Real assets' role in public pension portfolios

How real estate and infrastructure can enhance returns and reduce volatility

Fall 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 public 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 additional allocation to core real assets of as little as 5% can significantly enhance portfolio outcomes.
- The funding source for a real asset allocation can have a considerable impact; as the funding source changes, portfolio improvements can toggle among more dampening of 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, we address how public 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 for various investment objectives.

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 such an allocation, and identify 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 asset volatility, more return enhancement or a combination of the two. We conclude that real assets may help public pension plans improve the probability of meeting and exceeding lofty return targets, mitigate portfolio volatility and drawdowns, or achieve some mixture of both.

PUBLIC PENSION PLAN INVESTING: CURRENT CHALLENGES

In the broadest context, public pension plans' funded status has been largely range-bound and well below pre-financial crisis averages. According to Moody's Investors Service research, as of June 30, 2018, unfunded state pension liabilities totaled USD1.6 trillion.[2] Meanwhile, the "public

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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 "Moody's—Unfunded US state pension liabilities surge in fiscal 2017 due to poor investment returns," Moody's Investors Service, August 27, 2018, https://www.moodys.com/research/Moodys-Unfunded-US-state-pension-liabilities-surge-in-fiscal-2017--PBM_1139183. Moody's USD1.6 trillion represents adjusted net pension liabilities (ANPL), which uses fair value of pension assets and pension liabilities adjusted to reflect market (high quality corporate) discount rates.

pension crisis" has captured the attention of mainstream media outlets, which have covered a wide range of potential reforms and strategies, including changes to plan design, increased contribution levels and even the reintroduction of pension obligation bonds.[3] While a handful of state and local plans are in deep trouble, with pension debt service claiming a disproportionate amount of tax revenues, the vast majority are largely focused on earning their expected return-on-assets assumption, a figure that has gradually ratcheted down since 2012.

At publication time, as the Federal Reserve continued monetary tightening, running off its USD4.5 trillion-plus balance sheet, U.S. stocks have just surpassed the longest bull market on record while returning over 300% during that period. Against this backdrop, many of our clients have been seeking to diversify away from public equity beta to mitigate the impact of potential market drawdowns, all while trying to maintain their portfolios' expected returns.

Concurrent with concerns about public market valuations are those associated with the U.S. public pension system's increasing maturity. According to the National Association of State Retirement Administrators (NASRA), the ratio of active participants to annuitants dropped from 2.4x in 2001 to 1.4x in 2016. The aging of the U.S. public pension system has caused persistent net cash outflows, raising the importance of income-producing assets. The impact of advancing plan maturity can be exacerbated in underfunded plans, especially when contribution amounts are less than actuarially required amounts, making it exceedingly difficult to recover from funded-status drawdowns.

Last, most public pension plans have cost of living adjustments (COLAs). Over the last decade, state pension reforms have reduced COLAs, and those reductions have largely withstood challenges in court. Nonetheless, liability inflation sensitivity still persists, both through remaining COLAs and wage growth, making it critical to have asset exposures that pass through inflation costs.

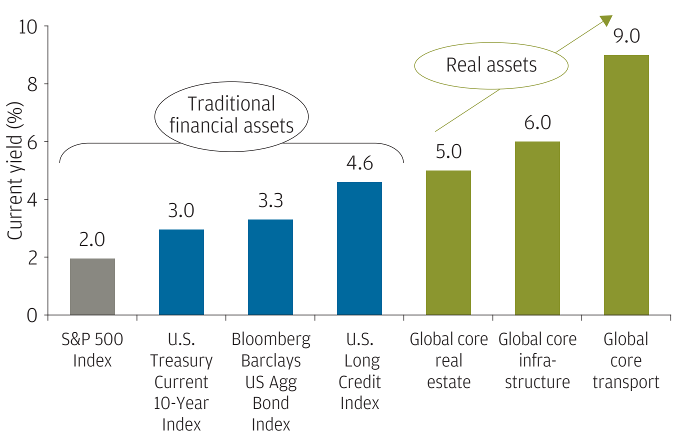
A ROLE FOR CORE REAL ASSETS

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

[3] Pension obligation bonds are taxable municipal bonds that are issued to fund a public pension fund. The spread between the municipal borrowing rate and the plan's discount rate can lead to accounting improvements. However, in the past these haven't always worked out so well economically.

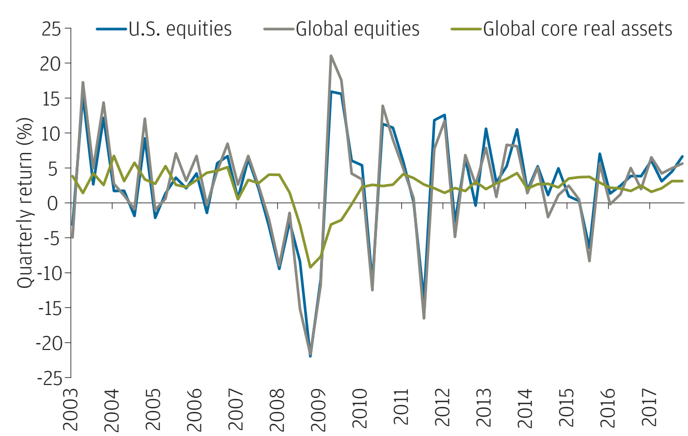
Global core real assets generate two or three times more income than financial assets with less than half the volatility

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



Source: Bloomberg, MSCI, Barclays Capital, 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.

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.

transport assets (maritime vessels, aircraft, 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 public pension portfolios.

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 (**EXHIBIT 1**). The return streams of a diversified real asset portfolio are local and uncorrelated to one another. As a result, compared with traditional asset classes, a diversified real asset 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 public 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 asset 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.[4] It has a meaningful allocation to global core infrastructure (30%) for its yield, inflation sensitivity and downside resilience; finally, it has 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

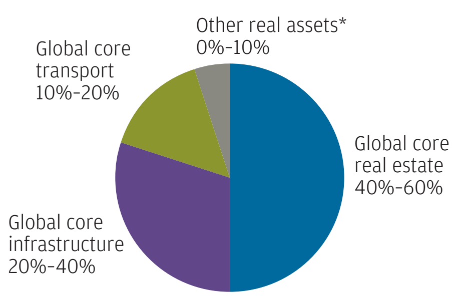
[4] We took an objective, rigorous analytical approach in arriving at this strategic global real estate allocation, using a variety of quantitative techniques and asset allocation frameworks, including mean variance and risk parity. The resulting allocation was designed to provide investors with durable yield, true real estate diversification across geographies and sectors, low volatility of returns, downside resilience and inflation sensitivity. For a deeper consideration of how to build the global core real estate foundation, see Pulkit Sharma, Michael Buchenholz and Winny Budiman, "The role of core real assets in liability-aware portfolios: Return enhancement or volatility reduction?" J.P. Morgan Asset Management, July 20, 2018, https://am.jpmorgan.com/us/institutional/library/the-role-of-core-real-assets.

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 ASSET 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 asset risk for most pension allocations
- **Inflation sensitivity** supports plans with ongoing benefit 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.

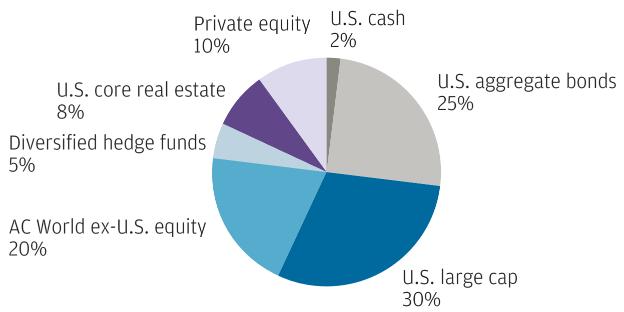
Yield is not guaranteed and may change over time. The portfolio manager seeks to achieve the stated targets/objectives. There can be no guarantee the targets/objectives will be met.

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 public pension plan volatility

EXHIBIT 3: CHARACTERISTICS OF A TYPICAL PUBLIC PENSION PLAN

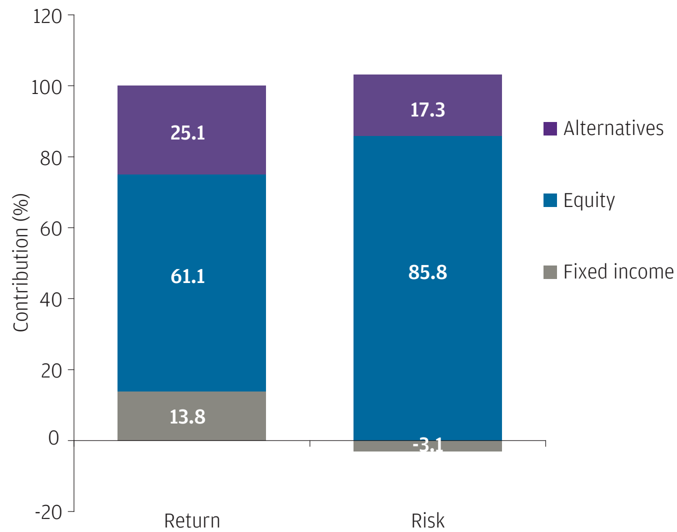
3A: ASSET ALLOCATION



3C: PORTFOLIO PROFILE

Expected return	6.28%
Expected volatility	10.95%
Sharpe ratio	0.388
World equity beta	0.53
Worst quarter return	-13.09%
Maximum drawdown (% of peak)	-30.11%

3B: RETURN AND RISK CONTRIBUTION



Expected return is in arithmetic terms. Sharpe ratio is calculated based on the long-term cash/risk-free rate of 2%. World equity beta, worst quarter return and maximum drawdown are based on 20 years of quarterly historical data, from 1998–2017. Maximum drawdown is calculated assuming quarterly rebalancing and quoted as a percentage of peak.

Source: Public Plans Data, Center for Retirement Research at Boston College, Center for State and Local Government Excellence, National Association of State Retirement Administrators, J.P. Morgan Asset Management.

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.

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

The case study that follows shows how a U.S. public pension plan can benefit from an allocation to core real assets, whether to de-risk or to enhance returns. This is a typical public pension plan portfolio, which was around 70% funded on a Governmental Accounting Standards Board (GASB) 67/68 basis at fiscal year-end 2017. The plan is diversified across financial assets, albeit concentrated in public equities, with a moderate allocation to alternatives across real estate, private equity and hedge funds (**EXHIBIT 3**). As the risk and return contribution chart illustrates, public equities, while contributing positively to returns, are also the largest contributor to risk. Similarly, the fixed income allocations dampen volatility but dilute returns in the asset mix with respect to their weight.

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

What happens if we replace a 5% pro rata slice of this typical public 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 core fixed income dampens volatility due to its negative correlation with risk assets, but also cuts expected return. Adding public equities boosts expected returns but correspondingly increases volatility. However, core real assets improve portfolio metrics across the board. In this example, we see that core real assets:

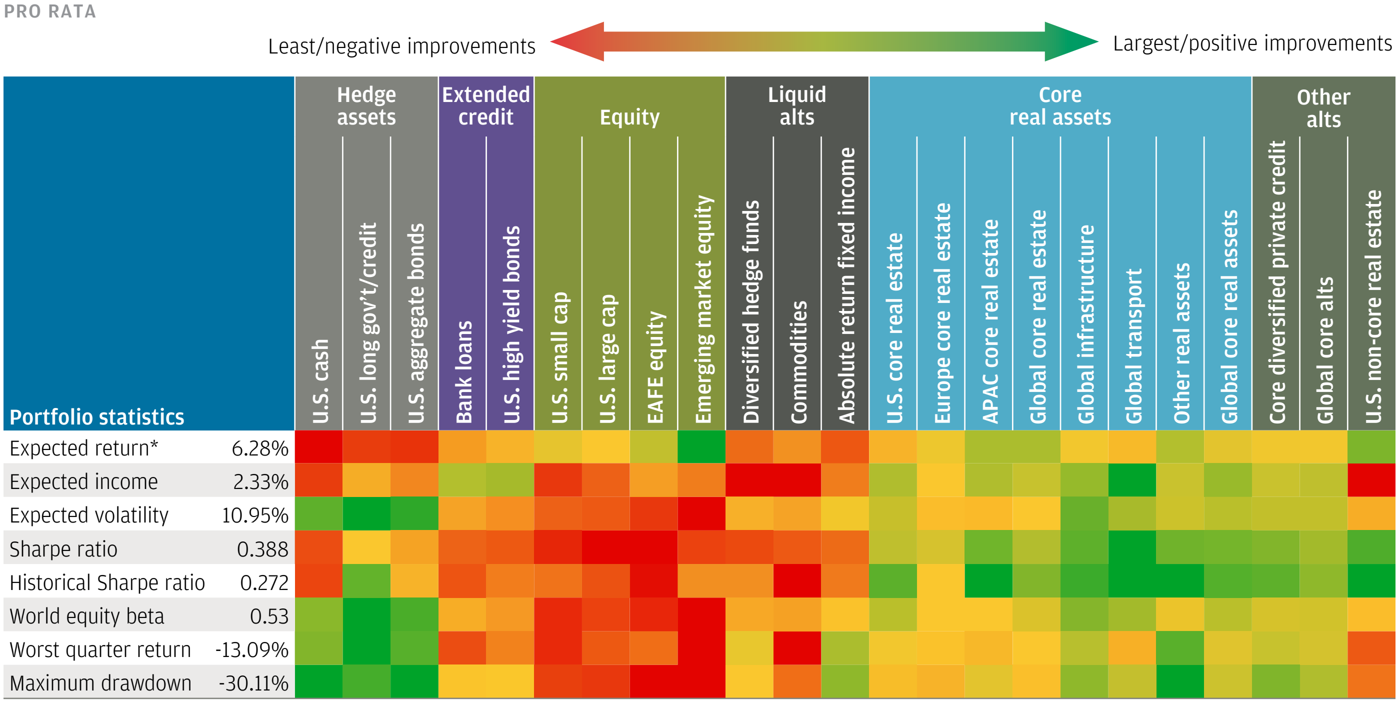
- reduce asset volatility
- increase both expected return and expected income
- enhance the Sharpe ratio on both a historical and a forward-looking basis
- reduce equity beta
- improve return in downside scenarios (e.g., worst quarter return, maximum drawdown)

Replacing a portion of a portfolio with core real assets has a relatively positive impact on portfolio metrics

Exhibit 4 offers insights that allow for gauging the marginal

Replacing a portion of a portfolio with core real assets has a relatively positive impact on portfolio metrics

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



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

Heat map ranks relative improvements for each metric (row). Expected return is in arithmetic term. Sharpe ratio and historical Sharpe ratio are defined as excess return over cash divided by asset volatility. World equity beta, worst quarter return and maximum drawdown are based on 20 years of quarterly historical data, from 1998-2017. Maximum drawdown is calculated assuming no rebalancing and quoted as a percentage of peak.

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 pension portfolios.

Optimizing the funding source

While the analysis above is a useful exercise 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 asset 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 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 volatility (through a reduction in public equity exposure), enhancing return (through a reduction in low yielding fixed income exposure) or a combination of both. Regardless of the plan sponsor's objectives, funding just an incremental 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.

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

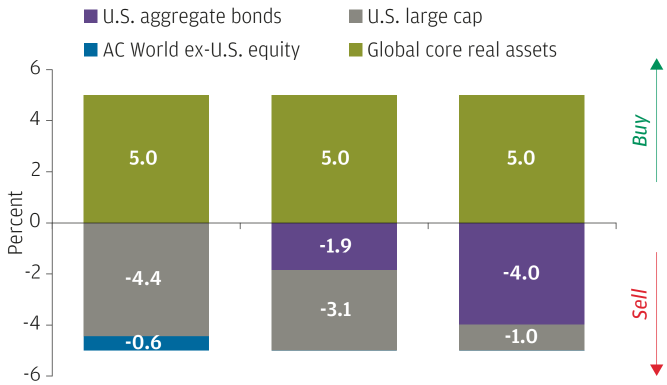
Real assets for risk reduction

In the Risk Reduction scenario, substituting core real assets for public equities increases income and total return potential while simultaneously dampening volatility. Notably, this asset allocation change reduces risk without adding duration to the portfolio. For plans that are deliberately underweight fixed income due to a rising rate view, core real assets are an effective way to use diversification to de-risk rather than relying purely on duration for portfolio ballast.

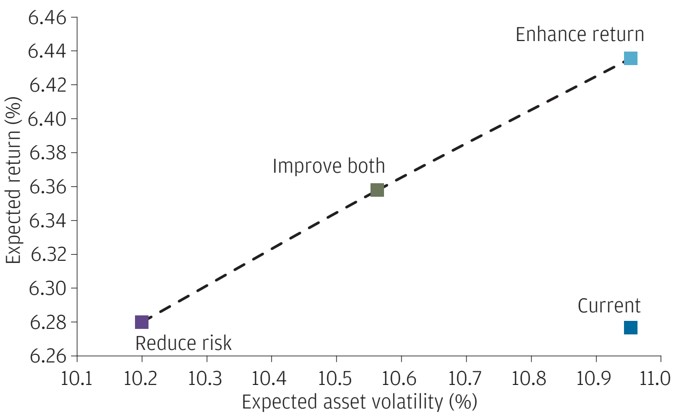
Funding a diversified global core real asset allocation can improve a wide range of metrics

EXHIBIT 5: OPTIMIZATION EXERCISE TO FIND EFFICIENT PORTFOLIOS, WHICH FUND A 5% GLOBAL CORE REAL ASSET 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*	6.28%	0	+8	+16
Expected income	2.33%	+19	+18	+17
Expected volatility	10.95%	-77	-39	0
Sharpe ratio	0.388	+290	+220	+145
Historical Sharpe ratio	0.272	+319	+243	+172
World equity beta	0.53	-434	-244	-39

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

Expected return is in arithmetic term. Green shading indicates a 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 paper for more information on the risks and limitations 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 volatility. Analyzing GASB 67/68 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 likely cannot 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 portfolio volatility.

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

Determining the most appropriate real asset 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 asset 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 plans.

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 plan liabilities. Core real assets can help plans de-risk through diversification without shifting a large portion of assets to traditional fixed income. For under-funded plans or those with high return targets, substituting core real assets for fixed income can enhance total return potential without a corresponding increase in asset volatility. For plans that have telegraphed current and future expected return reductions, substituting core real assets for public equities can reduce risk while increasing income and close the gap between capital market expectations and return assumptions, which manager selection alone is unlikely to bridge. Core real assets or a broader core alternatives allocation—with their higher forward-looking projected returns and lower volatility than public equities—can be an elegant solution for plan sponsors trying to close that gap. And sponsors may accomplish this without increasing 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.

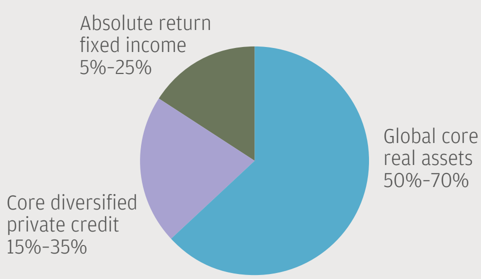
Core diversified private credit	Absolute return fixed income
Return enhancement, more flexibility than private equity from a liquidity perspective, diversify traditional fixed income issuer exposure	Tactical duration and credit spread exposure

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 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, 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 targets/objectives will be met.

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J.P. MORGAN GLOBAL ALTERNATIVES

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