The role of core real assets in liability-aware portfolios

Return enhancement or volatility reduction?

Summer 2018

IN BRIEF

- Our research finds that thoughtfully constructed, optimally sized portfolio allocations to core real assets—real estate, infrastructure, transport and natural resource assets—can meet various plan objectives in liability-aware pension portfolios.
- Core real assets have hybrid characteristics, providing the opportunity for a stable, volatility-reducing income stream and potential equity-like upside from price appreciation.
- Our analysis shows that an allocation addition of core real assets as small as 5% can significantly enhance portfolio outcomes.
- The funding source for a real assets allocation can have a considerable impact; as the funding source changes, portfolio improvements can toggle among more dampening of funded status volatility, more improvement of expected returns or a combination of the two.

MANY INSTITUTIONAL PORTFOLIOS HAVE MADE THE STRUCTURAL SHIFT TOWARD HIGHER ALLOCATIONS TO REAL ASSETS, AS WE OUTLINED FIVE-PLUS YEARS AGO.[1] In this paper,[2] we address how corporate pension plans specifically can build or enhance their real asset portfolios. We define the asset class and, using model portfolio analytics, consider the right size, and the role, of real assets at various stages of the pension life cycle.

Because the question of the funding source for a new real asset allocation has considerable consequences for portfolio metrics, we run a constrained optimization analysis to determine how to fund a new real asset allocation, for identifying portfolios on the efficient frontier. We find that, depending on the funding source for a new real asset allocation, the improvements to a portfolio toggle among more dampening of funded status volatility, more return enhancement or a combination of the two. We conclude that real assets may help corporate pension plans improve their expected returns, mitigate funded status volatility, or achieve some mixture of both.

CORPORATE PENSION PLAN INVESTING: CURRENT CHALLENGES

In the broadest context, corporate pension plans' funded status has been largely range-bound and below pre-financial crisis averages. At publication time, as the Federal Reserve continued monetary tightening and began running off its $4.5 trillion-plus balance sheet, plan sponsors that declined to de-risk at higher interest rate levels have been hesitant to do so. Against this backdrop, many of

[1] "The Realization: A New World. A New Normal. A Tectonic Shift," J.P. Morgan Asset Management, April 2012, https://am.jpmorgan.com/se/institutional/11-298a-the-realization.

[2] This paper is a distillation of a longer research paper, *The role of core real assets in liability aware portfolios: Return enhancement or volatility reduction?* J.P. Morgan Asset Management, July 2018.

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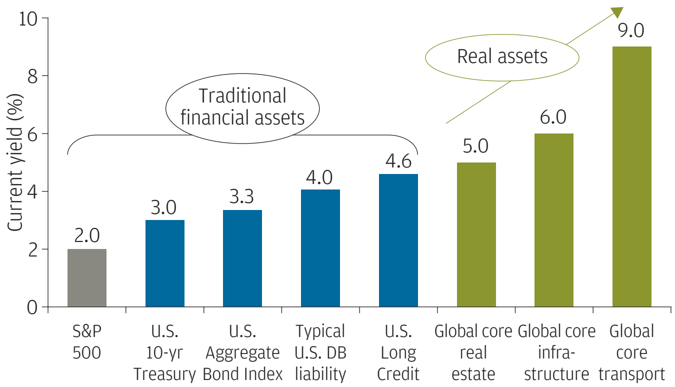
Global core real assets generate two or three times more income than financial assets with less than half the volatility

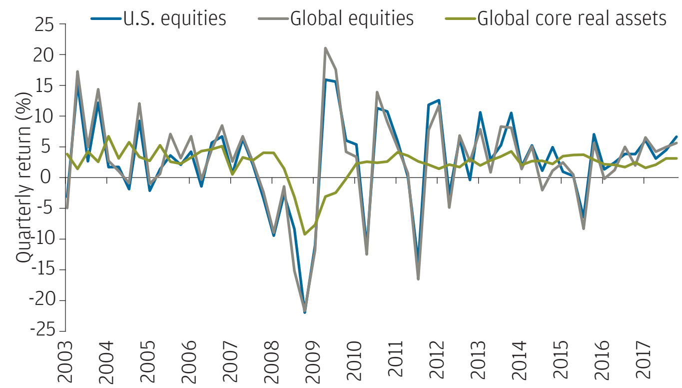
EXHIBIT 1A: POTENTIAL INCOME, GLOBAL CORE REAL ASSETS VS. FINANCIAL ASSETS



Source: Bloomberg, MSCI, Barclays Capital, FTSE Pension Discount Curve, J.P. Morgan Asset Management Global Alternatives Research; data as of April 30, 2018. Global Real Assets income targets are J.P. Morgan Asset Management Global Alternatives Research midpoint strategy targets. Opinions, estimates, forecasts, projections and statements of financial market trends that are based on current market conditions constitute our judgment and are subject to change without notice. For illustrative purposes only.

U.S. DB liability is based on a hypothetical pension liability with 13-year liability duration discounted on the FTSE Pension Discount Curve (formerly Citi) as of April 30, 2018.

EXHIBIT 1B: RETURN STABILITY, GLOBAL CORE REAL ASSETS VS. FINANCIAL ASSETS



Source: Bloomberg, MSCI, NCREIF, IPD, CBRE, Jones Lang LaSalle, J.P. Morgan Asset Management Global Alternatives Research. Quarterly data calculated in USD currency terms as of 4Q 2017.

our clients have been seeking to make adjustments around the edges—to implement asset allocation changes aimed at enhancing returns without taking on additional funded status volatility and the corresponding risk that plan sponsors would need to make unexpected required contributions.

The U.S. Tax Cuts and Jobs Act of 2017, combined with a heavy and increasing Pension Benefit Guaranty Corporation premium burden, has given plan sponsors compelling corporate finance incentives to find ways to accelerate contributions.[3] Allocators tasked with deploying sudden large inflows may face a similar challenge: finding ways to de-risk without earmarking all new dollars for traditional hedging assets.

The past several years have also seen plans implement de-risking through another lever: liability management. Widespread plan closures and benefit accrual freezes have, over time, led to increasingly mature liabilities. This aging of the U.S. corporate pension system—together with accelerated benefit outflows from lump-sum programs, and regulatory pension relief that significantly reduced sponsors' minimum required contribution levels—has caused persistent net cash outflows, making income-producing assets increasingly important. Over the next decade, more and more plans will tip into decumulation, a position from which funded status drawdowns become increasingly difficult to recover through asset returns alone.

A ROLE FOR CORE REAL ASSETS

We refer to certain real assets as "core" if their cash flows are forecastable for long time periods with a low margin of error. For example, core real assets include well-leased properties in major developed markets; regulated utilities, and other infrastructure sectors with transparent, predictable cash flows; and transport assets (maritime vessels, aircrafts, rail cars, etc.) that feature long-term contracts with high-credit quality counterparties. Amid the current challenges facing pension plans, core real assets' hybrid characteristics can play a key role in portfolios, providing the opportunity for a stable, volatility-reducing income stream along with the potential for equity-like upside from price appreciation. Whether acting as a replacement for volatile public equities or for low yielding fixed income assets, core real assets may enhance the efficiency of liability-aware portfolios.[4]

[3] Under the new U.S. tax law, plan sponsors with calendar tax years can deduct pension contributions at their 2017 tax rate until September 15, 2018.

[4] We use "liability driven" and "liability aware" interchangeably. In our view, both are appropriate terms to describe an investment policy that explicitly recognizes the liability and considers funded status volatility as a risk metric. This definition is broad enough to include portfolios ranging from low-tracking error key-rate duration-matched fixed income to high-tracking error low-hedge ratio portfolios (as long as the tracking error to the liability is intentional and understood).

Global core real assets can generate two or three times more income than financial assets with less than half the volatility.

Several high quality, income-oriented, core real asset categories have generated two to three times the income of core fixed income or core equities, with minimal interest rate risk, due to their underlying cash flows' potential to grow as rates (or inflation) rise (**EXHIBITS 1A** and **1B**). The return streams of a diversified real assets portfolio are local and uncorrelated to each other. As a result, compared to traditional asset classes, a diversified real assets portfolio displays lower volatility (less than half vs. public equities), lower correlations with traditional asset classes and lower equity beta—an important feature, as public equity exposure often accounts for the majority of funded status risk in a typical corporate pension portfolio.

RIGHT-SIZING THE CORE FOUNDATION REAL ASSET PORTFOLIO

Investors should view their core real asset portfolio much as they view their core fixed income or core equities portfolios—that is, as an allocation that should provide broad market exposure to high quality underlying investments across the asset class. For research purposes, we created a global core real assets portfolio (what we would call a diversified Core Foundation) to model investment scenarios. The model portfolio has an anchor allocation to global core real estate (50%)—the largest, most transparent and most liquid part of the real asset spectrum.[5] It has a meaningful allocation to global core infrastructure (30%) for its yield, inflation sensitivity and downside resilience; and finally, a complementary allocation to global core transport (20%) for its significantly higher yield and diversification properties (**EXHIBIT 2**). In our modeled scenarios, adding this diversified Core Foundation results in incremental benefits to a traditional 60/40 mix of stocks and bonds.

The recommended strategic weightings for the Diversified Core Foundation are the result of numerous asset allocation and implementation analyses that J.P. Morgan Asset Management has conducted for institutional investors of varying types and sizes.

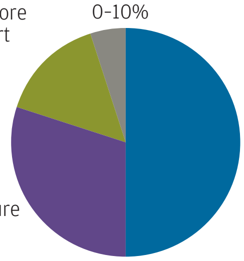
5 We took an objective, rigorous analytical approach in arriving at this strategic global real estate allocation using a variety of quantitative techniques and asset allocation frameworks, including mean variance and risk parity. The resulting allocation was designed to provide investors with durable yield, true real estate diversification across geographies and sectors, low volatility of returns, downside resilience and inflation sensitivity. For a deeper consideration of building the global core real estate foundation, see Sharma et al.

The strategic allocation of global core real assets can enhance investment outcomes vs. financial assets

EXHIBIT 2: PORTFOLIO COMPOSITION AND RELATIVE VALUE OF A GLOBAL CORE REAL ASSETS ALLOCATION

RELATIVE VALUE VS. 60/40 STOCK/BOND PORTFOLIO

- 2-3x more income
- 200-300bps return premium
- 30% lower volatility
- Low equity beta and low duration risk
- Better downside resilience and inflation sensitivity



PORTFOLIO BENEFITS

- **Durable yield** with higher current income than traditional public market assets
- **Diversification** to traditional asset class exposure: unique sources of risk and return
- **Low volatility** of returns and downside resilience, with favorable impact on surplus risk for most pension allocations
- **Inflation sensitivity** supports plans with ongoing service cost accruals (tied to wage inflation) or inflation indexing (pre- or post-retirement cost-of-living adjustments)

Source: Bloomberg, MSCI, Barclays, NCREIF, CBRE, Jones Lang LaSalle, J.P. Morgan Asset Management Global Alternatives Research; data as of December 2017. For illustrative purposes only.

*Other real assets are represented by 50/50 timberland/farmland. The target returns are gross returns for illustrative purposes only and are subject to significant limitations. An investor should not expect to achieve actual returns similar to the target returns shown above. Because of the inherent limitations of the target returns, potential investors should not rely on them when making a decision on whether or not to invest in the strategy. Diversification does not guarantee investment returns and does not eliminate the risk of loss.

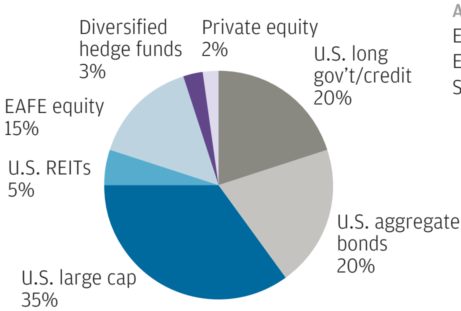
Yield is not guaranteed and may change over time. The Portfolio Manager seeks to achieve the stated targets/objectives. There can be no guarantee the objectives/targets will be met.

Portfolio details: **Global Core Real Estate:** Exposure to high quality real estate assets with stabilized and high occupancy levels across North America, Europe, and Asia-Pacific; **Global Core Infrastructure:** Exposure to regulated utilities, contracted power generation, and transportation assets across OECD markets; **Global Core Transport:** Exposure to maritime, energy logistics, aircraft, rail and vehicles and other surface and air transport segments operating across the globe.

Equity is the largest contributor to typical corporate pension plan surplus volatility

EXHIBIT 3: CHARACTERISTICS OF A TYPICAL CORPORATE PENSION PLAN

3A: ASSET ALLOCATION



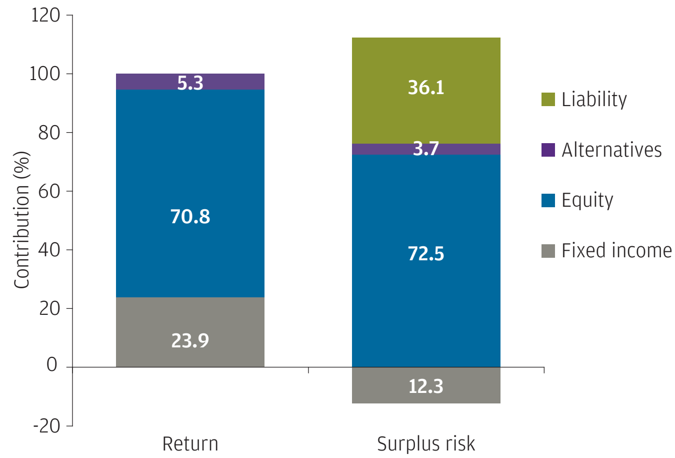
ASSET PROFILE

Expected return: 5.75%
Expected volatility: 9.41%
Sharpe ratio: 0.396

8C: PENSION PROFILE

Funded status	83.5%
Expected surplus volatility	10.13%
Interest rate hedge ratio	32%
Liability duration	11.3 years

3B: SURPLUS VOLATILITY CONTRIBUTION



Surplus volatility: Expected tracking error of plan assets to liabilities. **Interest rate hedge ratio:** One of the main drivers of surplus risk and a measurement of portfolio interest rate sensitivity relative to liabilities. Surplus volatility is quoted as a percentage of the pension liability. Expected return is in arithmetic term.

Source: J.P. Morgan Asset Management; data as of December 31, 2017.

The typical plan is based on the aggregate funded status and asset allocation of defined benefit pension plans of companies in the S&P 500, sourced from S&P Capital IQ and 10-K filings. A custom liability cash flow stream was created as of 12/31/2017 to approximate the liability and funded status, discounted on the FTSE Pension Discount Curve. Sharpe ratio is calculated based on the long-term cash/risk-free rate of 2%. Liability movement is based on key rate duration match weight of U.S. Corporate AA bonds with various maturity.

CASE STUDY: THE ROLE OF CORE REAL ASSETS AT VARIOUS STAGES OF THE PENSION GLIDE PATH

The case study that follows shows how a corporate pension plan can benefit from an allocation to core real assets, whether to de-risk or to enhance returns. This is a typical corporate pension plan portfolio, which was 85% funded on a U.S. GAAP basis at year-end 2017. [6] The plan is diversified across financial assets, with a modest allocation to alternatives through hedge funds and private equity exposure (**EXHIBIT 3**). As the risk and return contribution chart illustrates, public equities, while contributing positively to returns, are also the largest contributor to surplus risk. Similarly, the fixed income allocations dampen surplus volatility but dilute returns in the asset mix with respect to their weight.

[6] Typical corporate pension plan portfolio based on J.P. Morgan analysis of 10-K asset allocation disclosures of S&P 500 companies as of December 31, 2017.

Changing asset class allocations: The risk and return trade-offs

What happens if we replace a 5% pro rata slice of this typical corporate pension plan portfolio with various asset class exposures? Most asset allocation changes come with trade-offs between risk and return, quantified in **EXHIBIT 4**. Adding long-duration fixed income reduces funded status volatility but also cuts expected return. Adding public equities boosts expected returns but correspondingly increases funded status volatility. However, core real assets improve portfolio metrics across the board. In this example, we see that core real assets:

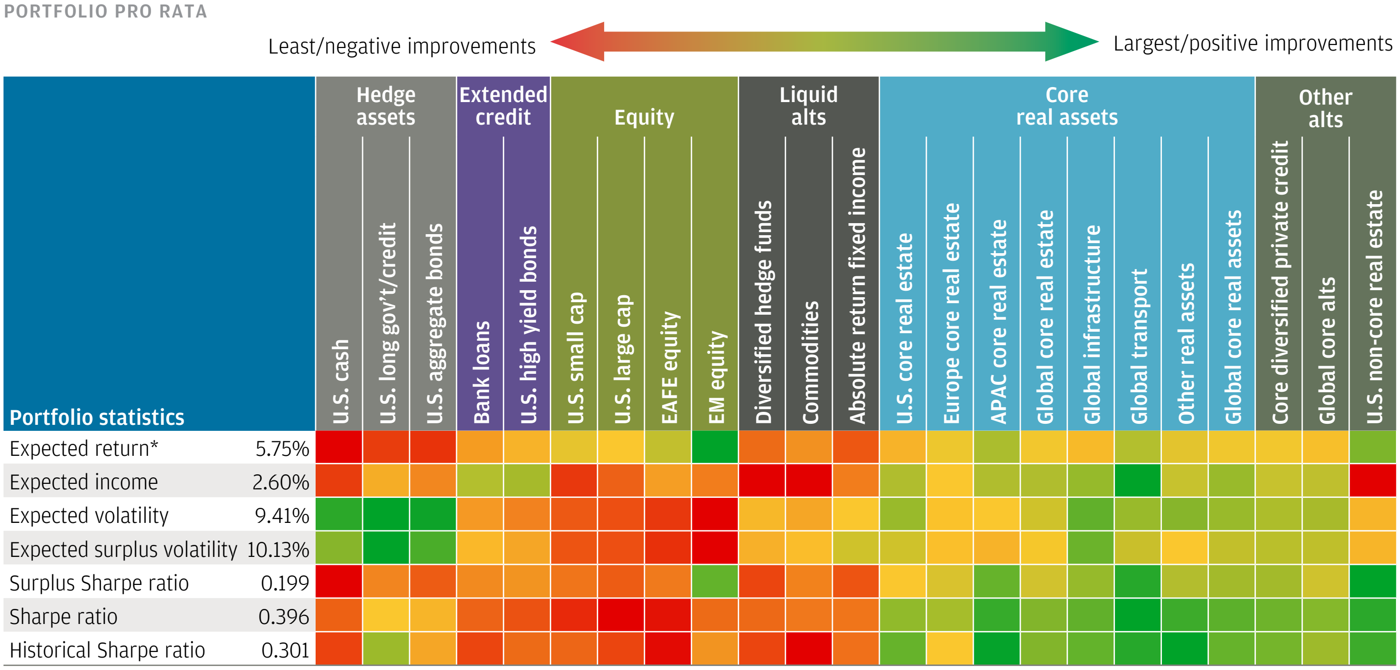
- reduce funded status volatility
- increase both expected return and expected income
- enhance (asset-only[7]) Sharpe ratio on both a historical and forward-looking basis
- improve surplus Sharpe ratio,[8] a measurement of liability-aware portfolio efficiency

[7] We delineate "asset-only" Sharpe ratio to refer to risk-adjusted returns of the portfolio on a stand-alone basis, without regard to the liability or surplus volatility.

[8] Surplus Sharpe ratio is a similar concept to asset Sharpe ratio but instead measures how much return the portfolio generates per unit of surplus risk.

Replacing a portion of a portfolio with core real assets has a relatively positive impact on asset and asset-liability metrics

EXHIBIT 4: ELASTICITY ANALYSIS—HEAT MAP OF CHANGES IN PENSION METRICS BY REPLACING 5% OF TYPICAL CORPORATE PENSION PLAN PORTFOLIO PRO RATA



Source: J.P. Morgan Asset Management; data as of December 31, 2017.

*Target returns are for illustrative purposes only and are subject to significant limitations. Please see the complete Target Return disclosure at the conclusion of the paper for more information on the risks and limitation of target returns.

Heat map ranks relative improvements for each metric (row). Surplus volatility is quoted as a percentage of liability. Surplus Sharpe ratio is a similar concept to asset Sharpe ratio but instead measures how much excess return over the liability the portfolio generates per unit of surplus risk. Liability return (discount rate) in this analysis is assumed to be 3.34% based on 12/31/2017 FTSE Pension Discount Curve. Sharpe ratio and Historical Sharpe ratio are defined as excess return over cash divided by asset volatility.

The elasticity table (Exhibit 4) offers insights that allow for gauging the marginal impact, direction and magnitude of making small asset class changes to a pension portfolio. The exercise underscores the role core real assets can play in materially enhancing outcomes for liability-aware pension portfolios.

Optimizing the funding source

While the analysis above is a useful exercise, as we noted earlier, institutional investors don't typically fund new asset classes by selling pro rata allocations across their holdings. What, then, should the funding source be for a new real assets allocation? This is a key question that can have a considerable impact on portfolio metrics. To address this in a more practical and implementable way, we run a constrained optimization analysis, minimizing funded status volatility at each return target to find portfolios on the efficient frontier, which fund a 5% allocation to global core real assets (**EXHIBIT 5**). Depending on where the allocation is drawn from, the improvements can be toggled among dampening funded status volatility (through a reduction in public equity exposure), enhancing return (through a reduction in low yielding fixed income exposure) or a combination. Regardless of the plan sponsor's objectives, funding just a 5% allocation to global core real assets can lead to material improvements in a plan's overall metrics. These results also have investment implications for how core real assets should be considered in different stages of the pension life cycle.

Real assets for risk reduction

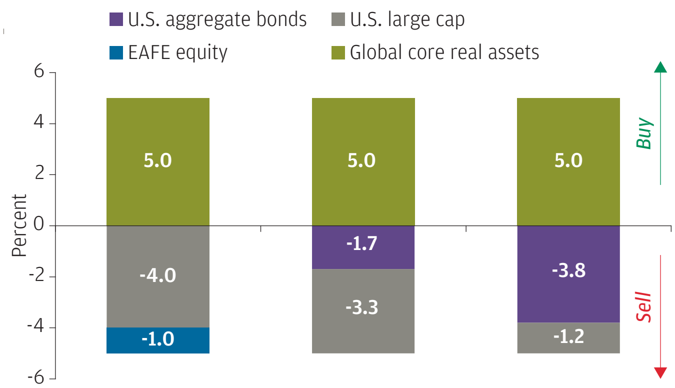
In the Risk Reduction scenario, substituting core real assets for public equities increases income and total return potential while simultaneously dampening funded status volatility. Notably, this asset allocation change reduces funded status risk without adding duration to the portfolio. For plans waiting for rates to rise, core real assets are an effective way to use diversification, rather than hedge ratio, to de-risk.

At the other end of the spectrum, plans running low surplus volatility portfolios with meaningful allocations to long-duration fixed income can benefit from core real assets as well. In fact, as a plan de-risks, the tolerance for illiquidity can actually increase as the magnitude of potential funded status drawdowns is diminished. Core real assets can act as a complement to traditional hedge portfolios, providing a stable cash flow profile and diversification to an often-concentrated exposure of credits.

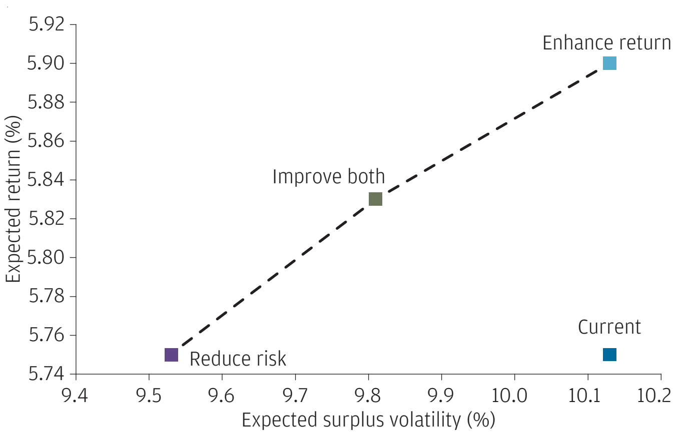
Funding a diversified global core real assets allocation can improve a wide range of metrics

EXHIBIT 5: OPTIMIZATION EXERCISE TO FIND EFFICIENT PORTFOLIOS WHICH FUND A 5% GLOBAL CORE REAL ASSETS ALLOCATION

5A: CHANGES IN PORTFOLIO ASSET ALLOCATION



5B: EFFICIENT FRONTIER



5C: PORTFOLIO SUMMARY STATISTICS

		Changes from Current (bps)		
	Current portfolio	Reduce risk	Improve both	Enhance return
Expected return*	5.75%	0	+8	+15
Expected income	2.60%	+19	+19	+17
Expected volatility	9.41%	-77	-44	-7
Expected surplus volatility	10.13%	-60	-32	0
Surplus Sharpe ratio	0.199	+126	+128	+124
Sharpe ratio	0.396	+352	+279	+191
Historical Sharpe ratio	0.301	+406	+307	+222

Source: J.P. Morgan Asset Management; data as of December 31, 2017.

Expected return is in arithmetic term. Green shading indicate positive impact; gray shading indicates no change to the portfolio metric.

*Target returns are for illustrative purposes only and are subject to significant limitations. Please see the complete Target Return disclosure at the conclusion of the presentation for more information on the risks and limitation of target returns.

Real assets for return enhancement

In the Return Enhancement scenario, substituting core real assets for fixed income enhances total return potential without a corresponding increase in funded status volatility. Analyzing U.S. Generally Accepted Accounting Principles (GAAP) assumptions for expected return on assets reveals a gap of about 150 basis points (bps) relative to J.P. Morgan Asset Management's Long-Term Capital Market Assumptions. This disparity cannot likely be filled with manager alpha alone, especially if passive investing is used across certain asset classes. Allocating to core real assets represents an elegant solution to the expected return gap compared with increasing public equity allocations at the expense of increased funded status volatility.

WHAT IS THE APPROPRIATE CORE REAL ASSETS INVESTMENT SOLUTION FOR MY PLAN?

Determining the most appropriate real assets investment solution and allocation amount will largely be defined in the context of investors' funded status, current exposure to real assets and tolerance for the lower liquidity of core real assets relative to traditional financial assets. As shown in the investor case study in Exhibit 5, we think both increasing and diversifying the core real assets allocation can yield meaningful outcomes for plan sponsors. These outcomes are relevant whether they are measured against traditional financial assets or stand-alone allocations to riskier and more illiquid forms of real assets, which may be more volatile and not appropriate for all stages of de-risking.

There are steps and potential solutions for implementing a diversified core real asset foundation, depending on the investment portfolio's current situation (**EXHIBIT 6**).

Implementation can accommodate an investor's current allocation

EXHIBIT 6: POTENTIAL WAYS TO IMPLEMENT A FOUNDATIONAL CORE ALTERNATIVES ALLOCATION

Current situation	Potential implementation
No real estate	Add U.S. core real estate
Only U.S. core real estate	Add International core real estate
Global real estate only	Add core infrastructure and core transport
No real assets	Add Global core real assets
No alternatives	Add Global core alternatives

Source: J.P. Morgan Asset Management Global Alternatives Research.

INVESTMENT IMPLICATIONS

Our portfolio analytics (both forward-looking and historical) demonstrate that adding core real assets to a pension portfolio can help plan managers, whether their objective is risk reduction, return enhancement, or both. Our models have shown the potential benefits when a well-constructed portfolio of core real assets—high quality, income-producing, inflation-sensitive investments such as core real estate, infrastructure and transport—replaces volatile public equities or low yielding bonds.

These long-term investments' stable income matches up well with the long-dated nature of plans' liabilities. Core real assets can help plans de-risk through diversification without adding duration. For underfunded plans, substituting core real assets for fixed income can enhance total return potential without a corresponding increase in funded status volatility. For fully-funded plans seeking risk-reduction, substituting core real assets for public equities can increase income and total return potential.

Core real assets may also help close the gap between the average pension plan's expected return on assets (EROA) accounting assumption and its likely investment portfolio return—about a 1.5% disparity, which manager selection alone is unlikely to bridge. Core real assets, or a broader core alternatives allocation—with their higher forward-looking projected returns than public equities and their lower volatility—can be an elegant solution for plan sponsors trying to close that gap. And sponsors may accomplish this without increasing funded status volatility in today's low growth, rising rate environment.

FROM REAL ASSETS TO STRATEGIC GLOBAL ALTERNATIVES

Some investors have a broader definition of core alternatives than only core real assets. Their definition encompasses other income-oriented and/or lower volatility alternative strategies, including hedge funds and private credit. Adding a well-diversified alternatives allocation across these other categories, together with a foundational allocation to core real assets, can further enhance risk-adjusted return outcomes in liability-focused investing, yielding positive outcomes for plan sponsors.

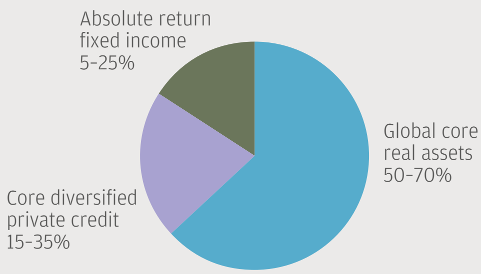
Core diversified private credit	Absolute return fixed income
Return enhancement, more flexibility than private equity from a liquidity perspective, diversify traditional fixed income issuer exposure	Tactical duration management and liability-hedging credit spread exposure

The strategic allocation of global core alternatives can enhance investment outcomes vs. financial assets

PORTFOLIO COMPOSITION AND RELATIVE VALUE OF A GLOBAL CORE ALTERNATIVES ALLOCATION

RELATIVE VALUE VS. 60/40 STOCK/BOND PORTFOLIO

- 2-3x more income
- 200-300bps return premium
- Less than half the volatility
- Low equity beta
- Better downside resilience and inflation sensitivity



PORTFOLIO BENEFITS

- **Stable income** with higher yields than traditional public market assets
- **Low volatility** of returns with an emphasis on the preservation of capital and downside resilience
- **Inflation sensitivity** supports plans with ongoing service cost accruals (tied to wage inflation) or inflation indexing (pre- or post-retirement cost-of-living adjustments)
- **Diversification** to developed market equities and low interest rate sensitivity

Source: Bloomberg, MSCI, Barclays, NCREIF, CBRE, Jones Lang LaSalle, and J.P. Morgan Asset Management Global Alternatives Research; data as of December 2017. For illustrative purposes only.

Portfolio details: **Global Core Real Assets:** Exposure to high quality core real assets including real estate, infrastructure, and transport located across global developed markets; **Core diversified Private Credit:** Exposure to corporate senior debt through asset sales and new loan origination diversified across geographies; **Absolute Return Fixed Income:** Exposure to fixed income assets across traditional, alternative, and private market segments.

Diversification does not guarantee investment returns and does not eliminate the risk of loss.

Yield is not guaranteed and may change over time. The Portfolio Manager seeks to achieve the stated targets/objectives. There can be no guarantee the objectives/targets will be met.

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J.P. MORGAN GLOBAL ALTERNATIVES

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Operating from 19 offices throughout the Americas, Europe and Asia Pacific, our independent alternative investment engines combine specialist knowledge and a singular focus with the global reach, vast resources and powerful infrastructure of J.P. Morgan to help meet each client's specific objectives.

As of March 30, 2018.

NEXT STEPS

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