Public Asset Class Roles, Segments & Benchmarks

January 17, 2017



What We Hope to Accomplish Today

• Refresh – Asset Liability Management Timeline (Progress and Goal)

- Discuss Strategic Asset Allocation by Public Asset Segments
- Discuss Benchmark Selection for Public Asset Segments
- Understand Alternative Strategic Asset Allocation Approach



2017-18 ALM Timeline | Board Review & Decision Making





Alternative Asset Allocation Approach - Why? | Portfolio Priorities

Portfolio Priorities: Specific to CalPERS, implementable, and will influence portfolio construction

1. Protect the Funded Ratio (PP1)

(mitigate severe drawdowns)

2. Stabilize Employer Contribution Rates (PP2)

(manage overall volatility)

3. Achieve Long-term Required Rate of Return (PP3)

(over the long run, but not in every market environment)



Public Assets | Primary Roles

Global Equity

Total return oriented and to capture the equity risk premium (ERP), defined as the excess return over risk-free Government Bonds, by means of ownership risk in companies and exposure to corporate earnings growth. The major driver is appreciation, with some cash yield.

- Growth
- Liquidity

Global Fixed Income

Serve as an economic diversifier to equity risk and be a reliable source of income.

- Diversification
- Income
- Liquidity



Public Assets | Primary Roles

Inflation Assets

Provide strong liquid protection against inflation.

- Inflation
- Liquidity

Liquidity

Exhibit safety and capital preservation properties.

Liquidity



Existing Asset Classes or Alternative Approach

The hypothetical alternative approach (by segment) described today almost doubles (from 4 to 7) the number of strategic building blocks.

Option 1: Existing Asset Classes

4 Building Blocks	Strategic Target Weight*
Public Equity	46%
Fixed Income	20%
Inflation	9%
Liquidity	4%
Public Asset Total	79%

Option 2: Alternative Strategic Asset Allocation Approach

7 Building Blocks (Asset Segments)		Strategic Target Weight*
ublic Equity: Market Cap Weighted		X%
ublic Equity: Non-Market Cap Weighted		Χ%
ixed Income: US Government Related Treasury and Agency)		Χ%
ixed Income: Spread Products Corporates, Mortgages, Sovereigns)		X%
ixed Income: High Yield		Χ%
flation: Inflation Linked Bonds, Commoditie	?S	Χ%
iquidity		Χ%
Ρι	Iblic Asset Total	79%

*Strategic target weights shown for illustrative purposes only.



Option 1: Existing Asset Classes | Total Fund Investment Policy*

Global Equity

100% FTSE CalPERS Global (All-World, All Capitalization)

Global Fixed Income

90% Barclays Long Liabilities

10% Barclays International Fixed Income Index (GDP Weighted ex-US)

Inflation Assets

75% Inflation Linked Bond

25% Commodities

Liquidity

100% 91 Day Treasury Bill



Option 2: Alternative Strategic Asset Allocation Approach | Public Assets

Global Equity (Two Segments)

- Market Cap Weighted
- Non-Market Cap Weighted (3 Building Blocks)

Global Fixed Income (Three Segments)

- US Government Related (Treasury and Agency)
- Spread Products (Corporates, Mortgages, Sovereigns)
- High Yield

Inflation Assets (Two Segments)

- Inflation Linked Bonds
- Commodities

Liquidity (One Segment)

• 91 Day Treasury Bill



Testing Asset Segments | Objectives

Effectiveness

Empirical evidence of asset segments' ability to reduce drawdown risk in crisis and to capture upside in normal markets

Distinctiveness

Diversifying behavior during crisis based on economic intuition or persistent behavioral bias

Robustness

Patterns of predictable behavior in different crisis

Materiality

Implementable at sufficient scale to matter

Commercially Available

Readily available indices from independent index provider



Testing Segments | Defensiveness vs. Cyclicality





Benchmark Consideration | Global Equity Segments

What could a set of benchmarks look like for the following segments? Speaker: Dr. Lionel Martellini, EDHEC Risk Institute

Global Equity (Two Segments)

- Market Cap Weighted
- Non-Market Cap Weighted (3 Potential Building Blocks)
 - o Minimum/Low Volatility
 - o Maximum Diversification | Maximum De-correlation
 - o Multi-Factor



Limits of Cap-Weighted Equity Benchmarks

- While cap-weighted (CW) indices are most often used as default investment benchmarks, these benchmarks suffer from two main limitations.
- Shortcoming # 1: CW indices may provide inadequate diversification of *unrewarded and specific* risks Due to a strong concentration in largest cap stocks, they contain an excess of uncompensated risks, which implies a sub-optimal reward per unit of risk.
- Shortcoming # 2: CW indices may provide inadequate allocation to *rewarded systematic* risks

 Their set of factor exposures is not efficient (for example they exhibit outsized large cap, growth biases).



Implications

- As a result of these limitations, CW benchmarks may be complimented by alternative (also known as smart) benchmarks in terms of risk-adjusted performance, as confirmed by a large body of academic and practitioner research.
- On the other hand, CW indices enjoy two main important benefits that justify their predominant role in the investment process, namely their liquidity and scalability.
- Key insight: whatever their shortcomings and merits, we should recognize that CW indices, which result from aggregate trades by a large variety of investors, have never been engineered to address the specific needs of CalPERS, as translated in terms of the 3 portfolio priorities (back to this later).



Benefits of Alternative Beta Equity Benchmarks: Better Diversification (Shortcoming # 1)

- Weighting methods aim to improve diversification or effectively reduce volatility:
 - "Naïve" Diversification
 - Equal Weighted (equal dollar allocation)
 - Equal Risk Contribution (equal volatility-adjusted dollar allocation)
 - "Smart" Diversification
 - Maximum Diversification / Maximum De-correlation
 - (maximize the diversifying benefits of correlations between stocks)
 - Volatility Reduction
 - Efficient Minimum Volatility

(minimizes expected volatility while avoiding excessive concentration on low risk stocks)

- Such approaches do <u>not</u> target factor exposures explicitly:
 - They do lead to factor exposures that are different from cap-weighted indices.
 - However, these factor exposures are an implicit result of the weighting methodology.



Benefits of Alternative Beta Equity Benchmarks: Harvest Rewarded Risk Exposures (Shortcoming # 2)

- Individual stocks earn their risk premium through exposure to rewarded factors, while the remaining risk is uncompensated.
- Main rewarded equity factors (in addition to market factor):
 - Value factor (Fama-French (1993)): long value short growth stocks;
 - Size factor (Fama-French (1993)): long Small Cap short Large Cap stocks;
 - Momentum factor (Carhart (1997)): winners losers stocks.
 - Low vol factor (Ang et al. (2006, 2009): low vol high vol stocks;
 - Quality factor (Asness et al. (2013)): quality stocks junk stocks.
- These risk premia can best be harvested via alternative beta indices: "All we really say in finance is hold diversified portfolios along whatever tilt you choose." (Eugene Fama).



On the Robustness of Alternative Beta Benefits

- While alternative beta indices are an attractive alternative to CW benchmarks, one should question the robustness of their benefits.
- Alternative beta features that are expected to be robust:
 - Better diversified portfolios will enjoy a higher risk-adjusted performance compared to more concentrated portfolios.
 - Excess returns that can be regarded as compensation for extra risk are not likely to vanish overnight.
- Alternative beta features that are not expected to be robust:
 - Well-rewarded factors can underperform (and they will at the worst possible times, which is the very reason why they are rewarded).
 - Anomalies such as the outperformance of low volatility stocks may eventually disappear when taken out of over-optimized track records.



Back to CalPERS Needs

- CalPERS portfolio priorities:
 - PP1: Protect funding ratio (mitigate severe drawdowns);
 - PP2: Stabilize contribution rate (reduce portfolio volatility);
 - PP3: Achieve long-term required rate of return (performance).
- One can envision the following blend of alternative betas (in addition to CW index):
 - Low vol selection with min vol weighting scheme (PP1 & PP2)
 - Max diversification index for better diversification (PP2 & PP3)
 - Multi-factor index for efficient risk premium harvesting (PP2 & PP3)



Benchmark Consideration | Global Fixed Income Segments

What could a set of benchmarks look like for the following segments? Speaker: Rose Dean, Vice President - Wilshire Associates

Global Fixed Income (*Three Segments*)

- US Government Related (Treasury and Agency)
- Spread Products (Corporates, Mortgages, Sovereigns)
- High Yield



Asset Class Roles and Macroeconomic Environments

• Asset segments within the GFI portfolio have a range of exposures to macroeconomic factors





Benchmark Consideration | Inflation Assets Segments

What could a set of benchmarks look like for the following segments? Speaker: Ron Lagnado, Investment Director – Asset Allocation & Risk Management

Inflation Assets (Two Segments)

- Inflation Linked Bonds
- Commodities



Inflation Asset Segments | Distinctiveness Inflation Assets Cumulative De-trended Compound Returns Sorted by Global Equity

CalPERS 🔊

Investment Office

(1997 to 2016)



Inflation Asset Segments | Distinctiveness Inflation Assets Cumulative De-trended Compound Returns Sorted by US Inflation (1997 to 2016)



CalPERS

Investment Office

Break



Testing GE & GFI Segments | Distinctiveness

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Investment Office

GE and GFI Segments Cumulative De-trended Compound Returns Sorted by Global Equity (2000-2016)



NOTE: **Spread Product ex HY**: Scaled components of GFI Benchmark (90% Long Liability Index + 10% International Government): Mortgage: 44%, Corporate: 35%, Sovereign: 5%, International Government (Hedged): 16%. Monthly Return data: Jan. 2000 to Jun. 2016 Testing GE Segments | Robustness Cumulative Returns Over Market Events





Dot-com Bubble: Mar. 2000 – Oct. 2002
 Global Financial Crisis: Oct. 2007 – Mar. 2009
 Illustration goes to the end of the equity recovery

Testing GFI Segments | Robustness Cumulative Returns Over Market Events





Dot-com Bubble: Mar. 2000 – Oct. 2002
 Global Financial Crisis: Oct. 2007 – Mar. 2009
 Illustration goes to the end of the equity recovery

Efficient Frontiers – All Segments



2016 Ten Year Horizon Expected Returns & Volatilities

Expected Volatility

	Same Volatility Level		Same Return Level	
	Expected Return	Expected Volatility	Expected Return	Expected Volatility
2016 Existing Asset Classes	6.13%	11.00%	6.25%	11.53%
2016 with Global Equity Segments	6.23% (+0.10%)	11.00%	6.25%	11.07% (-0.46%)
2016 with Global Fixed Income Segments	6.29% (+0.16%)	11.00%	6.25%	10.80% (-0.73%)
2016 with All Segments	6.39% (+0.27%)	11.00%	6.25%	10.37% (-1.16%)



Next Steps | 2017 Milestones To Support Board ALM Decision Making

Delivery Date	Decision Point
February 21, 2017 Investment Committee*	 Agenda Item (Information): To support alternative asset allocation approach Follow-up to address takeaways from January Board Offsite discussion on Public Assets (GE/GFI/Inflation) Introduce Private Equity (PE) Role, Segments, and Benchmarks
April 17, 2017 Investment Committee*	 Agenda Item (Information): To support alternative asset allocation approach Follow-up to address takeaways from February IC discussion on Public Assets (GE/GFI/Inflation) plus Private Assets (PE) Introduce Real Assets (RA) Roles, Segments, and Benchmarks
June 19, 2017 Investment Committee*	Agenda Item (Action): To adopt capital market assumptions (CMAs) — CMAs will support current and alternative (segment) approaches to ALM decision making
July 17, 2017 <i>Board Workshop*</i>	 Workshop Session: To support alternative asset allocation approach Propose alternative asset allocation approach using both public and private asset segments Introduce use of leverage, if applicable, in strategic ALM decision making
November 13, 2017 ALM Workshop*	 Workshop Session: To present candidate portfolios Under current asset allocation approach: Asset Class Under alternative asset allocation approach: Segments

*May need Closed Session for segments chosen to allow for asset allocation deployment.



Board Q&A



Appendix: Definitions

Role	Definition
Income	Generate current cash flow
Inflation	Provide protection against inflation
Diversification	Reduce risk associated with public equity exposure
Growth	Increase sensitivity to economic growth
Liquidity	Ability to convert assets into cash

