determine a duration strategy**, including a target duration hedge ratio and a timeframe for reaching it. Ensure that the strategy is consistent with the corporation’s capacity to deal with the volatility of funded status and contributions.
  
  - Extending duration does not necessarily mean increasing the allocation to bonds. The objective may also be achieved by shifting to longer duration bonds (including strips/zero coupon bonds) or using derivatives to synthetically extend duration—or some combination of approaches over time.
  
  - It takes time to develop, gain approval for and implement a long duration strategy. Don’t wait for the ideal market environment to put a plan in place.

- **Diversify pension assets**—mitigating risk doesn’t end with extending duration.
  
  - Consider allocations to global equities, high yield and emerging market debt and alternative asset classes.
  
  - Incorporate strategies with asymmetric returns—those, such as hedge funds, that can help to moderate losses while participating in gains (Exhibit 4).

Assets with asymmetric returns can enhance protection on the downside yet still participate on the upside.


Source: Bloomberg, Hedge Fund Research. Financial information is through June 30, 2011.
PENSION DIAGNOSTICS
DEFINING OBJECTIVES AND PRIORITIES

A strategy for improving plan health starts with clearly defining the plan sponsor’s objectives and priorities—where the plan and the plan sponsor are today, where they want to be at a specified point in the future and what they are willing and able to do to get there.

As illustrated by the Assessment Wheel in Exhibit 5, objective setting involves a careful consideration of external factors (the plan’s regulatory environment and capital market outlook), plan sponsor circumstances and of course, factors specific to the plan and its beneficiaries.

This assessment should help to clarify the plan’s pension investment objectives and priorities, i.e., its funded status and contribution policy, its need for return and liquidity as well as the appropriate level of risk-taking. This in turn will shape the broad allocation mix, degree of duration hedging and the plan’s flexibility to respond to investment opportunities.

Economic/Capital Market Expectations
The plan sponsor’s view of the macro factors impacting the pension portfolio and the corporation’s core businesses should be made explicit, as they are a driving force behind all asset allocation and plan design decisions.

• What is your outlook for returns and correlations across asset classes? What is your expected return on assets?
• What is your outlook for interest rates and credit spreads?
• What are your expectations for the economy, inflation and other factors affecting your business?
Regulatory and Accounting Framework

Understanding the Pension Protection Act of 2006 (PPA) and its funded ratio requirements helps to define the “pressure points” for plan sponsors. (See Appendix A for key components of this pension legislation.)

- How challenging will it be for your plan/plan sponsor to meet contribution requirements under PPA?
- What are the potential implications for participant benefits if funded status requirements are not met?

Plan Funded Status

Plan funded status is a measure of the plan’s financial health and determines the distance the plan needs to go to meet funded status requirements.

- What is the plan’s current funded status?
- If underfunded, what is the timeframe for reaching full funding?
- Given implications for contributions, benefits and corporate financial statements, has the plan set a minimum target for funded status?

Plan Liability Profile

The type of plan, its status (open, closed, frozen), the characteristics of its workforce, etc., will determine the nature of the plan’s liabilities and impact the amount of return required.

- What is the duration of liabilities?
- What is the plan’s service cost relative to its projected benefit obligation (PBO)?
- What is the size of current benefit payments relative to PBO?

Size of the Plan Relative to the Sponsor

The larger the plan relative to the sponsor, the greater its potential impact on the sponsor’s balance sheet, earnings and cash flow.

- Could a change in the plan’s circumstances present an outsized business risk to the sponsor?
- What is the pension deficit relative to the sponsor’s market capitalization?
- What are plan contributions relative to plan assets or operating cash flow?
- How much does the sponsor rely on the expected return on assets in its P & L?
**Sponsor Circumstances**

The healthier the plan sponsor, the more likely that it will have the capacity to absorb unexpected contribution requirements, raise capital and tolerate volatility in the pension plan’s performance.

- What is the plan sponsor’s credit rating and what is the potential for pension plan performance to impact that rating?
- Is it likely to be less burdensome for the plan to make contributions now or later?
- What resources does the plan sponsor have for managing the plan?

While this is not meant to be an exhaustive list of diagnostic questions, the answers can help plan sponsors and pension investors clarify their objectives and priorities and shape the risk, return and liquidity dimensions of any plan-specific investment solution. The following case studies will put this diagnostic tool to work.
CASE STUDIES

THE NEED FOR A HOLISTIC APPROACH TO TREATING PENSION DEFICIT DISORDER

As any good physician will attest, helping a patient regain and maintain their health and well-being involves more than diagnosing an ailment and prescribing a standard medication. It involves understanding and treating the “whole” patient, being aware of his/her unique characteristics and helping the individual to establish a healthy lifestyle for the long term. In short, there is no single “cure-all.”

In the case studies that follow, we look at two corporate defined benefit (DB) plans—both are equally underfunded and are similar in terms of their current broad asset allocation strategies. Yet, when the questions and tools laid out in the prior section are applied, two very different diagnoses emerge. Corporation A is suffering from an acute case of PDD while Corporation B has a milder form of the ailment. This shapes the goals set by each plan and their choice of two distinct courses of treatment (investment solutions), based on their individual profiles and goals.

Comparing Sponsor and Plan Profiles

Exhibit 6 compares and contrasts these two corporate sponsors and their pension plans across a number of dimensions, highlighting some of the key factors driving the plans’ pension investment decisions.

Diagnosis

Corporation A: Acute Pension Deficit Disorder

Corporation A is suffering from an acute case of PDD. Given the large size of its plan relative to the corporation, its underfunded pension plan has become a significant risk to the sponsor and threatens to distract the attention of management from its core businesses (primarily retail). In 2010, contributions were a dangerously high 50% of cash flows. Corporation A has already closed its plan to new employees to slow down the growth of its pension liabilities. However, in meeting its responsibilities to existing benefit participants, it remains extremely vulnerable to any major contribution surprises.

This presents a serious challenge for the sponsor since, given the cyclical nature of the retail industry, both its core businesses and pension returns can be simultaneously hard-hit by economic and market downturns. The most recent recession was no exception and the particularly slow recovery in the consumer sector has hurt earnings growth. Corporation A’s
current credit rating indicates its financial health is not strong. Furthermore, its 80% funded status suggests that, under PPA, Corporation A needs to have a plan to achieve fully funded (100%) status within seven years. Further declines in funded status could subject the plan to an increase in Pension Benefit Guaranty Corporation (PBGC) premiums as well as limited restrictions on plan benefits under PPA.

Corporation B: Mild Pension Deficit Disorder

Corporation B is suffering from a milder case of PDD. As with Corporation A, it is currently 80% funded. However, the plan remains fully open with a high percentage of active versus retired employees, so that annual “new” benefit liabilities are being generated and thus, the plan’s growth requirements are greater than for Corporation A. Nevertheless, given the small size of Corporation B’s plan relative to the company, as well as the sponsor’s overall health, funding the plan is not a significant burden. Furthermore, the plan sponsor has a competitive position in a non-cyclical industry (pharmaceuticals), and its earnings and cash flow are stable and growing.

Comparing Pension Investment Policies—More Similarities than Differences

Before considering potential treatments, it is important to compare the current portfolio allocations and investment policies of these two plans. On these dimensions, Corporations A and B are more alike than different (Exhibit 7).

Loosely speaking, pension portfolios can be viewed as consisting of two categories of assets: risk assets—those used to target an expected return and, when diversified, to mitigate risk; and liability hedging assets—generally long duration bonds and/or duration overlays, which can serve to more closely match the duration of liabilities and assets (See Appendix D: Assets and Their Roles in Pension Portfolios). This liability matching can help to reduce surplus volatility and contribution surprises resulting from changes in pension discount rates.

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4 We are using this measure of funded status as a proxy for funding targets as defined under PPA.

5 Assumes Corporation A is not eligible for or has chosen not to exercise special exemptions under the Pension Relief Act of 2010 to extend the amortization period for up to 15 years. See Appendix A.
Both pension plans have very similar strategic asset allocations, with a traditional 60% in risk assets (primarily U.S. equities) and 40% in fixed income, benchmarked to the Barclays Capital Aggregate Bond Index (Barclays Agg). Duration hedge ratios and expected return on assets (EROA) are also very similar and both plans have a fairly optimistic outlook on capital market returns. Additionally, they both believe interest rates should begin to rise in the near term. The distinguishing characteristic between the two investment policies is that Corporation A’s policy permits the use of derivatives while Corporation B’s does not.

**Customizing the Cure**

After a careful assessment of external, corporate and plan-specific factors, both plan sponsors have arrived at well considered objectives for their plans and have worked with their consultants, asset managers and actuaries to determine how they will treat their pension deficit disorders. Not surprisingly, given the differences in their profiles and certain aspects of their investment policies, the solutions are quite different in magnitude, timing and implementation, if not direction.

**Treating Corporation A’s Acute PDD**

Corporation A has set an objective to reach fully funded status over the intermediate term (i.e., 7 years) and significantly reduce the volatility of its surplus (deficit) and contributions. This should help improve the plan’s ability to make benefit payments and mitigate the plan’s impact on the corporation’s financial health. The sponsor has set a minimum acceptable level for funded status at 70%. Despite its view on rising interest rates, it is willing to increase its 14% duration hedge as it is uncomfortable with the potential for increased contribution requirements should rates remain low or decline.

Corporation A faces a serious dilemma. It needs to substantially decrease surplus/deficit volatility and the risk of major contribution surprises. Yet, shifting its allocation away from risk assets and toward long duration bonds could diminish its ability to generate the returns required to meet its benefit obligations.

To treat its acute case of PDD and meet its investment objectives, Corporation A has decided to take a “re-risk while de-risking” approach in managing the pension portfolio. It will initially make a fairly dramatic shift in its allocation, moving from 60% risk assets/40% fixed income to 80% risk assets/20% fixed income, while increasing its duration hedge ratio from 14% to 55% (with the help of derivatives) to mitigate interest rate risk. Then, as it approaches full funding, it will gradually continue to de-risk, reducing risk assets and adding to the fixed income allocation to increase its duration hedge ratio.

**Liability Hedging Assets**: Obviously, with only 20% of the portfolio remaining in fixed income, this nearly four-fold increase in liability duration hedging can not be accomplished simply by extending the duration of existing fixed income assets. The duration extension will be achieved through a combination of a long duration bond mandate, and a derivatives overlay (using either Treasury bond futures or interest rate swaps [See Appendix C: Duration Overlay Strategies]). The long duration overlay frees up cash, allowing the plan to increase the allocation to risk assets while, at the same time, mitigating interest rate risk. Of course, overlays require collateral, and marks-to-market—especially in sharply rising rate environments—could put further pressure on liquidity. Liquidity analyses conducted for Corporation A suggest that current liquid assets held are sufficient to meet liquidity requirements. However, liquidity must be monitored closely and the analyses should be repeated regularly.
**Risk Assets: Corporation A** has decided to significantly expand and diversify its allocation to risk assets. It will decrease its allocation to U.S. equities and invest in: global and emerging market equity mandates, private equity, real estate and hedge funds (a less illiquid alternative that can enhance alpha and [as seen in Exhibit 4] add to the asymmetry of returns) in order to provide further downside protection. The plan will also consider a possible allocation to high yield, emerging markets debt (EMD) or credit-based hedge fund strategies to mitigate spread duration risk (see insert—“Derivative Overlays and Spread Duration Risk”).

Corporation A has undertaken further analysis, utilizing J.P. Morgan’s multidimensional risk management framework, to get a better sense of the potential benefits of this initial “re-risking” of its pension portfolio (see Exhibit 8 for results and an explanation of this scenario analysis).

Results suggest that by extending duration (with the help of a derivatives overlay) while expanding and diversifying its allocation to risk assets, Corporation A may be able to decrease its expected contributions over the next 10 years by 18% while decreasing the potential for large unexpected contributions by 25%. This solution may not be appropriate for all plans facing Corporation A’s risk/return dilemma. However, Corporation A believes, given its corporate and plan profile, that this is a reasonable approach for improving funded status and helping to mitigate the risks that a significant contribution surprise could present for the corporation and its benefit participants.

**Dynamic Asset Allocation:** As the plan reaches its fully-funded goal, it will gradually reduce its allocation to risk assets and further increase its duration hedge—by increasing long duration fixed income—to lock in full funding. Corporation A does not feel it has the in-house resources available to implement this dynamic asset shift. As a next step, it will identify a qualified multi-asset manager with proven pension finance expertise that can help define a de-risking glide path for the plan. Manager specifications include extensive cross-asset class capabilities, demonstrated insight, flexibility and the reporting tools needed to effectively execute this strategy.

**Treating Corporation B’s Mild Case of PDD**

Corporation B’s objective is to gradually improve funded status, reaching 100% funding over the long term (It has not set a floor on funded status). Corporation B wants to preserve its plan’s 8% expected return on assets and reduce the potential for contribution surprises. Given its overall health in terms of earnings and cash flow, it has less urgency with regard to closing its funding gap, a higher tolerance for risk than Corporation A, and is able to absorb the financial consequences if markets underperform or the liability outperforms. However, as its current investment policy does not permit the use of derivatives, it will enhance returns and mitigate interest rate risk while maintaining its current 60% risk assets/40% liability hedging allocations. This will involve a reallocation within both the risk and liability hedging portions of the portfolio.

**Liability Hedging Assets:** To decrease the pension plan’s interest rate exposure and manage downside contribution risk, the plan sponsor intends to increase its liability duration hedge from 14% to approximately 39%, by converting to a long duration strategy.

**Risk assets:** To enhance expected returns while diversifying risk within its 60% allocation to risk assets, Corporation B will decrease its allocation to U.S. equity and invest in emerging markets equity, private equity, real estate and commodities, with a specific mix tailored to its needs. Additionally, it will seek to improve the efficiency of its risk assets by using hedge funds to access fixed income and equity beta while enhancing alpha potential. Given the challenges of implementing this hedge fund allocation with the limited resources available to the plan, it will invest with a carefully selected multi-strategy, multi-manager fund of funds.

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**DERIVATIVE OVERLAYS AND SPREAD DURATION RISK**

Liabilities are sensitive to changes in corporate bond yields (long-term Treasury yield + credit spread). A duration overlay is sensitive to changes in Treasury yields (but has no credit spread sensitivity). There is, therefore, an inherent basis risk in using duration overlays, namely, the “spread duration risk.” Increasing exposure within risk assets to high yield, EMD and/or credit-based hedge fund strategies may help to mitigate this spread duration risk.

However, it is worth noting that there are historical examples of flight to quality environments (e.g., in 2008) when Treasuries and swaps outperformed corporate bonds (and therefore liabilities).
Assuming these changes to duration hedging and risk assets, risk management analysis (Exhibit 8) indicates that Corporation B may be able to reduce expected contributions over the next 10 years by over 5% and the probability of major unexpected contributions by roughly 17%.

**Dynamic Asset Allocation:** Going forward, should Corporation B wish to further increase its duration hedge, this would likely require: (a) additional fixed income allocations; (b) investing in strips [zero coupon bonds] with long durations and/or (c) use of derivatives.

This fully-open plan will also need to determine what course of action it will take as its funded status improves. Will it choose to de-risk? How does contribution policy fit within a de-risking strategy for such plans?

**Conclusion**

The goal of the guidelines, diagnostic framework and case studies presented here is to assist plan sponsors and their pension investors in clarifying pension objectives and enhancing their approach to establishing and maintaining pension health. As illustrated throughout, we believe:

- **Liabilities are the true benchmark for plan assets**—pension surplus (deficit) should be the focus in managing pension assets.

- **Pension strategies require a two-pronged approach**—one addressing the need for return (through risk assets) and one focusing on the mitigation of interest rate risk (through liability hedging assets).

- **There is no single cure, no “best” solution that applies across all pension plans.** The balance in emphasis between return generation and liability hedging, as well as the composition of assets designed to address these needs (Appendix D) will depend on the external and plan-specific factors driving each plan’s pension investment decisions.

- **This tailored approach should also have a dynamic element**—allowing the plan to shift emphasis between return generation and liability hedging as funding status changes and pension needs evolve.

We hope we have accomplished our goal for this paper and encourage you to contact your J.P. Morgan representative for further information on these pension investment concepts.

Please visit jpmorgan.com/institutional for our continuously expanding library of thought-leading pension investment research.

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**EXHIBIT 8: MITIGATING CONTRIBUTION RISK THROUGH INVESTMENT POLICY CHANGES**

<table>
<thead>
<tr>
<th>Portfolio allocation (% risk assets/% fixed income)</th>
<th>Corporation A: $300 million plan assets</th>
<th></th>
<th>Corporation B: $800 million plan assets</th>
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<td></td>
<td>Initial</td>
<td>New</td>
<td>Impact</td>
<td>Initial</td>
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<tr>
<td>Portfolio allocation (% risk assets/% fixed income)</td>
<td>60%/40%</td>
<td>80%/20%</td>
<td></td>
<td>60%/40%</td>
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<tr>
<td>Liability Hedge Ratio</td>
<td>14%</td>
<td>55%</td>
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<td>14%</td>
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<tr>
<td>Median contribution (present value over 10 years)</td>
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<td>$63mm</td>
<td>-18%</td>
<td>$421mm</td>
</tr>
<tr>
<td>Downside contribution (present value over 10 years)</td>
<td>$280mm</td>
<td>$211mm</td>
<td>-25%</td>
<td>$1,148mm</td>
</tr>
</tbody>
</table>

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

This analysis is based on J.P. Morgan’s multi-dimensional risk management framework, as presented in its white paper—*The Blind Side: Managing downside risk in corporate defined benefit plans*, J.P. Morgan Asset Management, 2010. The approach is designed to account for the non-normality of asset and liability returns, i.e., it does not make the common assumption that asset and liability returns follow a perfect bell-shaped normal distribution.* Given forward-looking capital market assumptions, the model generates 10,000 Monte Carlo simulations and the required contribution outcome for each, resulting in a probability distribution of contributions for a given portfolio allocation.

**Median contributions** The median value of contributions the plan sponsor is going to make into the plan over the next ten years, given forward looking assumptions. It is defined as the median of the Present Value of Projected Future Contributions over ten years, calculated under rules aligned with the Pension Protection Act of 2006.

**Downside contribution risk** The worst-case contribution risk (defined as the Conditional Value at Risk of the Present Value of Projected Future Contributions at the 95th Percentile (CCVaR95)). This is the contribution the sponsor would make over the next ten years given the average of the worst 5% of outcomes from the model simulations described above.

Appendix A: The Pension Protection Act of 2006 (PPA) and Funded Ratios

Impact of the funded ratio on contributions under PPA

• PPA stated that plans would be required to amortize all shortfalls below 100% funding by January 1, 2011.

− Should the plan benefit from a pre-funding balance and/or carryover balance, these could be offset against future contributions. This would have no impact on the total cash to be contributed into the plan, but would push the funding to a later stage, once all balances had been depleted.

Note: Subsequent to the enactment of PPA, the Preservation of Access to Care for Medicare Beneficiaries and Pension Relief Act of 2010 provided temporary, targeted funding relief for some plans that suffered significant losses in asset value due to the steep market slide in 2008. This took the form of a special exemption that could be used for 2009-2011 to extend the amortization period for up to 15 years. Use of this extension, however, would have strings attached with regard to compensation as well as dividend and stock repurchase policy.

Impact of the funded ratio on benefits under PPA

• A low funded ratio will result in the incapacity of the plan to offer certain benefits:

  − Less than 80%:
    • Restriction on improving benefits
    • Restriction on lump sum payments

  − Less than 60%:
    • Freeze on benefit accruals
    • Inability to pay plant shutdown benefits
    • Restriction on all lump sum payments

  − A plan is determined to be “at-risk” in the current year if the funded status in the prior year was:
    • Less than 70% based on conservative assumptions, or...
    • Less than 80% based on standard assumptions.

  − Once “at-risk,” penalties are incurred:
    • Liabilities are measured using more conservative assumptions, increasing funding requirements. However, the increase in liabilities is phased in at 20% per consecutive year in which the plan is “at-risk,” reducing the impact.
    • In addition, if the fund is “at-risk” repeatedly (over 2 of the last 4 years), the funding target will increase by $700 per participant and an additional 4% of the determined at-risk liability.
    • Plans that are “at-risk” face restrictions on funding non-qualified deferred compensation programs for executives.

SUMMARY OF THE IMPACT OF THE FUNDED RATIO ON CONTRIBUTIONS AND BENEFITS UNDER THE PENSION PROTECTION ACT (FULLY IMPLEMENTED JANUARY 1, 2011)

<table>
<thead>
<tr>
<th>Funded Ratio</th>
<th>Contribution Impact Based on current year funding</th>
<th>Benefit Impact Based on previous year funding</th>
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</thead>
<tbody>
<tr>
<td>Funded ratio above 120%</td>
<td>Surplus above 120% can be used for OPEB benefits</td>
<td>No rules on benefits offered</td>
</tr>
<tr>
<td>Funded ratio between 100% and 120%</td>
<td>Normal pension cost and flat PBGC premium are due</td>
<td>Limited benefit restrictions kick in</td>
</tr>
<tr>
<td>Funded ratio between 80% and 100%</td>
<td>Contributions are required to get funding to 100% over 7 years</td>
<td>Significant benefit restrictions (Plan frozen)</td>
</tr>
<tr>
<td>Funded ratio between 60% and 80%</td>
<td>PBGC premium is increased by 0.9% of funding gap</td>
<td></td>
</tr>
<tr>
<td>Funded ratio below 60%</td>
<td>If funded ratio is under 80%, added contributions are to be expected</td>
<td></td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management; for illustrative purposes only.
Appendix B: Statement of Financial Accounting Standards 158 (SFAS 158)

Balance-Sheet Reporting Under SFAS 158
SFAS 158 (issued in September 2006) arguably improves financial reporting by more clearly communicating the funded status of defined benefit pension plans. Previously, this information was not reported in the company balance sheet at market values.

Under SFAS 158, companies with defined benefit pension plans must recognize the difference between the plan's projected benefit obligation and its fair value of plan assets as either an asset or a liability. The projected benefit obligation is the actuarial present value of the benefits attributed by the pension plan benefit formula for services already provided.

Income Reporting Under SFAS 158
SFAS 158 does not change the computation of periodic pension cost that continues to have elements of smoothing. The cost remains a function of service cost, interest cost, expected return on pension plan assets, and amortization of unrecognized items. SFAS 158 does, however, impact the reporting of comprehensive income. Specifically, actuarial gains or losses and prior service costs that arise during the period are recognized as components of comprehensive income.

Appendix C: Duration Overlay Strategies
An overlay strategy involves entering into derivative contracts to hedge all or some of a plan's interest rate risk. These contracts, which generally have a large notional value, are in addition to the plan's current portfolio (such that the notional exposure of the plan's investments exceeds 100% of the value of the plan's liabilities). The overlay can be implemented with a small amount of cash while enabling the plan to gain a significant level of duration. Using this approach, the plan sponsor can avoid significant changes to the plan's underlying asset allocation or alpha sources.

The primary derivatives used in extending duration include interest rate futures and interest rate swaps.

Interest rate futures
Interest rate futures are exchange-traded contracts with standardized terms regarding the underlying instrument (i.e., note or bond), the notional amount and settlement date. The contract has no market value at its inception; an initial margin, however, is deposited with the exchange's clearing house.

The contract is marked to market every day and additional margin is either deposited with or received from the clearing house. At the contract's maturity, the purchaser of the contract would be obligated to take delivery of the underlying security. More typically, however, the purchaser would “roll” the position into the next available contract.

A pension plan can increase the duration of its assets by buying Treasury futures contracts that are available on 2-year, 5-year, 10-year “bond contracts” and long-term Treasury securities (also known as “bond contracts”). As interest rates rise, and the price of futures fall, the plan will pay margin to the clearing house. As interest rates fall and the price of futures rises, the plan will receive margin from the clearing house. In this manner, the value of the futures contracts may change in line with the present value of the plan’s liabilities as liability discount rates move up or down with changes in interest rates.
A futures-based strategy has two main advantages: It is relatively easy to implement since most active fixed income portfolios make use of futures contracts and it has minimal counterparty risk due to both daily margin requirements and the fact that the exchange stands behind the contract.

Its disadvantages include a lack of flexibility in setting terms, the need to manage margin on a daily basis and some expected variability in the specific security that can be delivered into the contract (particularly the bond contract). Also, Treasury futures have no sensitivity to credit spreads and therefore, will not track the credit spread movements that occur in the corporate-based discount rates that are generally used to value plan liabilities. Depending on the direction of the spreads, this can be either an advantage or a disadvantage.

**Interest rate swaps**

A swap is an Over-The-Counter (OTC) agreement between two parties to exchange cash flows throughout the life of the contract. In an interest rate swap, the pension plan and the counterparty to the swap (generally a bank) agree to exchange cash flows under a privately negotiated contract. The pension plan agrees to pay interest on a notional amount (e.g., $100 million) based on a floating interest rate (e.g., 3-month LIBOR) for a predetermined time period such as 20 years. The counterparty to the swap agrees to pay interest on the notional amount of the swap at a fixed interest rate set on the initial date of the contract. Because the swap is initially priced so that the net present value (NPV) of both sides of the swap is the same, there is no upfront fee payable under the swap except for a bid/ask spread.

As interest rates change, the NPVs of each side of the swap will change, resulting in gains for one party and losses for the other. The increases or decreases in the swap’s NPV may mimic gains or losses experienced in the plan’s liabilities caused by interest rate fluctuations. In this manner, the pension plan has now decreased risk, because the gains or losses under the swap are expected to closely resemble the interest rate related changes in the plan’s liabilities (with greater precision, the higher the hedge ratio).

The advantages of swaps include their cost, liquidity, flexibility of terms and convexity (how much the duration changes when interest rates change, which is similar to that of pension liabilities). Their disadvantages include counterparty risk, as well as the administrative burden of putting the swap program in place: identifying appropriate counterparties to the swap, negotiating International Swaps and Derivatives Association (ISDA) agreements and monitoring and managing the swap on a daily basis. (Still-evolving regulatory reforms that stem from the recently enacted Dodd-Frank legislation are also likely to make implementation of swap programs somewhat more complex. Details have not yet been finalized.)

Spread risk is also a consideration. Swaps are initially priced off a Libor-based yield curve, which is generally deemed to have a AA-level credit quality. Spread risk arises from the fact that spread spreads (the yield difference between swaps and Treasuries of the same duration) can either fail to narrow or even widen when other spreads (such as those for corporate bonds used to discount pension liabilities) are narrowing. This spread behavior may well occur in a sharply rising rate environment. In such a scenario, it is likely that an overlay portfolio will underperform a given liability.
## Appendix D: Assets and Their Roles in Pension Portfolios

<table>
<thead>
<tr>
<th>Risk Assets</th>
<th>Role</th>
<th>Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>• Outperform liability&lt;br&gt;• Earn equity risk premium over long term</td>
<td>• High volatility&lt;br&gt;• Market beta risk</td>
</tr>
<tr>
<td>Intermediate fixed income</td>
<td>• Diversify equity exposure</td>
<td>• Duration mismatch relative to liabilities&lt;br&gt;• Typically under-yields liability</td>
</tr>
<tr>
<td>Extended Markets (Emerging markets debt; high yield)</td>
<td>• Outperform liability&lt;br&gt;• Diversify equity exposure&lt;br&gt;• Potentially hedge liability spread duration</td>
<td>• High volatility and market beta risk&lt;br&gt;• Credit spread risk&lt;br&gt;• Could be illiquid</td>
</tr>
<tr>
<td>Alternatives (Hedge funds, private equity, real estate)</td>
<td>• Outperform liability&lt;br&gt;• Diversify equity, debt exposure&lt;br&gt;• Downside protection</td>
<td>• Can be illiquid&lt;br&gt;• Can be resource intensive&lt;br&gt;• Choice of active manager extremely important&lt;br&gt;• Fees and expenses</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liability Hedging Assets</th>
<th>Role</th>
<th>Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Duration Bonds</td>
<td>• Risk control—match liability duration&lt;br&gt;• Lower surplus volatility and contribution surprises&lt;br&gt;• Track liability performance</td>
<td>• Does not outperform the liability&lt;br&gt;• Limited bond universe&lt;br&gt;• Credit risk</td>
</tr>
<tr>
<td>Long Duration overlay (swaps, futures)</td>
<td>• Risk control—improve duration hedge&lt;br&gt;• Lower surplus volatility and contribution surprises&lt;br&gt;• Cash efficient source of duration</td>
<td>• Requires cash/collateral for margin&lt;br&gt;• Portfolio liquidity for larger overlays&lt;br&gt;• Operational complexity&lt;br&gt;• Basis risk can be significant</td>
</tr>
</tbody>
</table>

Source: J.P. Morgan Asset Management
Glossary

Alpha: The return of an investment in excess of its benchmark.

Beta: A standardized measure of systematic risk based upon an asset’s covariance with the market portfolio.

Closed pension plan: A pension plan that is not open to new entrants.

De-risking glide path: An investment program that is designed to change the risk profile of the asset allocation in line with changes in funded ratio, the passage of time or valuation-based metrics.

Derivative overlay: Use of derivatives to achieve a particular market exposure. In this paper derivative overlays are discussed as a way to hedge all or some of a plan’s interest rate risk. The primary derivatives used in extending duration include interest rate futures and interest rate swaps (see Appendix C).

Duration: A measure expressed in years of the sensitivity of the value of an instrument to interest rates. Numerically, it is the approximate percentage change in the price of a bond for a 100-bps change in rates. (e.g. given a bond with a duration of 10, a 100-bps increase in rates would result in an approximate 10% reduction in the price of the bond).

Expected return on assets (EROA): A forward-looking estimate of the investment return over a 10-15 year horizon.

Frozen pension plan: A defined benefit plan closed to new entrants and in which current participants cannot accrue new benefits.

Funding ratio: The ratio of pension assets to pension liabilities.

Liability duration hedge/Duration hedge ratio: The dollar change in a pension plan’s asset value relative to the dollar change in its liabilities, given a small change in interest rates. Example: a plan that has $80 million in assets with a duration of 2 years and $100 million in liabilities with a duration of 13 years, would have a duration hedge of ($80 x 2 years)/($100 x 13 years) = 12.3%, implying that, for a given small decline in interest rates, assets will increase by $12.30 for every $100 increase in liabilities.

Open pension plan: Pension plan that is open to new members and in which existing members are accruing new benefits.

Projected benefit obligation: Under U.S. GAAP, a measure used in estimating the current value of a pension plan’s liability, taking into account future compensation increases.

Service cost: The present value of the amount added to planned future retirement pay for the current year’s work. Service cost increases pension cost and the projected benefit obligation.

Spread duration risk: Basis risk inherent in using duration overlays to hedge pension liabilities, arising from the fact that pension liabilities, valued using AA corporate bond yields (long-term Treasury yield + credit spread) are sensitive to the widening/narrowing of credit spreads while a duration overlay is sensitive to changes in Treasury yields (but has no credit spread sensitivity).

Strategic asset allocation: The plan’s long-term strategic portfolio at the asset class level designed to incorporate the investor’s return objectives, risk tolerance, investment constraints, and capital markets views.

Tactical asset allocation: Asset allocation that involves making short-term adjustments to asset class weights based on short-term market views.
A Month to Remember
Lessons for pension plans from the August corrections
Discusses how turbulent markets in August, 2011 drove home a practical lesson for plan sponsors—aside from long duration bonds, diversification may be the best defense against volatility.

The Blind Side
Managing downside risk in corporate defined benefit plans
Investigates the issue of pension contribution risk, proposes a multi-dimensional risk management framework and tests the effectiveness of de-risking and dynamic asset allocation strategies.

Non-normality of Market Returns
A framework for asset allocation decision-making
Explores the limitations of traditional asset allocation frameworks which are based on assumptions of normality in asset returns and offers a framework to better incorporate and account for non-normality.

Long-term Capital Market Return Assumptions
Provides a summary, updated annually, of our long-term (10–15 year) return expectations, expected volatilities and correlations across key asset classes.

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