Use of Leverage in Strategic Asset Allocation

July 17, 2017

What We Hope to Accomplish Today

Discuss

- Leverage as a tool in Asset Allocation – Understanding the risks and rewards
- Governance requirements for the use of leverage
- Market Environment - Challenges and opportunities
- Vision and path forward

Refresh

- Asset Liability Management Timeline (Progress and Goal)

External Speaker: Alan Emkin, PCA

GOVERNANCE OF LEVERAGE USE FOR ASSET OWNERS & THEIR BOARDS

CalPERS

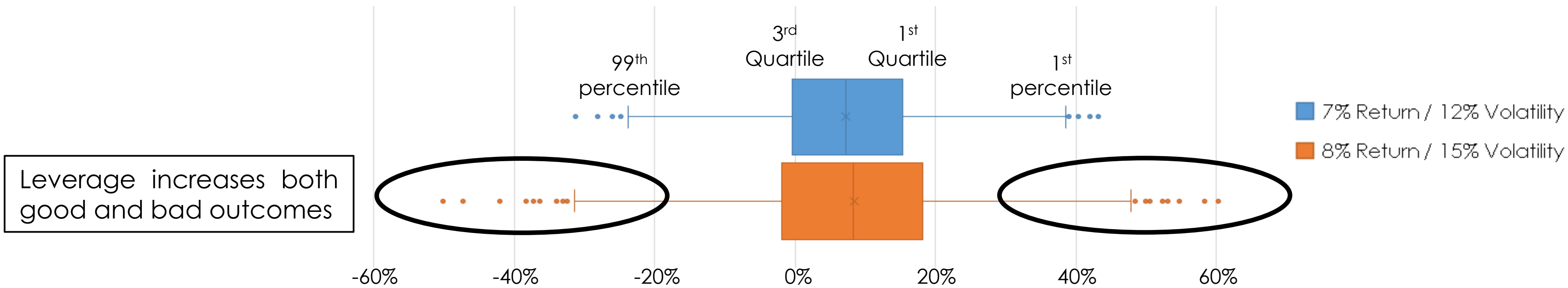
July 2017

PCA PENSION CONSULTING ALLIANCE

Governance of Leverage Use

- Leverage is a tool to manage risk <u>and</u> return
- The more predictable the asset being levered, the more leverage may potentially be applied (but perhaps should not be)
- The more predictable the leverage/financing costs, the more leverage may potentially be applied (but perhaps should not be)
- Leverage is a double-edged sword

Theoretical Distributions of Annual Returns (Simulation Based)



Notes:
Levered return assumes 3% cost of debt. 2,000 simulations per distribution.

Governance of Leverage Use

- Addressing leverage in a comprehensive manner is best practice
  - Examining program/class level <u>and</u> Total Fund level limits/protocols is prudent

- The Board sets risk and return policy, and as such, the Board should define and specify how and when leverage should be used

- Leverage is often used to "solve" for a return target
  - Increases complexity
  - Increases uncertainty
  - Increases potential for disproportionate unfavorable outcomes during a crisis

- A key issue is how much delegation for leverage decisions

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Governance of Leverage Use

- Leverage introduces additional complexities and liabilities
- The downsides of leverage often become apparent at the worst times
  - What was once thought of as a safe/diversifying asset suddenly is not
- Leverage introduces additional uncertainties on the liabilities side for a plan sponsor
  - e.g., additional cash-flow uncertainties
  - Implications should be incorporated into an asset-liability study
- Throughout history, leverage has both helped and hurt CalPERS

External Speaker: Lionel Martellini, EDHEC

Use of Leverage in Strategic Asset Allocation

CalPERS Offsite Board Meeting, July 17, 2017

An Academic Perspective on the Use of Leverage in Strategic Asset Allocation Decisions: What, Why, and How

Lionel Martellini
Professor of Finance, EDHEC Business School
Director, EDHEC Risk Institute
Scientific Advisor, ERI Scientific Beta

Research for Business

London - Nice - Singapore

Outline

- Use of Leverage in SAA: What is Leverage?
- Use of Leverage in SAA: Why use Leverage?
- Use of Leverage in SAA: How to use Leverage?

EDHEC-RISK Institute

Key Take Away from this Presentation

- Key take away: Investors need to define a strategic leverage target at the total fund level, including both directly controlled and embedded leverage, and explicitly measure and manage the associated risks, as opposed to having an uncontrolled amount of leverage opportunistically defined at the level of internal and external program managers.

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Use of Leverage in SAA: What is Leverage

- **What is leverage?** Leverage is the investment strategy of using (…) various financial instruments or borrowed capital to increase the potential return of an investment. (Investopedia)

- Two main insights from this simple definition:
  - Leverage may explicitly involve borrowing or come without (explicit) borrowing through instruments with embedded leverage;
  - Leverage seems attractive since it leads to increasing potential return, but there must be an impact on risk as well.

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Use of Leverage in SAA: Why use Leverage

- **Why use leverage?**

- Leverage allows investors to change the payoff of an underlying investment strategy.

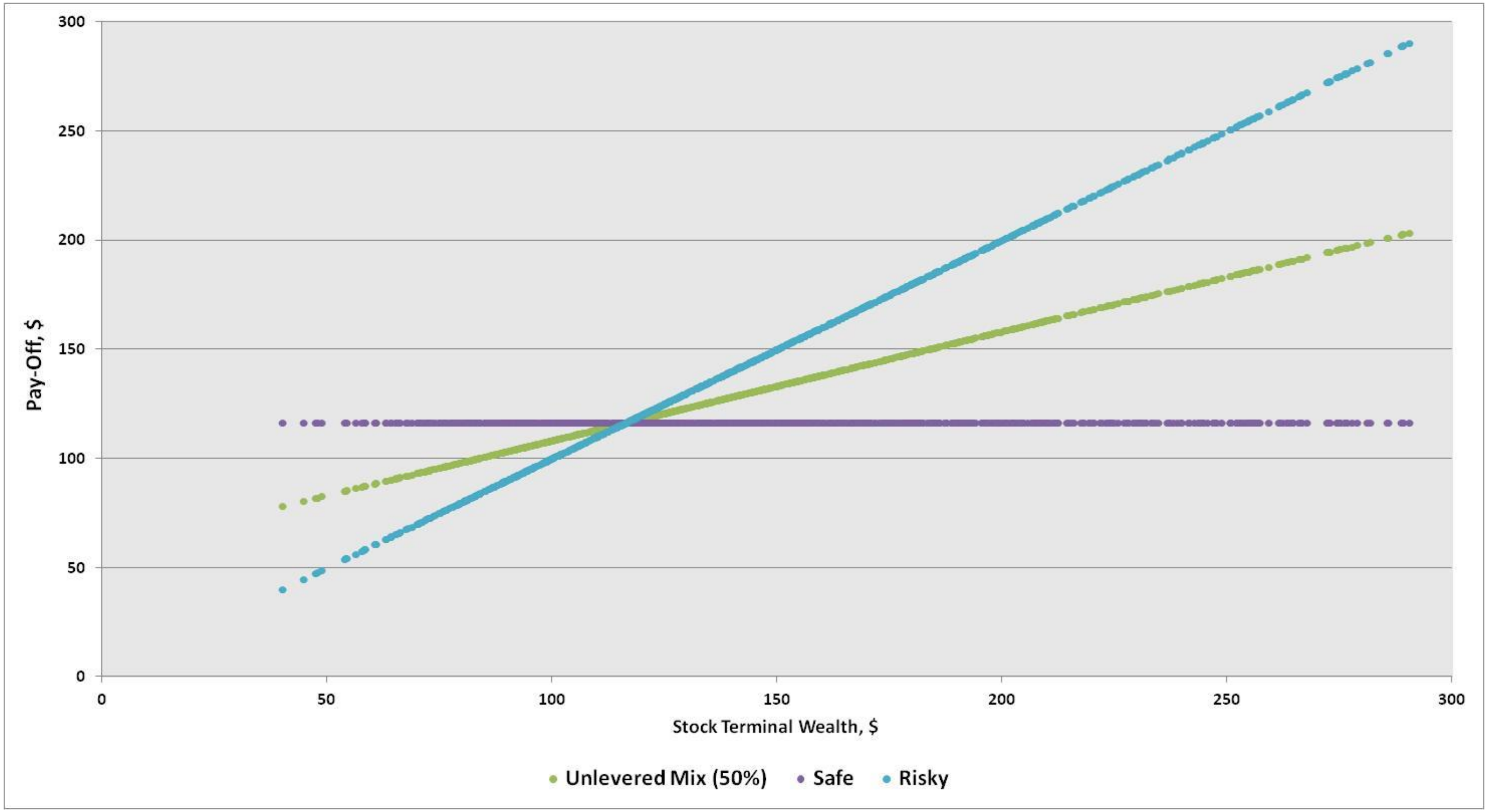
- Due to an increased access to the upside, a leveraged strategy requires a lower return on the underlying risky portfolio to achieve a target level of performance; this is an attractive opportunity for investors who need more upside potential.

- Of course, leverage also leads to a corresponding increase in exposure to downside risk.

EDHEC-RISK Institute

Use of Leverage in SAA: Why use Leverage

- Unlevered allocation to safe vs. risky: 0%, 100%, 50%/50%



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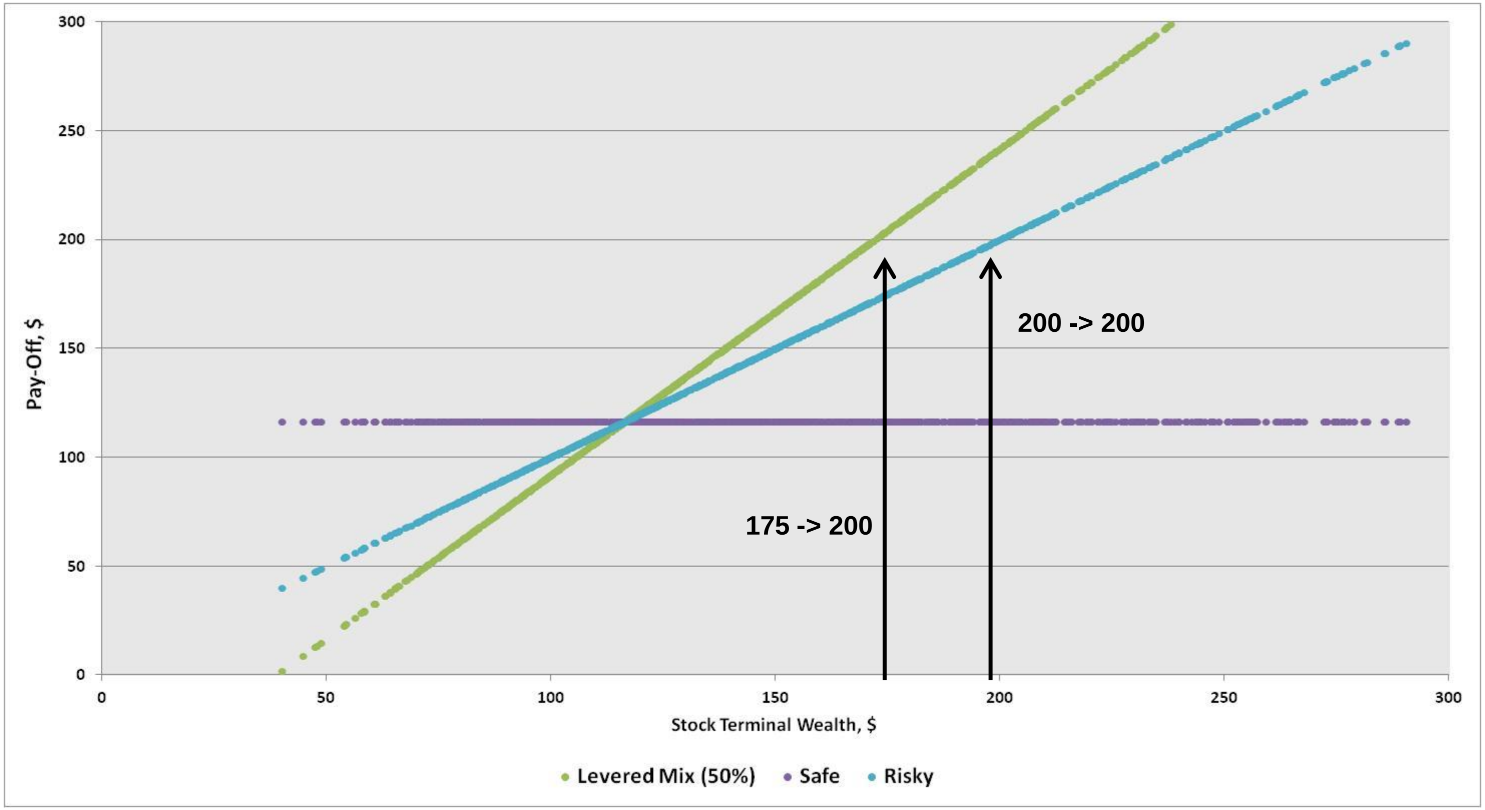
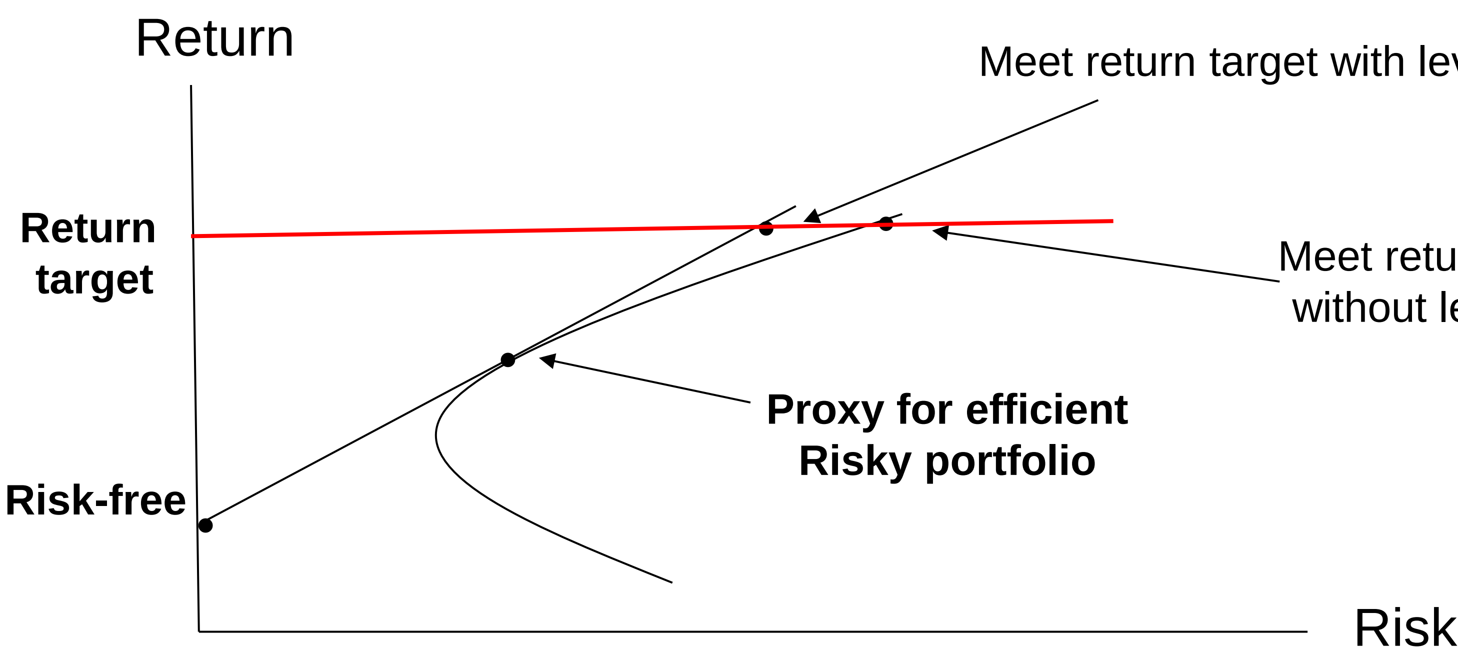
Use of Leverage in SAA: Why use Leverage

- Levered allocation to risky vs. safe: 0%, 100%, -50%/150%



- Increase in upside potential: with leverage investors need a lower performance on the risky asset to reach a given target.

A Different Perspective on Impact of leverage on Portfolio Risk



- The use of leverage allows investors to meet their return target without decreasing the risk-reward ratio of their portfolio.
- Leverage leads to an increase in risk, but the increase is lower compared to an attempt to meet the return target without leverage.

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Use of Leverage in SAA: How to use Leverage

- **How to use leverage?**

- A key distinction exists between using leverage within instruments versus using leverage at the overall allocation level.
  - The former approach can be executed via investments in risk parity funds, hedge funds, private equity funds or real estate funds, most of which tend to have built-in leverage.
  - The latter use of leverage is often implemented by pension plans via a derivatives-based matching of liabilities or implementation of equity and fixed-income exposure on the asset side via futures or swaps.

- Derivatives can also be used to manage the risks associated with leverage.

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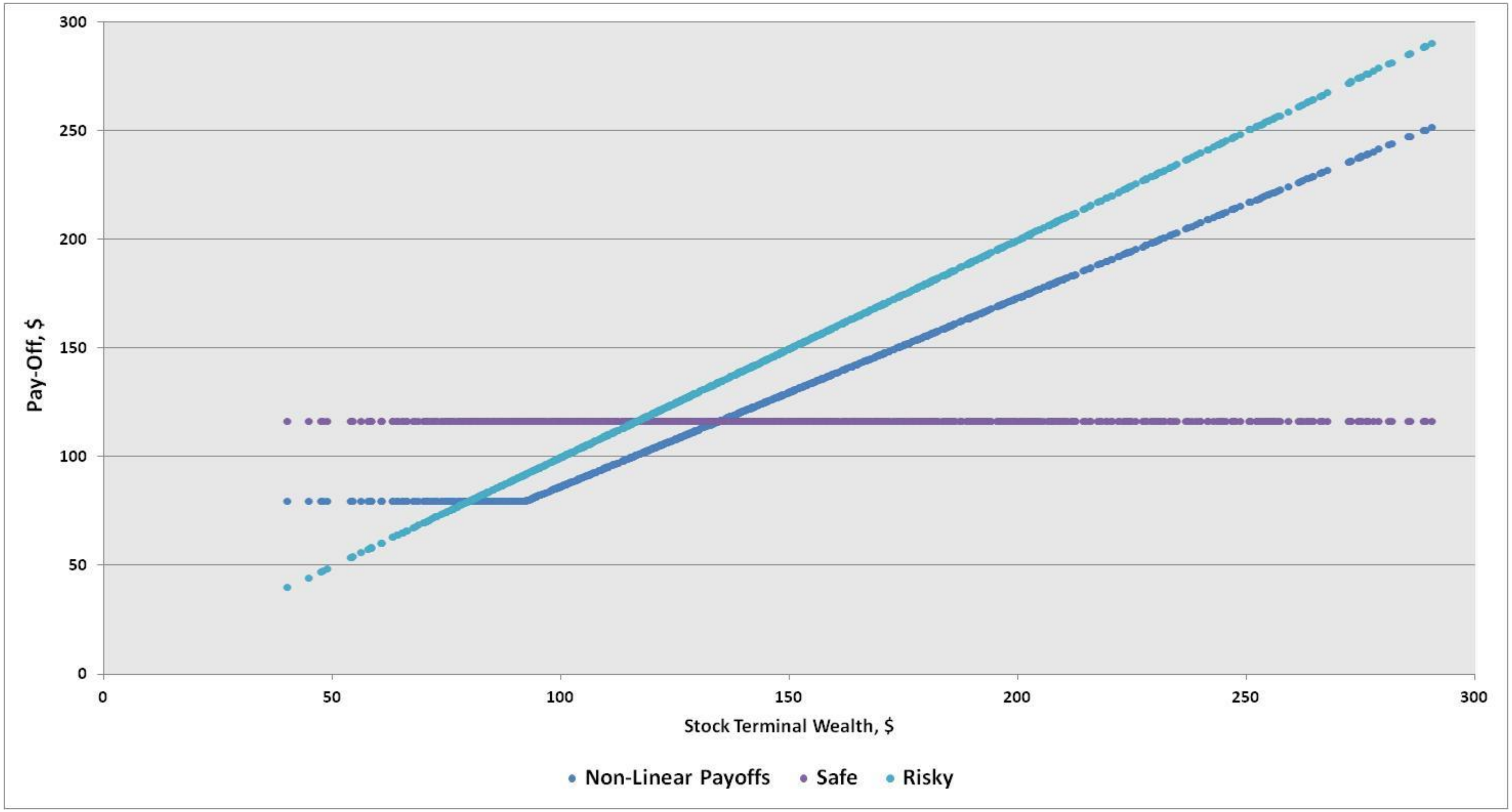
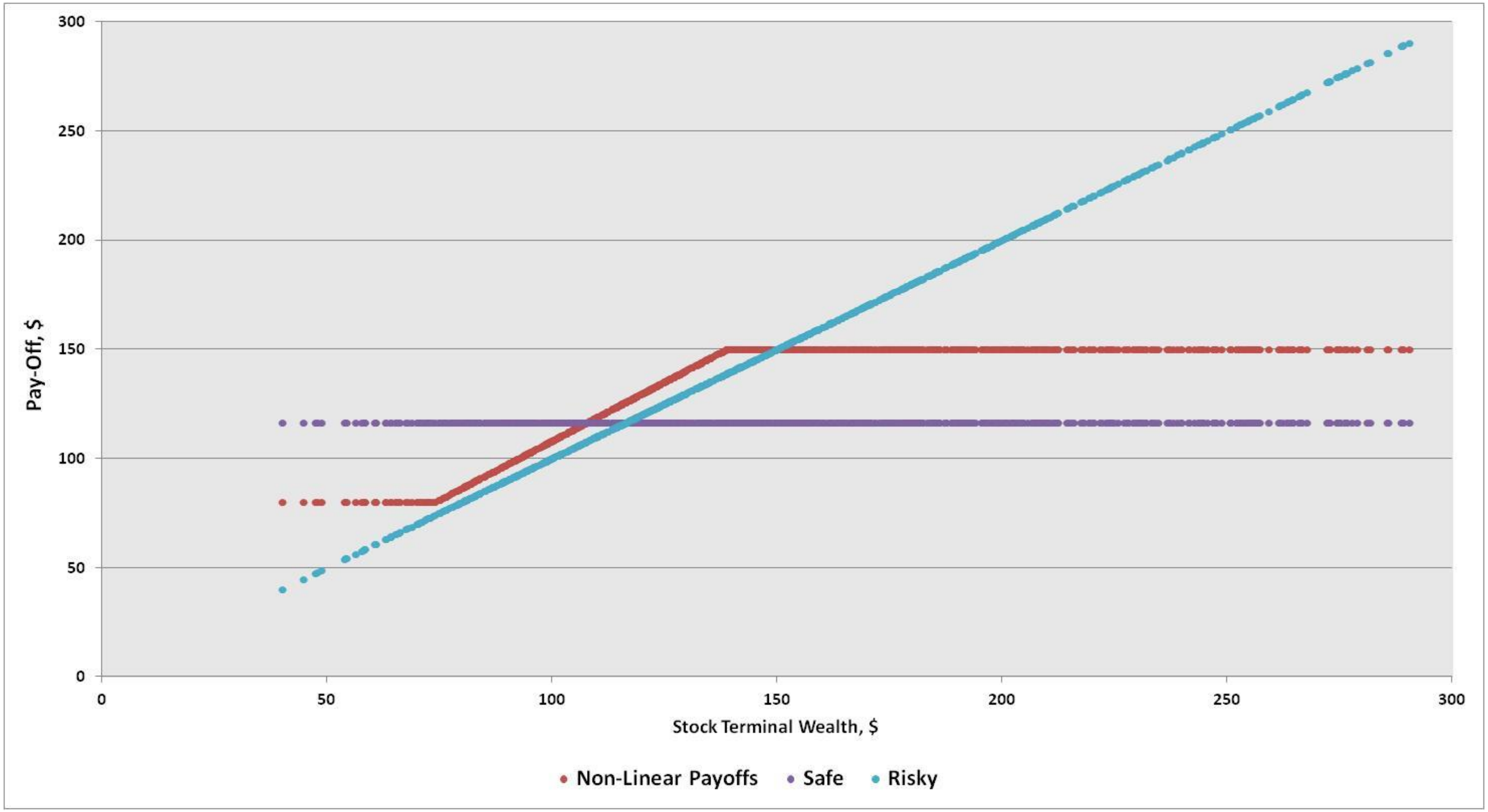
Risk Control for Downside Protection with Options

- Risky asset here can be regarded as levered or unlevered:



Reducing the Cost of Downside Protection

- Risky asset here can be regarded as levered or unlevered:



External Speaker: Patrick Lighaam, Wilshire Associates

WILSHIRE ASSOCIATES

Wilshire Consulting

Governance of Leverage for Asset Owners and their Boards

Patrick Lighaam, Managing Director

July 17, 2017

Tools for Optimizing Risk - Return

The tools available to investors for enhancing the portfolio risk/return include:

- Diversification (more efficient beta mixes)
- Illiquid investments (capture illiquidity premium)
- Active management (harness alpha opportunities)

Leverage is another potential tool that investors often…

- Under-utilize
- Misunderstand
- Consider to be extremely risky

Types & Purposes of Leverage

The types and uses of leverage have changed over time

- Traditionally used to…
  - ‘Enhance’ the return profile of low/modest risk & return assets (real estate)
  - Directionally increase existing portfolio risks (private equity)
  - Exploit narrow market opportunities or dynamically adjust market positions (hedge funds)
- Nowadays leverage is also used to…
  - Hedge liabilities (corporate DB plans)
  - Achieve similar returns but through a more diversified portfolios (risk parity)
  - Access alternative risk premia, tactically position portfolios and to generally hedge or adjust market risk (hedge funds, tail-risk, etc.)

Leverage is established in different ways and not always under direct control

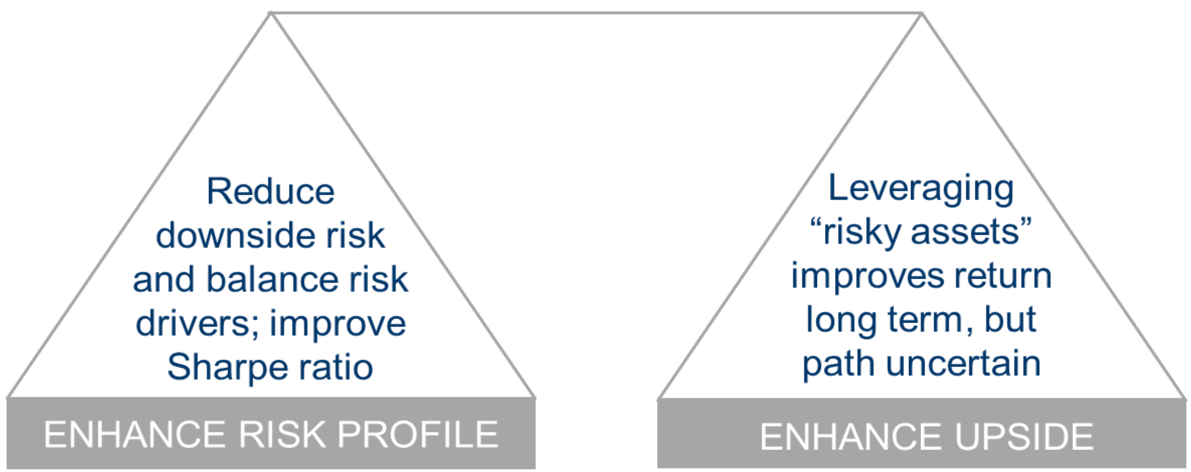
- Embedded in private equity and infrastructure investments
- Explicit through recourse and non recourse debt in private real estate
- Directly controlled, derivative based in public markets

Leverage Can Fulfill Dual Purpose

Aggressive return targets can contribute to the pressure to pursue larger allocations to return/risk-seeking assets, often at the expense of lower returning, diversifying assets

Leverage can serve as a powerful tool for risk reduction and improved diversification while meeting return targets

Leverage in stable, cash flow generating assets (real estate, infrastructure) can enhance the return profile (e.g. similar embedded leverage used in private equity structures enhances returns as well, but with increased short-term uncertainty)



What is the more optimal place to take leverage?

Governance & Risk Management

Even though the merits of leverage are widely recognized, investors are often reluctant to more aggressively adopt the usage of leverage

- Leverage has ‘a bad reputation,’ due in part to its misuse and role in several large bankruptcies during times of stress (e.g. LTCM, Orange County, Lehman Brothers)

Leverage does necessitate sophisticated risk management

- Liquidity risk (leverage assets that naturally self-finance through their cash flows)
- Counterparty risk (reduced through use of listed derivatives and improved regulation)
- Market risk (different impact from leveraging risky assets versus diversifying assets)

Current management of leverage

- Leverage is currently predominantly managed locally in each of the individual investment programs
- However, a potential overlap of the risks can accumulate at the total portfolio level
- Management of exposures and liquidity are more challenging in a decentralized structure

Governance & Risk Management

Extending the use leverage can reduce downside risk, balance contributions to risk and enhance returns

- Investors can capitalize on these benefits consistently if leverage is used "prudently"

Appropriate governance and oversight are critical

- With an impact on multiple segments of the portfolio and a multitude of risks, a governance structure that regulates leverage at the total fund level is crucial
  - especially when seeking to fully exploit the potential benefits of utilizing (more) leverage
- Objective is to adopt a standardized measure of leverage that allows for aggregation of leverage to the total portfolio level including explicit and embedded leverage
- Ultimate decision making on the application of leverage, dynamic adjustments in leverage and implementation methods to achieve that leverage can be centrally coordinated
- Identify not only what investment purpose is sought with leverage, but also develop contingency plans when certain risks (e.g. liquidity) materialize during stressed market periods

CalPERS Investment Office

Trust Level Portfolio Management

Leverage | Where to Find It

Different asset classes and institutions…

Pension Funds

Corporations

Public Equity

Real Estate

Private Equity

Banking Institutions

Hedge Funds

Securities Lending

In numerous forms…

Subscription Financing

Notional Leverage

Non-Recourse Debt

Recourse Debt

Credit Accommodation

"*Leverage* is the use of fixed costs in a company's cost structure…"

CFA Institute

"What is 'Leverage'
Leverage is the investment strategy of using borrowed money: specifically, the use of various financial instruments or borrowed capital to increase the potential return of an investment. Leverage can also refer to the amount of debt used to finance assets. When one refers to something (a company, a property or an investment) as "highly leveraged," it means that item has more debt than equity."

INVESTOPEDIA

Measured in various ways…

Debt to Equity

Loan-to-Value Ratio

Net Exposure

Liquidity Costs

Leverage in Context | Use by Asset Owners

Use of leverage by Pension Funds has evolved over time

Historically (1990/2000's):

- Mostly focused on return seeking through embedded leverage in Private Assets, or Hedge Funds

Contemporary Use:

- Focused on balancing risks and seeking additional returns to meet the unique objectives of each Pension Fund:
  - Hedging Liabilities (Liability Driven Investing)
  - Risk Managed Strategies (Tail Hedging, Risk Parity, Trend Following)
  - Private Assets, Opportunistic Strategies, Risk Premia Strategies

Leverage in Context | Use by Asset Owners

Contemporary Use Examples:

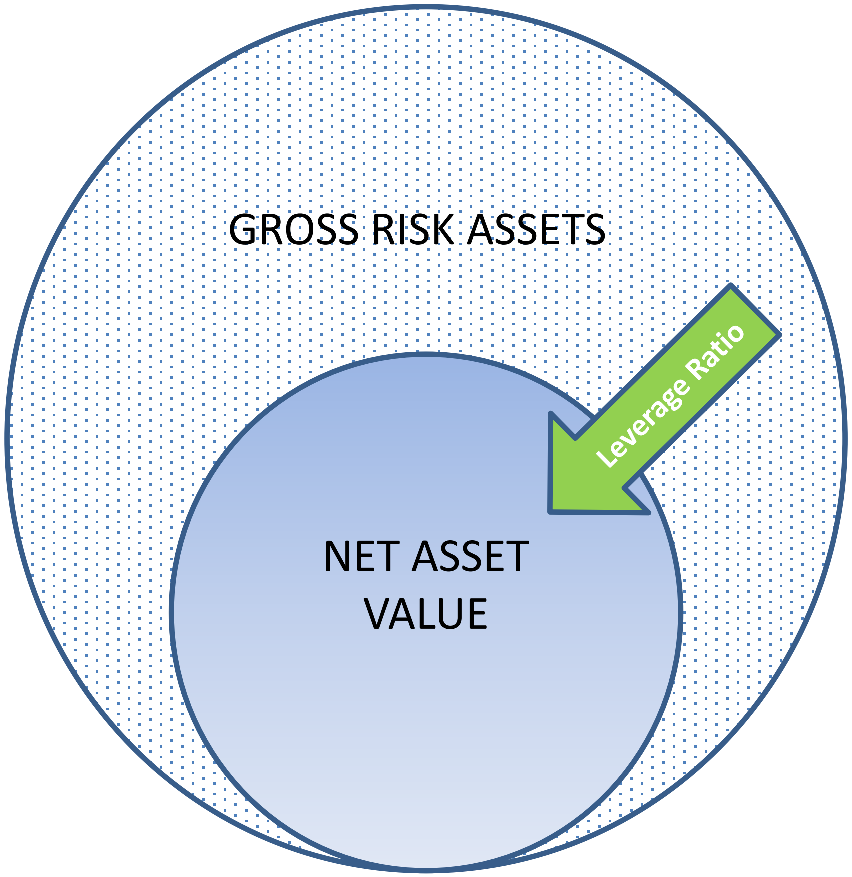
- Healthcare of Ontario Pension Plan utilizes a Liability Driven Investment process with net assets of appx. $70B and gross asset exposure of $164B, 2.34x, 134% leverage.
- Missouri State Employees Retirement System has deployed Risk Parity at the Total Plan level
- Ontario Teachers Pension utilizes up to 40% leverage at the Total Plan level to fund private investments and balance their asset allocation

Each fund has chosen unique portfolio construction solutions that utilize leverage in different ways, what is not unique is that their governance of leverage is applied from a Total Fund perspective.

Leverage in Context | What is it?

- Method of balancing **risk** adjusted **return** within a portfolio by acquiring additional economic exposure without committing the full amount of capital that an equivalent cash investment would require.
- Function of the unique risk, cash flow profile, and volatility of the assets it's used to purchase; it amplifies the underlying risk characteristics that were already present.
- Linked to liquidity risk - if the levered asset or portfolio does not produce enough cash flows or have enough collateral to support the leverage it must be supported by other means, or become insolvent.

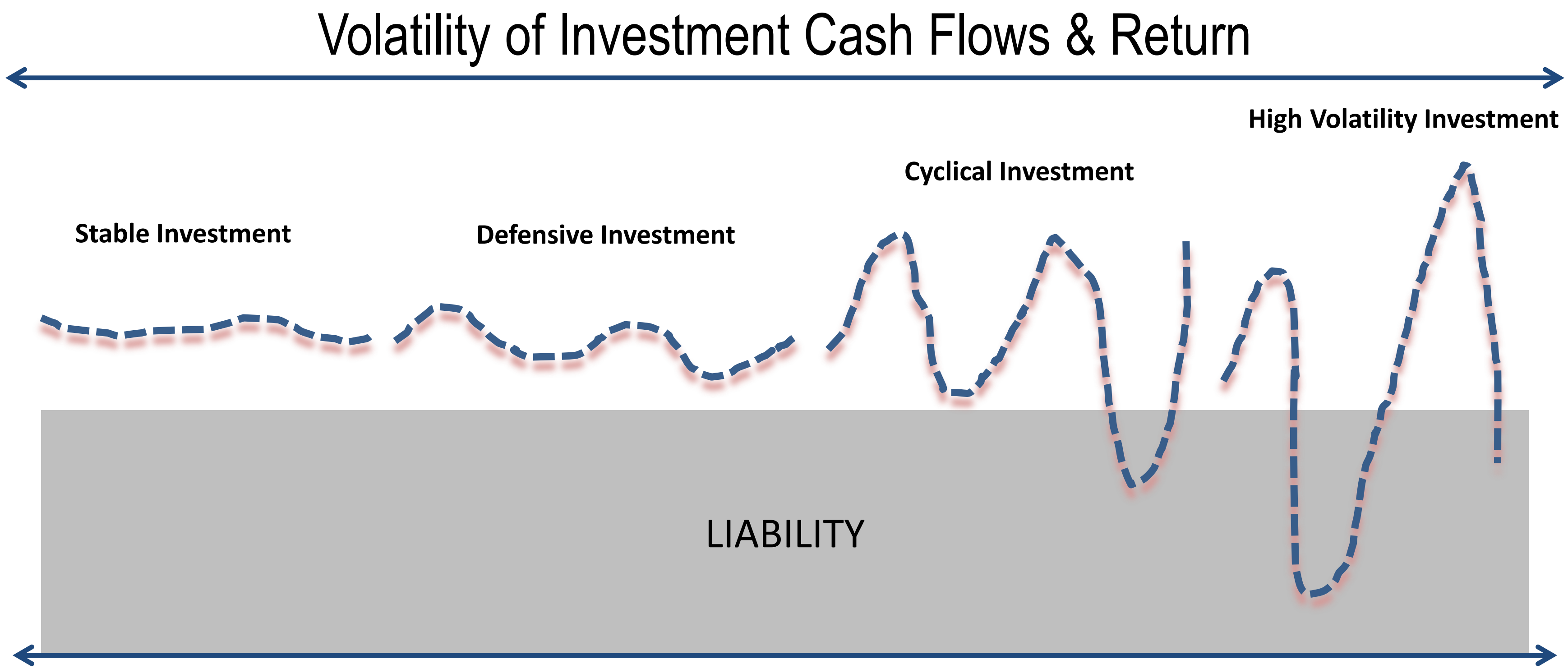
Leverage in Context | Basic Concept - Leverage vs. Risk



- **Gross Risk Assets Exposure** is the total contractual ownership of economic exposure to risky assets
- **The Net Asset Value** represents the value of gross assets minus the value of liabilities utilized to acquire those assets
- The level of risk to the Net Assets is determined by the risk (volatility) of the Gross Risk Assets and the **leverage ratio** (Gross Market Exposure - Cash Equivalent / Net Asset Value)

Example: Gross Risk Assets Volatility = 15
Leverage Ratio = 1.3X , 33% Leverage
Net Asset Value Volatility = 19.5

Leverage in Context | Risk > Underlying Assets



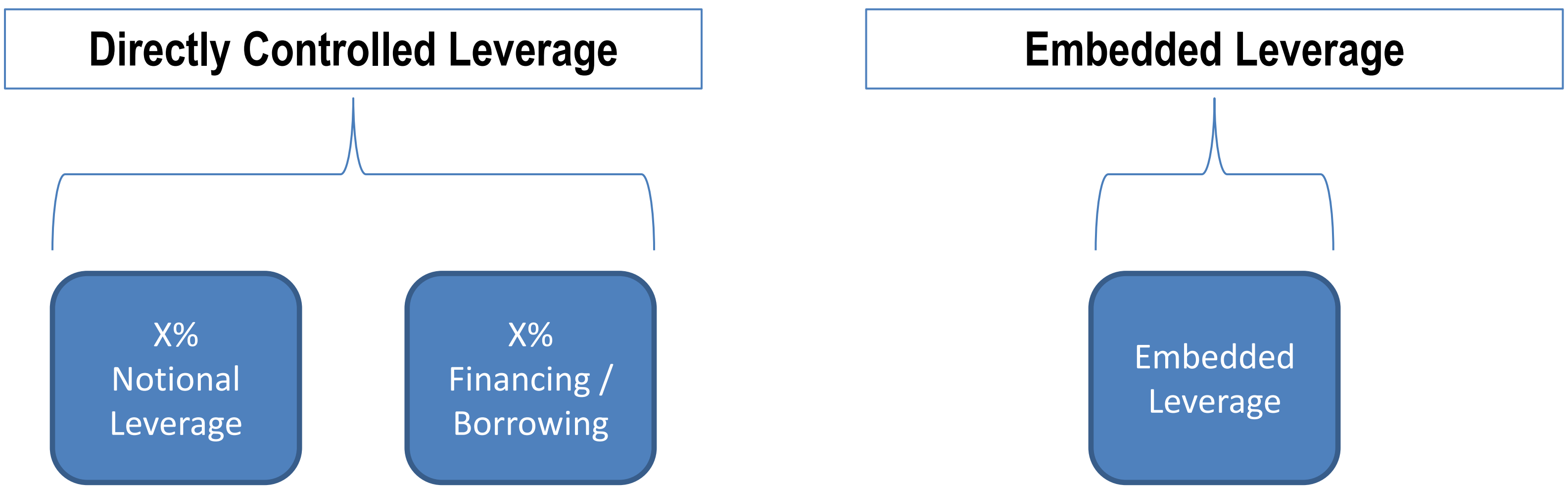
The inherent riskiness of the asset or investment being levered should inform the governance process & where to set constraints

Leverage in Context | Governance Challenges

- Application of leverage is currently managed primarily at the Program level while many of the risks can accrue to the Total Fund, i.e. contingent liquidity demands, rebalancing impacts.
- Alignment of controls on leverage between internal and external managers
- Coordination of funding, liquidity management, and exposure management for levered exposures can be difficult in a distributed governance framework
- Transparency & measurement
- For all of these reasons, leverage at the Total Fund is kept at a relatively low level overall. Governance would need to be re-aligned and centralized before leverage could be increased

Framework | Evolving Leverage Governance

Policy limits set at the Total Fund Level



Example

- Internal Staff directly control leverage decision
- X% Limit Notional Leverage at Total Fund
- X% Limit Financing/Borrowing at Total Fund

Example

- External agents control leverage decision
- Constraints by Policy Benchmarks, % allocation to Asset Class / Strategy and manager guidelines

Framework | Simplify Exposure Measurement

Goal: Move to a common exposure measurement that can be aggregated at Total Fund level

$$\frac{Gross\ Market\ Exposure\ - Cash\ Equivalent\ *}{NAV}$$

*Aligned with internal Liquidity Program guidelines

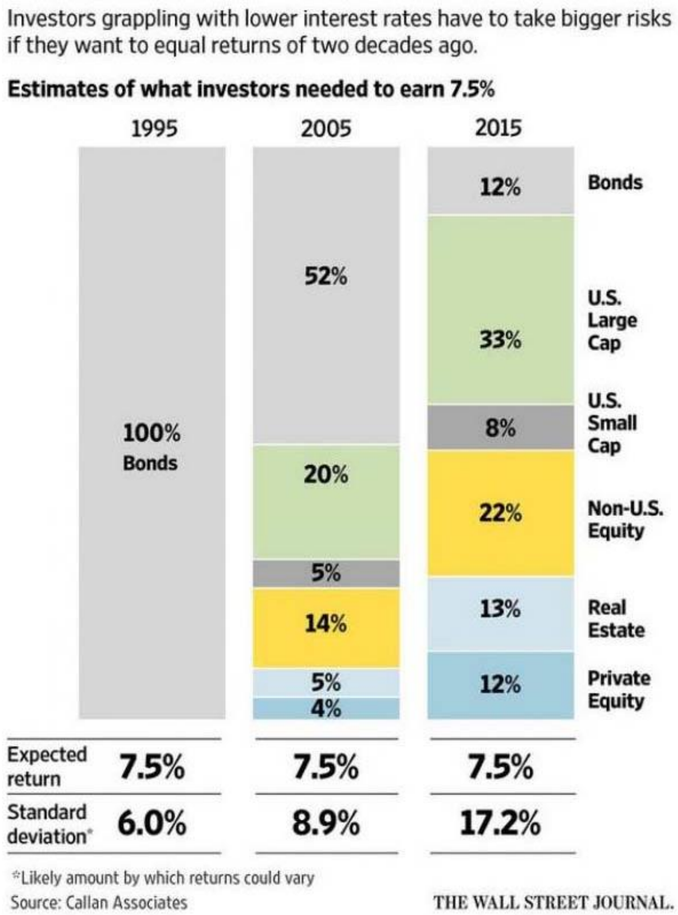
Framework | Choice of Path for Applying Leverage

Risk of the underlying assets and complexity of strategy should determine the implementation path for applying leverage

Economic Sensitivity of Cash Flows / Return Volatility

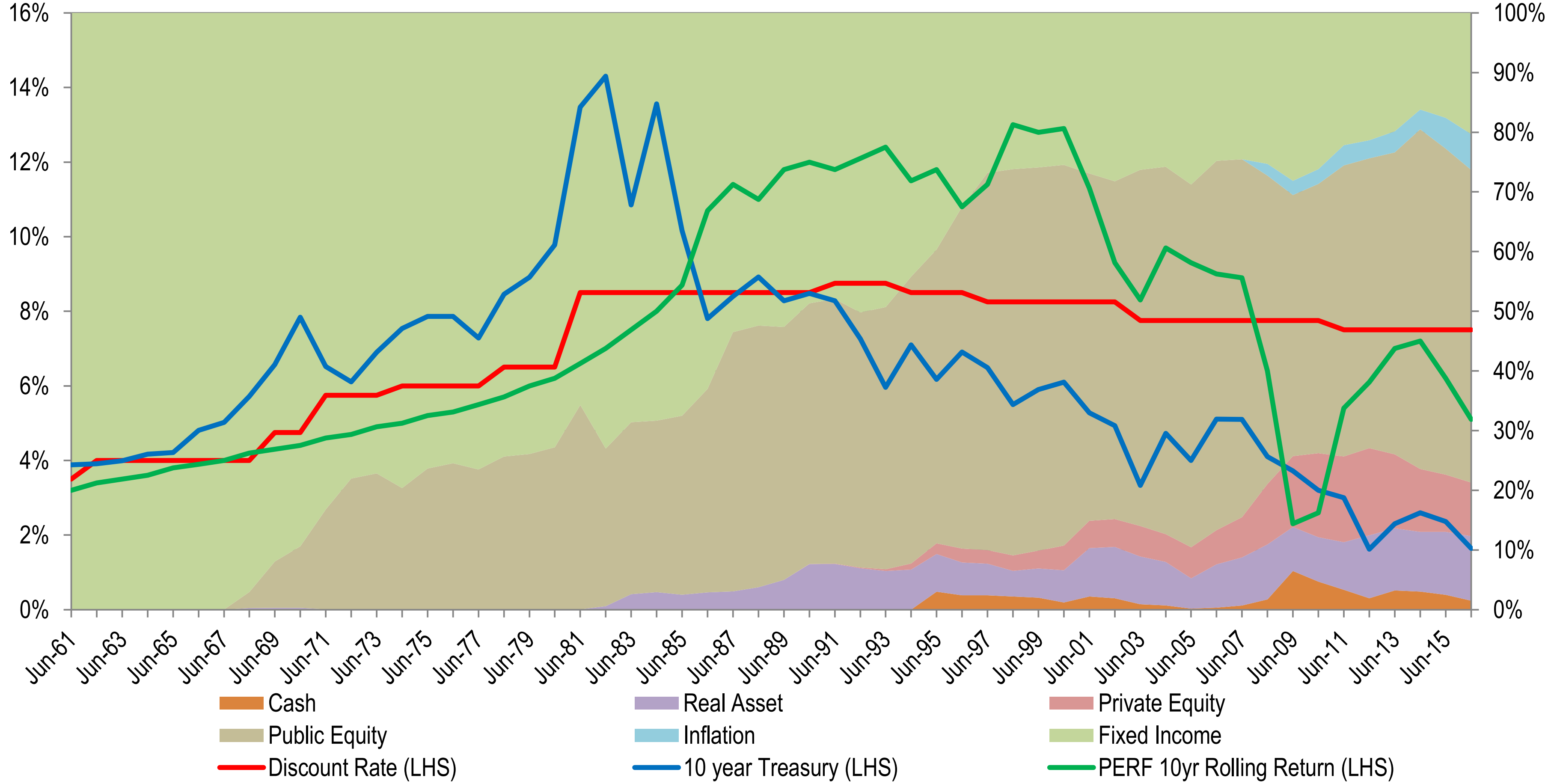
Complexity & Borrowing Cost	LOW	HIGH
LOW	Fund Using: - Direct Control - Notional Leverage - Recourse	Fund Using: - Direct or Indirect Control - Favors Term borrowing - Favors Non Recourse over Recourse
HIGH	Fund Using: - Depends on specific Assets - Direct or Indirect Control - Favors Non Recourse over Recourse	Infrequent – implement through Non Recourse vehicle

Market Environment | Investments



Current investment environment anticipates 2x the risk needed to generate the same return as compared to a decade ago…

CalPERS Historical Allocation
Discount Rate,10yr Rolling Return, and 10yr US Treasury Yield



- Data Source: CalPERS Comprehensive Annual Financial Reports (CAFR) for Discount rate, 10yr rolling returns and allocation
- Data Source: Bloomberg for 10YR US Treasury Constant Maturity Rate (H15T10Y)
- Inflation asset class was not provided as a separate line item in the 2014 & 2015 CAFRs. Used the asset allocations from the AA-Spreadsheet

Market Environment | Implications

> *The decline in the natural rate of interest, or r-star, over the past decade raises three important questions. First, is this low level for the real short-term interest rate unique to the U.S. economy? Second, is the natural rate likely to remain low in the future? And third, is this low level confined to "safe" assets? In answer to these questions, evidence suggests that low r-star is a global phenomenon, is likely to be very persistent, and is not confined only to safe assets.*
>
> – John Williams, San Francisco Fed President

Presents both a challenge and opportunity for Asset Owners

How do we maintain investment returns that are sufficient to meet pension promises?

Challenge for investors & other market participants to avoid excessive risk taking/search for yield

Opportunity of low borrowing costs to apply leverage prudently to adjust risk and return profile of portfolio

Source: "Three Questions on R-star" FRBSF Economic Letter, February 21, 2017

Market Environment | CalPERS Challenges

The forward return environment is challenging and our plan is maturing…

Many difficult choices – what is the right balance?

Choose a lower risk profile & adjust contribution levels.

→ The Discount Rate is already going towards 7%

Move to a higher risk portfolio in a traditional way – adding more Growth Assets, Private Assets (embedded leverage)

Explore alternative ways to reshape the portfolio risk/return distribution including improved utilization of Total Fund leverage as a tool

Leverage in Context | Research & Peer Reviews

Work towards refinement…

- Reviewed research & case studies of leverage use applications, definitions, measurement, and governance frameworks
- Conducted surveys & discussions with US, Canadian, and European peer pension funds and institutions

General observations of successful management of leverage use include:

- Have concrete objectives for the use of leverage
- A governance framework that is applied at the Total Fund level
- Utilize forward looking risk metrics in addition to traditional accounting based metrics (e.g. ex ante volatility estimates and scenario analysis)
- Centralize *funding* and *liquidity* management decision making at the Total Fund level

Vision & Path Forward

Current circumstances and portfolio priorities necessitate evolution in how we think about and utilize leverage

FROM		TO
Distributed leverage governance processes with limits established at the Program level	➡	A centralized governance framework that facilitates improved Trust Level decision making

Desired Outcomes & Capabilities

- Holistic & comprehensive understanding of the leverage we are taking
- More actively controlled application of leverage with policy limits set at Total Plan level
- Centralization of funding and liquidity management processes
- Greater internal control and better alignment with managers applying leverage
- Explicit focus on balancing portfolio priorities in determining where and when to apply leverage

Use of Leverage | Aligning Portfolio Priorities

Targeted use of leverage to address Portfolio Priorities

1. Protect the Funded Ratio
   (mitigate severe drawdown)
2. Stabilize Employer Contribution Rates
   (manage overall volatility)
3. Achieve Long-term Required Rate of Return
   (over the long run, but not in every market environment)

Leverage to change the risk distribution (→ 1, 2)

Leverage to generate additional returns (→ 3)

Next Steps | 2017 Milestones To Support Board ALM Decision Making

Asset Liability Management (ALM)

Ongoing CalPERS Board Review and Decisions

Bolded items are actionable by Board Committees and/or Board of Administration

2017

January

Educational Workshop:

- CalPERS adopts an asset allocation mix that lowers investment risk but largely keeps investment strategy unchanged

February

Board Adopts:

- **Modifications to Funding Risk Mitigation Policy and temporarily suspends**

April

Educational Workshop:

- Private asset roles and benchmarks

FAC Review:

- Affiliate Funds Valuations

June

IC Approves:

- **Capital Market & Economic Assumptions for 2018-2028 July**

July

Release FY 2016-17 Investment Returns

Educational Forum:

- Use of leverage in strategic asset allocation decisions

September

FAC Review:

- Notification of Risk Mitigation Policy Thresholds (Policy temporarily suspended)
- Negative cash flow analysis and strategic approach
- Pension Funding Level & Risk Report

October

CalPERS Educational Forum:

- Education and engagement opportunity with employers and other stakeholders

November

Educational Workshop:

- Candidate portfolios for strategic ALM

FAC Review:

- Experience Study that looks at lifespan, workforce changes, and payroll trends

December

First Opportunity for Board to adopt:

- **Strategic asset allocation mix**
- **Actuarial assumptions**

2018

February

Second Opportunity for Board to Adopt:

- **Strategic asset allocation mix**
- **Actuarial assumptions (tentative pending Board decision in December)**

April

FAC Review:

- Affiliate Funds Valuations which may include asset allocation mix

July

CalPERS Implements:

- Board adopted strategic asset allocation for PERF

September

FAC Reviews:

- Notification of Risk Mitigation Policy Thresholds (Policy temporarily suspended)

November

FAC Review:

- Use of leverage in strategic asset allocation decisions

2017-18 Key Asset Liability Management Milestones

- Jan 2017 — Educational Workshop: Public Assets
- Apr 2017 — Educational Workshop: Private Assets
- June 2017 — Approval of Capital Market & Economic Assumptions
- July 2017 — Fiscal Year Investment Returns announced & Educational Workshop: Leverage
- Sept 2017 — Pension Funding and Risk Report
- Oct 2017 — CalPERS Educational Forum
- Nov 2017 — Experience Study & Educational Workshop: Candidate Portfolios
- Dec 2017 — First opportunity for Board to adopt ALM changes
- Feb 2018 — Second opportunity for Board to adopt ALM changes
- July 2018 — Implementation of Board decisions

Board Q&A

Consultant Comment