CalPERS
Investment Portfolio Priorities

January 19, 2016

What We Hope to Accomplish Today

- Refresh – Where are we and where we've been

- Discuss – The connections between Portfolio Priorities, attributes, asset segments and classes, and benchmarks

- Understand – What does being "different" really mean?

Contents

[1] A glossary of terms related to this session is included within the Appendix beginning on slide 40

Portfolio Priorities|

Portfolio Priorities are the goals and objectives that are specific to CalPERS and which are implementable and will influence portfolio construction

1. Protect the Funded Ratio
2. Stabilize Employer Contribution Rates
3. Achieve Long-term Required Rate of Return

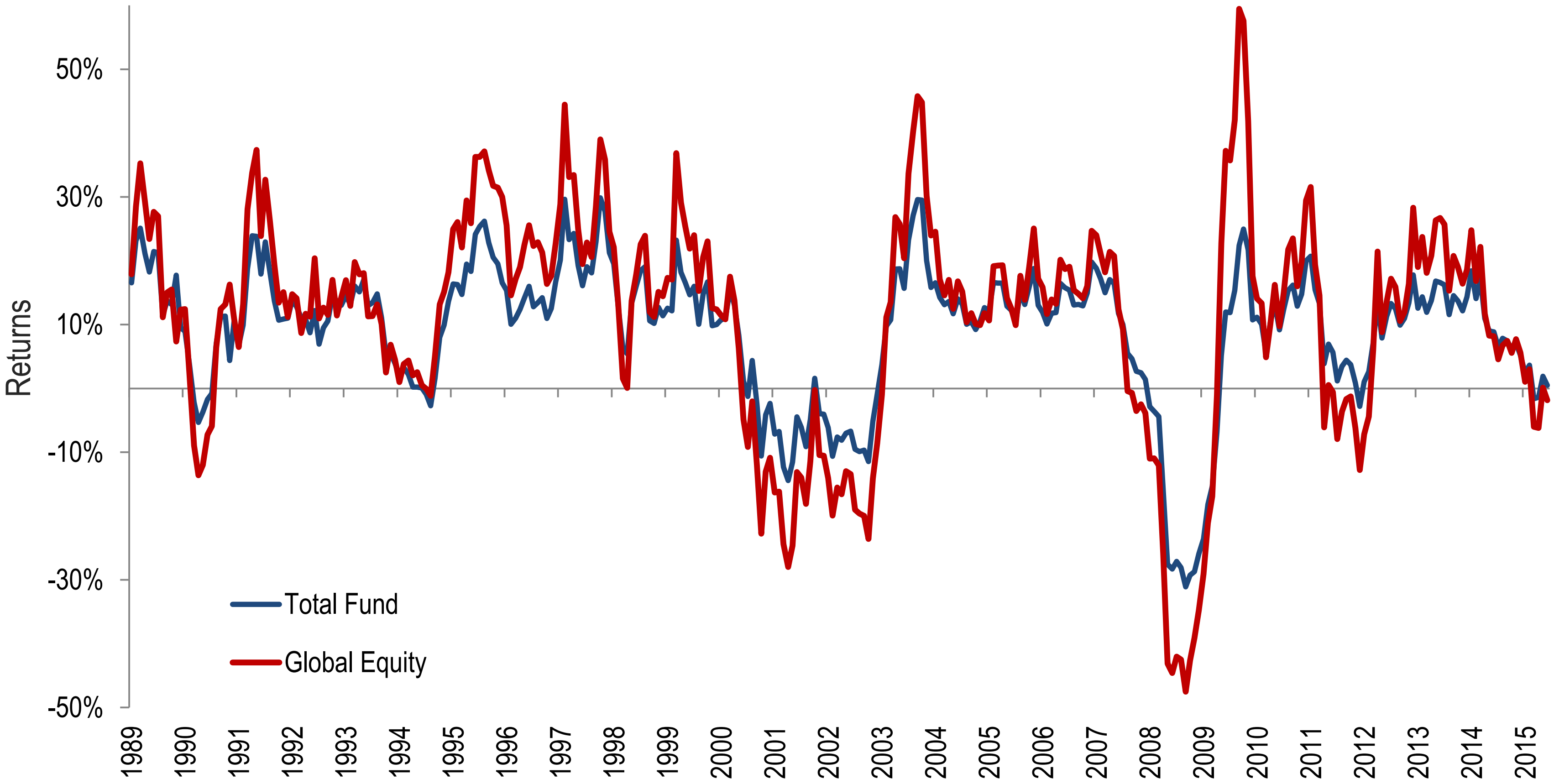
Portfolio Priorities | Gauging Our Focus

Implications of Our Funded Ratio

- Comparisons to 2008
- Importance of pathway as well as outcome
- Linchpin of portfolio construction decisions

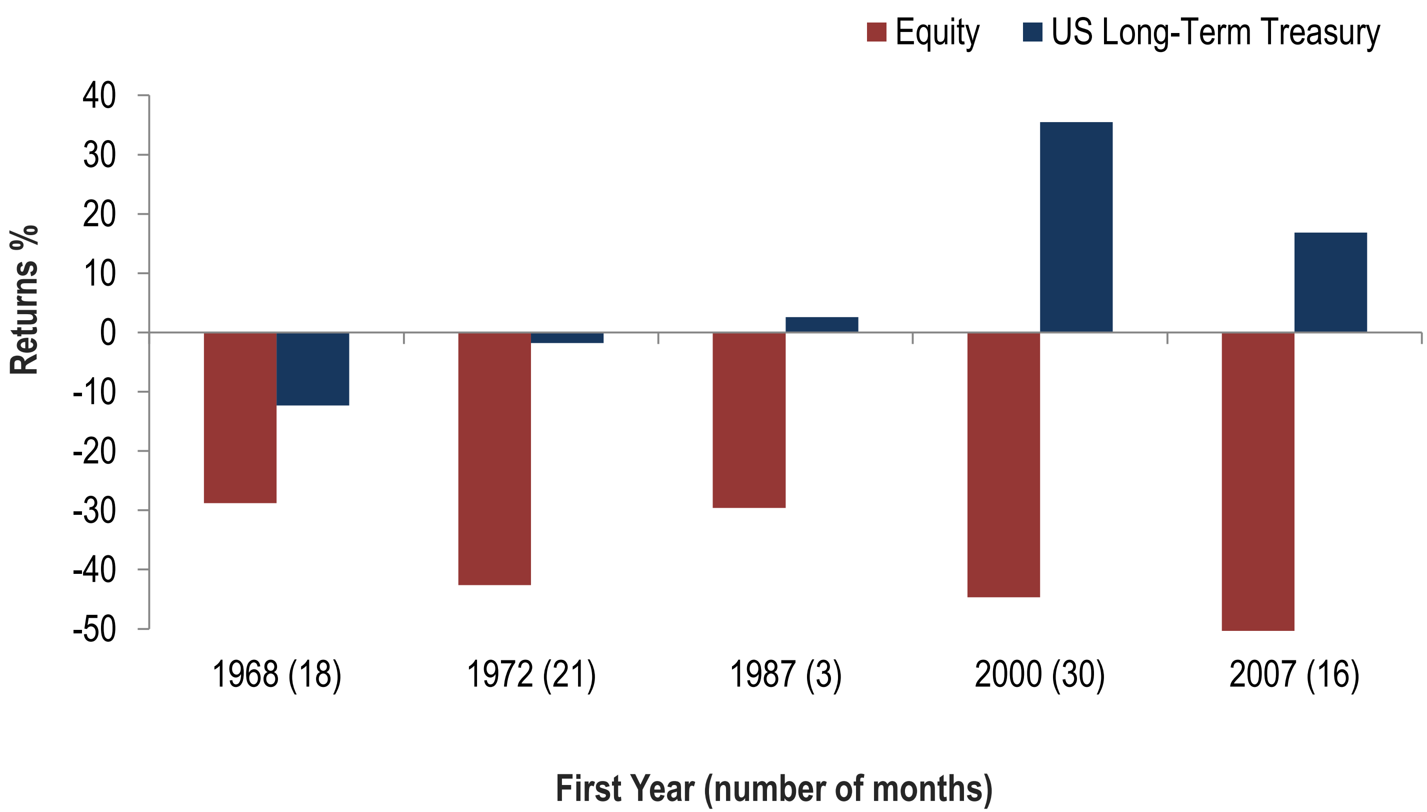
Total Fund and Global Equity Returns

Rolling 12-Months



Diversification Example| Equities vs. Long-Term Bonds

US Asset Returns During Equity Bear Markets



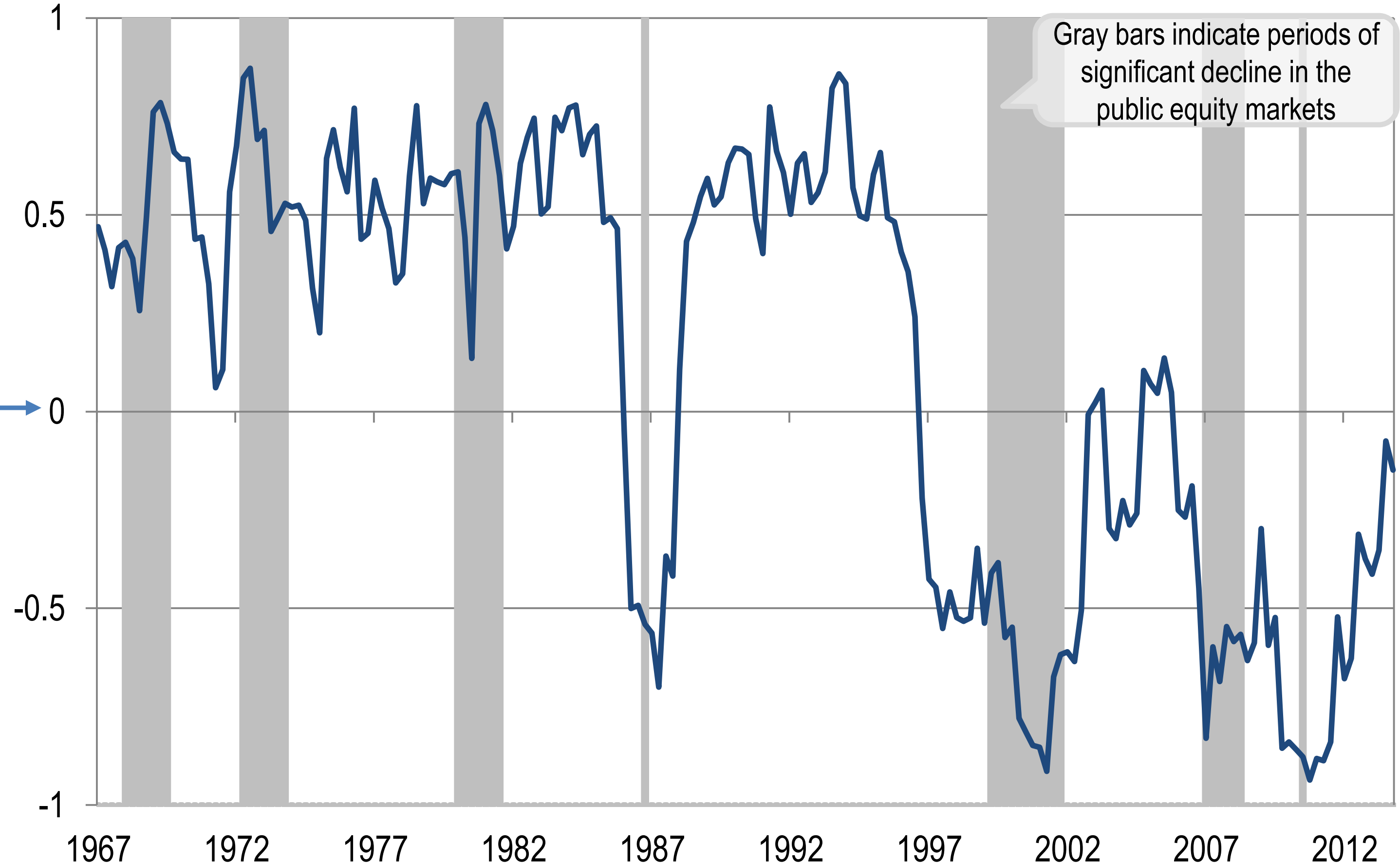
Sources: For 1972-2007periods: US Long-Term Treasury (Barclays Agg US Treasury Long) and Equities (S&P 500 Total Return Index). For 1968 period: Morningstar (Ibbotson Study Stocks Bonds, Bills and Inflation SBBI ®)

Portfolio Priorities | Diversification Potential

Correlation[1] Between Equities and Bonds

Greater than 0 means the assets move in the same direction
(when stocks go up, bonds go up)

Less than 0 means the assets move in opposition direction
(when stocks go down, bonds go up)

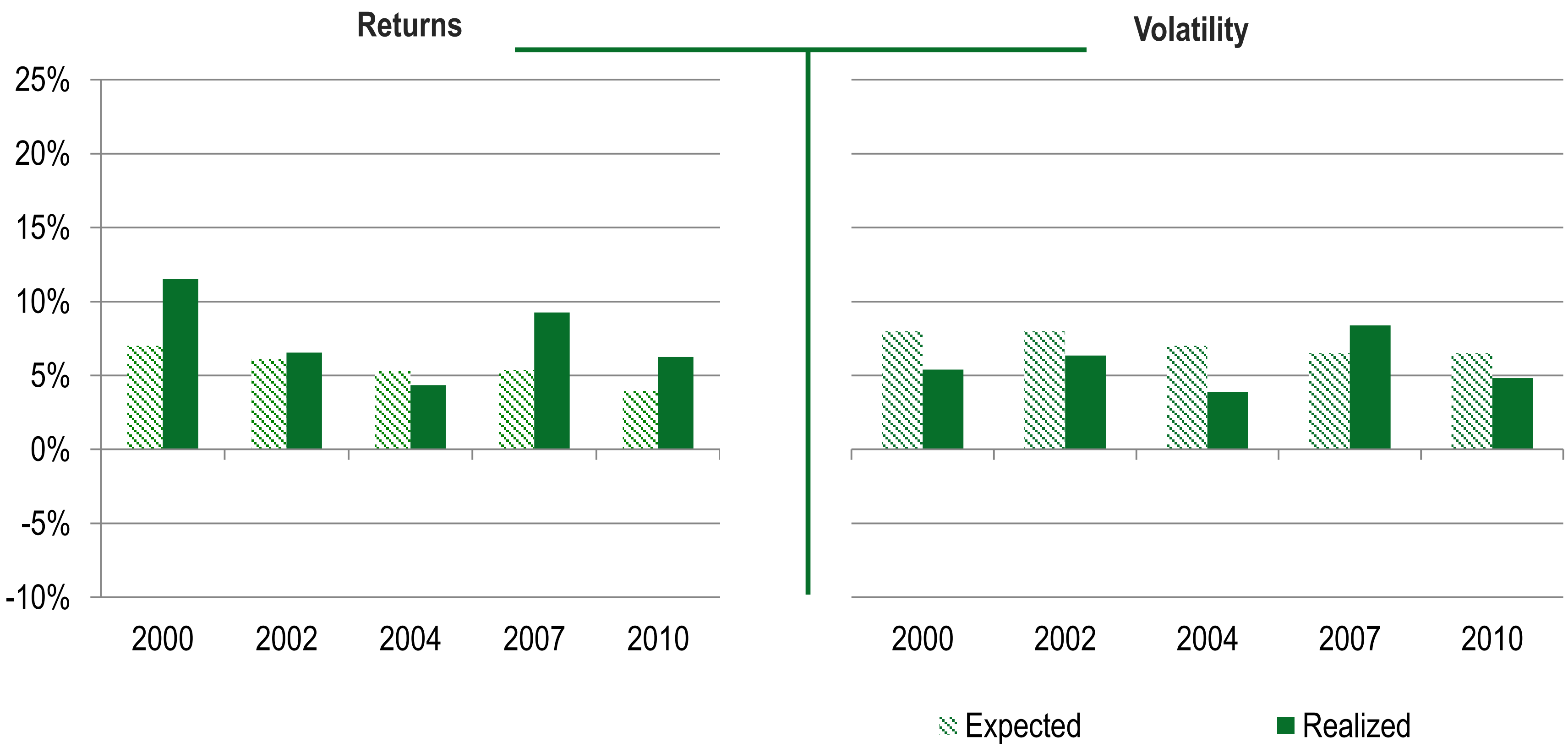


[1] *Rolling 2-year window, 4 quarters forward/behind*

ALM Forecasts |
Expected[1] vs. Realized[2] Returns & Volatility: Global Equity

[1] Based on CalPERS Capital Market Assumptions
[2] Based on returns and volatility until the next ALM event

ALM Forecasts |
Expected[1] vs. Realized[2] Returns & Volatility: Fixed Income



[1] *Based on CalPERS Capital Market Assumptions*
[2] *Based on returns and volatility until the next ALM event*

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ALM Forecasts |

Expected[1] vs. Realized[2] Returns & Volatility: Private Equity

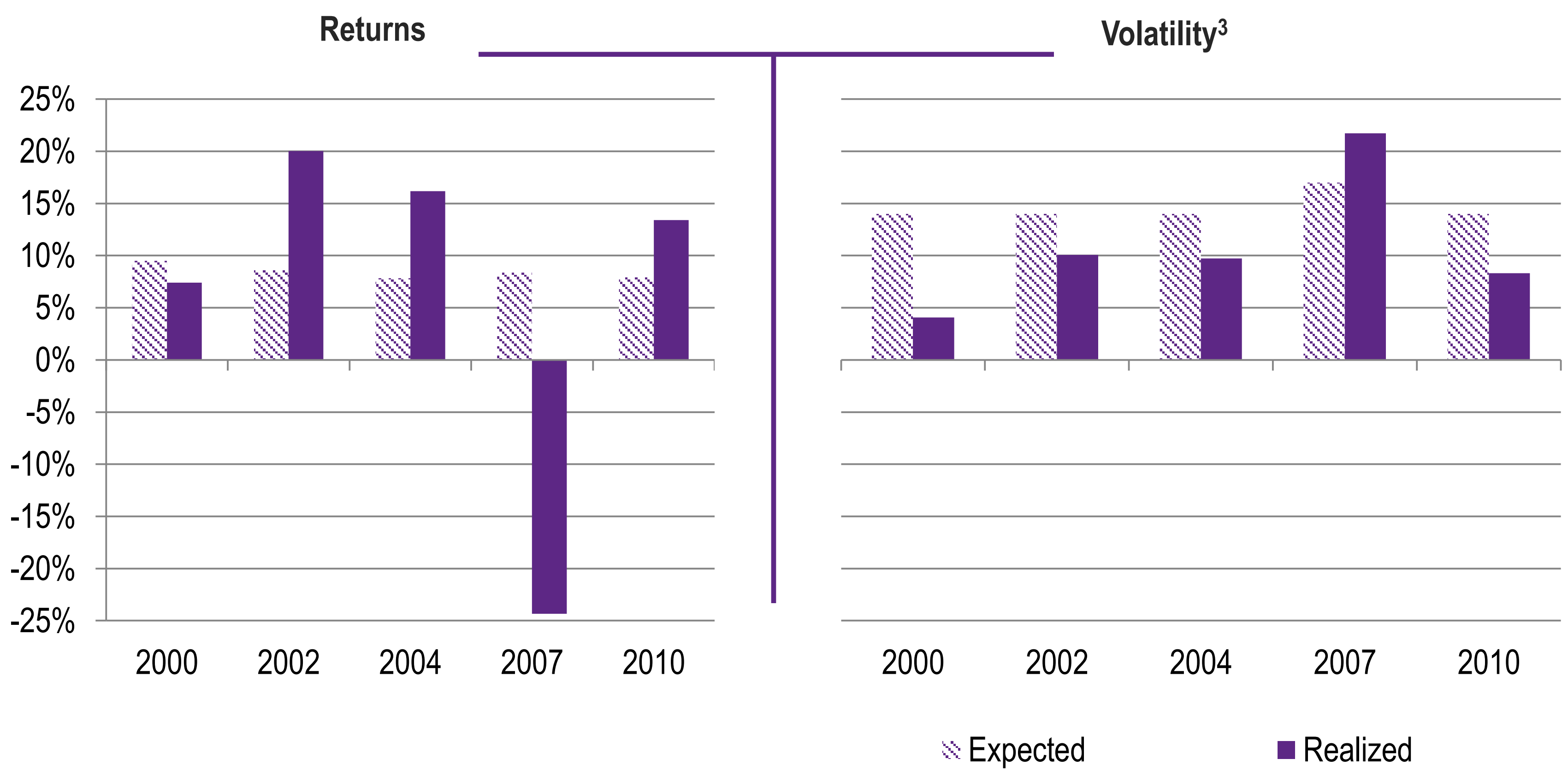
1 *Based on CalPERS Capital Market Assumptions*

2 *Based on returns until the next ALM event*

3 *Calculated using quarterly valuations, may understate underlying volatility.*

ALM Forecasts |

Expected[1] vs. Realized[2] Returns & Volatility: Real Estate



[1] Based on Capital Market Assumptions
[2] Based on returns until the next ALM event
[3] Calculated using quarterly valuations, may understate underlying volatility

Mitigating Total Fund Risk

- CalPERS Funding Risk Mitigation Policy
  - Provides a mechanism for target return and discount rate reductions when investment performance exceeds set thresholds
- CalSTRS Risk Mitigating Strategies (Target Weight 9%)
  - Expected to dampen volatility, particularly during large equity market downturns, but may underperform for extended time periods

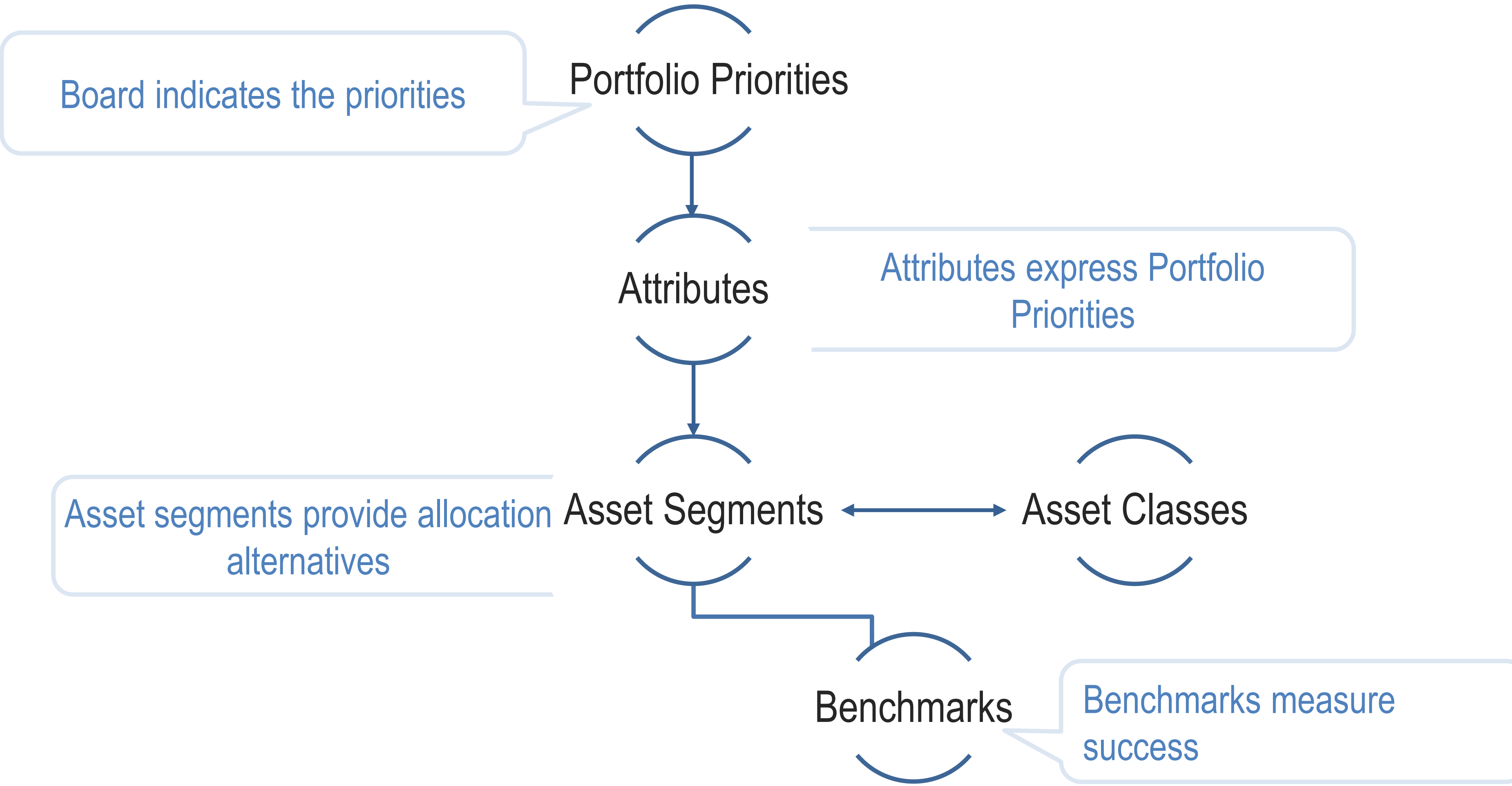
Agenda

Refresh

Portfolio Priorities & Implications

Being Different - What Does it Really Mean

Critical Linkages to Construct Portfolios



Attributes| Definitions & Implications

Definition [1]

— An inherent characteristic

— An intelligible feature by which a thing may be identified

Implications for CalPERS

— Attributes could be more (or less) effectively implemented by different asset segments

— Allocation to asset segments may be an effective way to express Total Fund priorities

[1] *Source: Merriam-Webster Dictionary*

Illustrative Example[1] | Attributes and Portfolio Priorities

Example Attributes	Portfolio Priorities		
	Protect the Funded Ratio	Stabilize Employer Contribution Rates	Achieve Long-term Required Rate of Return
Capital Appreciation			✓
Income Generation		✓	
Inflation Protection	✓		
Leverage			✓
Diversification	✓		
Volatility		✓	

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[1]Note: Example attributes have been check-marked for each priority for illustrative purposes only. Attributes can influence multiple priorities, sometimes supporting and sometimes detracting from the priority.

Example| Potential Asset Segments

Asset Class	Potential Asset Segments	
Global Equity	• Diversification • Market Cap-Weighted	• Alternative Beta
Private Equity	• Buyout and Growth Capital	• Credit Related
Global Fixed Income	• U.S. Treasuries • U.S. Mortgages • U.S. Investment Grade Corporates	• High Yield • International Fixed Income
Inflation Assets	• Inflation-Linked Bonds	• Commodities
Real Assets	• Core Real Assets	• Non-Core Real Assets

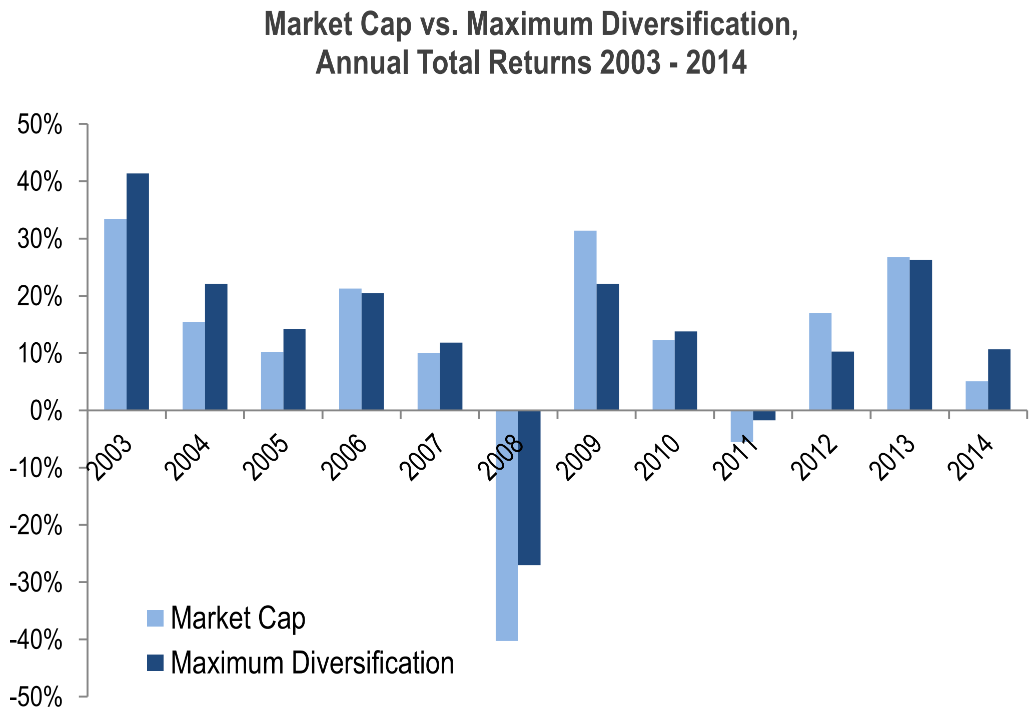
Asset Segments & Attributes| Illustrative Examples

The following slides contain illustrative examples demonstrating how attributes can be emphasized by selecting “segments” with different characteristics

- Examples utilize 10-15 years of historical data, and
- Compare two benchmarks within a general asset class by:
  - Total Return, and
  - A number of quantifiable attributes which impact one or more of the Portfolio Priorities

Asset Segments Examples: Market Cap vs. Max Diversification

In this example, the lower volatility and correlation contribute to the Portfolio Priority "Stabilize Contribution Rates" and the lower maximum drawdown contributes to the Priority "Protect the Funded Ratio"



Monthly Net Returns
November 2002 - September 2015

Attribute	Market Cap[1]	Maximum Diversification[2]
Total Return[3]	8.3%	11.6%
Capital Appreciation	5.6%	9.4%
Income	2.6%	2.2%
Correlation to Total Fund Policy Benchmark	0.97	0.93
Volatility[4]	15.2%	11.8%
Max. Drawdown	-53.6%	-38.8%
Inflation Protection*	No	No
Sharpe Ratio[4]	0.46	0.86

* Inflation protection is assessed by regressing quarterly index returns onto contemporaneous and three quarterly lagged changes in the Consumer Price Index without seasonal adjustment (NSA CPI)

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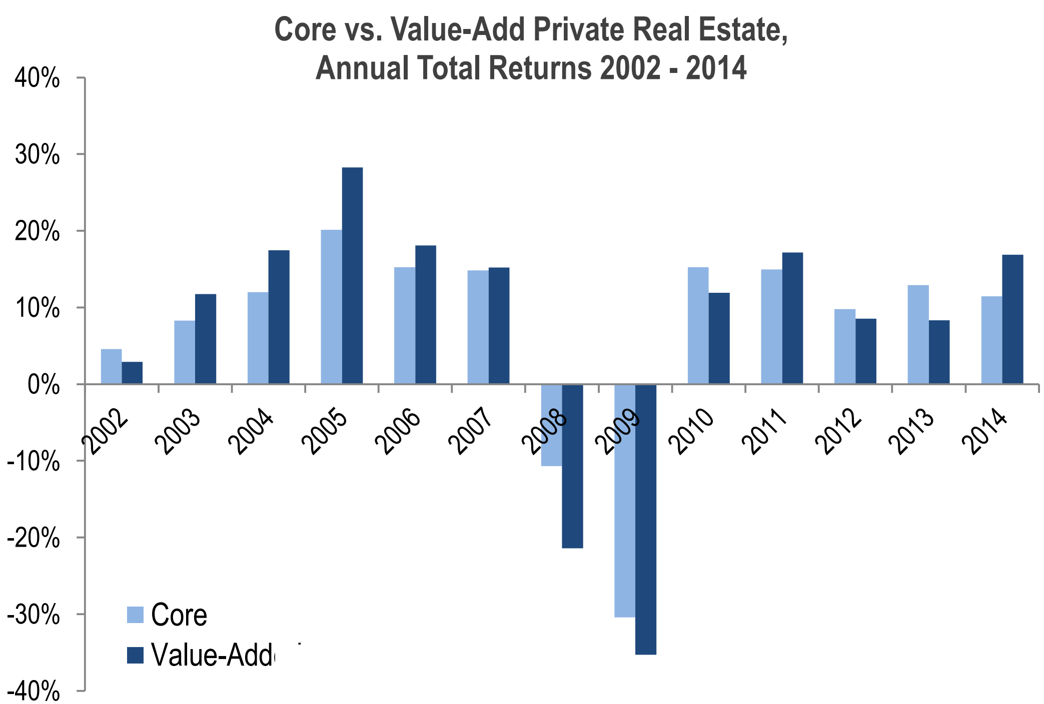
[1] FTSE Developed World Index
[2] FTSE-TOBAM Developed World Maximum Diversification Index
[3] Components of Annualized Compound Return
[4] Annualized

Asset Segment Examples: Core vs Value-Add Real Estate

In this example the lower drawdown of Core Real Estate supports the Priority "Protect the Funded Ratio" and the lower volatility and correlation support the Priority "Stabilize Contribution Rates"



Quarterly Net Returns
Q1 2002 - Q2 2015

Attribute	Core[1]	Value-Add[2]
Total Return[3]	6.9%	6.5%
Capital Appreciation	1.8%	2.8%
Income	5.1%	3.8%
Correlation to Total Fund Policy Benchmark	0.22	0.24
Volatility[4]	7.7%	10.6%
Max. Drawdown	-38.6%	-49.3%
Inflation Protection*	Yes	Yes
Leverage	21.4%	47.3%
Sharpe Ratio[4]	0.68	0.49

* Inflation protection is assessed by regressing quarterly index returns onto contemporaneous and three quarterly lagged changes in the Consumer Price Index without seasonal adjustment (NSA CPI)

[1] ODCE Core: 23 funds with $180.4B of Gross Asset Value (GAV) and $142.0B of Net Asset Value (NAV) as of Q2 2015.
[2] Townsend Value-Add: 64 funds with $40.1B of GAV and $20.4B NAV as of Q1 2013, discontinued in Q3 2013 and replaced by NFI-CEVA Value-Add in Q1 2014: 45 funds with $23B of GAV and $13B of NAV as of Q2 2015.
[3] Components of Annualized Compound Return
[4] Annualized

Considering Asset Segments | Initial Take-Aways

- Potential opportunities to capture desirable attributes by allocating to certain asset segments

- Benefits will likely come with trade-offs

- Need to balance quantitative assessment with qualitative judgment in assigning benchmarks and evaluating success

Asset Segments and Benchmarks| Examples[1]

Asset Class	Asset Segment	Benchmark	Comparison
Global Equity	Alternative Beta	Cap-Weighted Index	Rolling 4-Year
Private Equity	Buyout & Growth	Cap-Weighted Index + 300 bps	Rolling 7-year
Global Fixed Income	Treasuries	Long Treasury Index	Annual

[1]Note: Intended as illustrations of one benchmark that would be part of a mosaic used to monitor and measure success

Multiple Benchmarks| How might it work?

Goal: Better assessment of our multiple objectives

Could involve benchmark types such as:

- Public Market Benchmarks
- Peer Benchmarks (custom to purpose)
- Absolute Return Benchmarks
- Key Performance Indicators

Benchmark Implications

From	To
Benchmarks Defined by Asset Classes	Benchmarks Defined from Total Fund Perspective by Asset Segment
Benchmarks Oriented to "Market"	Benchmarks Oriented to CalPERS Priorities and Designed to Capture Desired Attributes
Single Benchmark Used to Address Multiple Purposes	Multiple Benchmarks are Considered Important to Form a Mosaic of Assessment

Benchmark Challenges

Outstanding Questions

- Do they measure success fairly?
- Are they aligned with Total Fund Priorities?
- Does a mosaic approach help accomplish our goals?

Case Study | Private Equity Benchmarking

Current Situation: Benchmark is Public Equities Plus 3%

- Portfolio comparisons are challenging
  - Benchmark is not representative of the Private Equity portfolio
  - Limited linkages to the investment process
  - Benchmark has more short-term volatility than portfolio
- Current benchmark may be useful over long-term in conjunction with additional benchmarks

Case Study| Potential Additional Benchmarks for Private Equity

Example Benchmark	Description	Question Answered by the Benchmark
Current Benchmark	Public Equities plus 3%	Are we being compensated for the risks associated with private equity?
State Street Private Equity Index	Peer Benchmark	How do we compare to a representative fund universe?
Internal Rate of Return (IRR) Target	Total Return Benchmark	Are we achieving our IRR targets?
Terms and Conditions, Including Fees	Key Performance Indicator	Are we realizing better economics or protection?

Work in Progress

Evaluation is Underway

- Analyzing attributes of asset segments
- Consideration of “trade-offs”
- Defining process for 2017-18 Asset Liability Management (ALM) cycle
- Assessing factor expressions of attributes

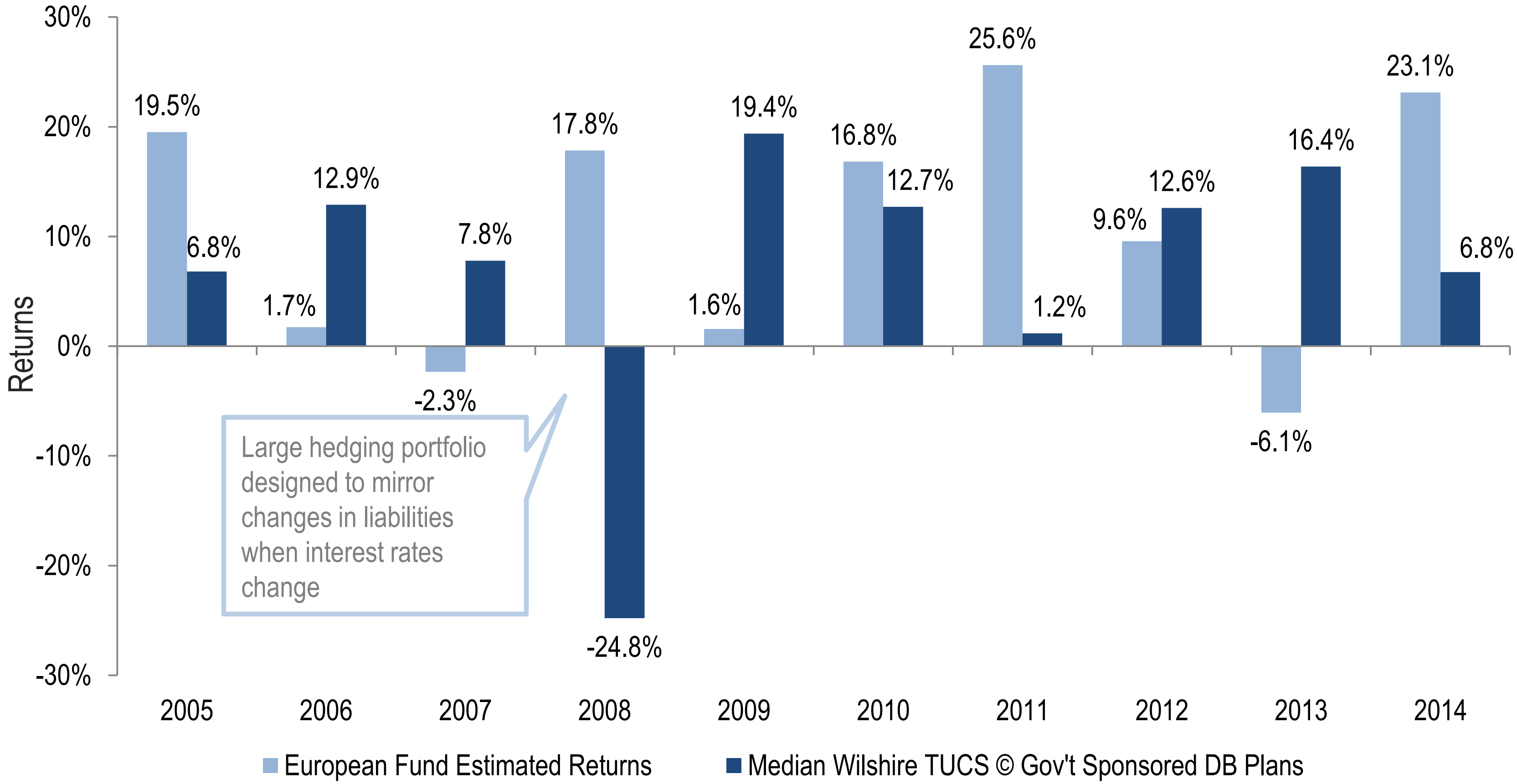
Agenda

Refresh

Portfolio Priorities & Implications

Being Different - What Does it Really Mean

Doing Something Different | European Fund Example



Being Different| How Does it Feel

Do you believe CalPERS' circumstances[1] are different enough from other defined benefit plans to warrant more targeted Total Fund construction?

a. Yes
b. No
c. Undecided

[1] *Note, these will be described and discussed in the session.*

Being Different| How Does it Feel

Regarding our strategic asset allocation process – Conventional risks vs. less travelled ground

a. We should utilize the same strategic asset allocation process as in 2013-14

b. We should develop the Portfolio Priority concepts presented in 2015 as we prepare for the next ALM cycle

c. Undecided

Being Different| How Does it Feel

Do you believe "winning by not losing[1]" is an appropriate emphasis for CalPERS?

a. Yes
b. No
c. Undecided

[1] *This is in reference to the article provided in January 2015 to the Board "**Investing Success in Two Easy Lessons**" from the book **Bold Thinking on Investment Management: The FAJ 60th Anniversary Anthology**, by Charles D. Ellis, CFA, 2005*

Being Different| How Does it Feel

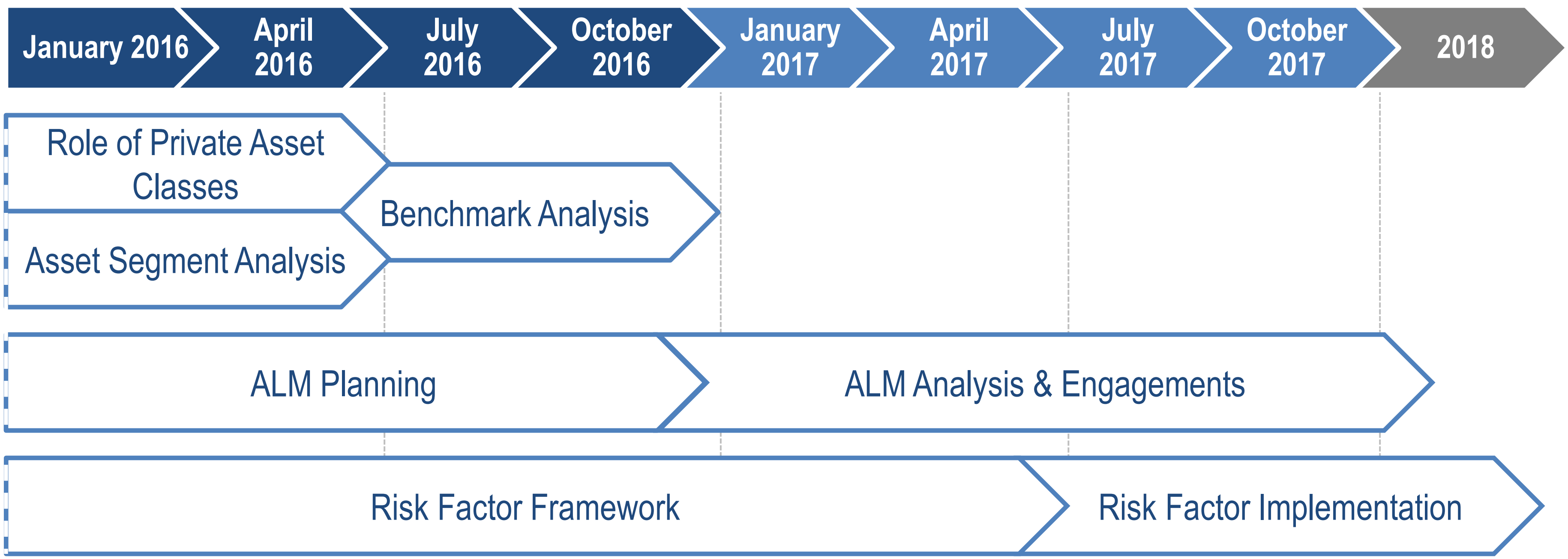
To what extent do you agree with the statement below?

The primary focus for the Board in the next ALM should be understanding the type and amount of risk appropriate for CalPERS

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

– Comments & Questions

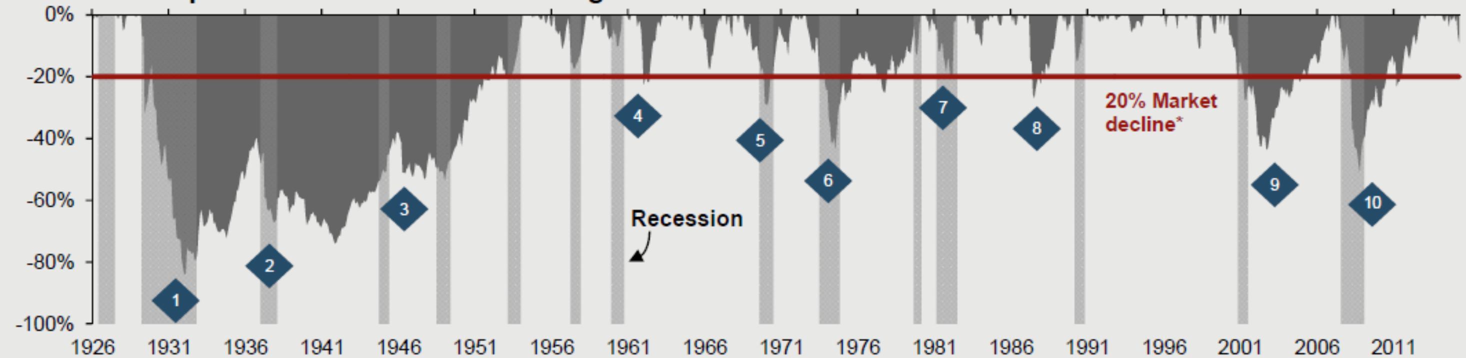
Next Steps


January 2016
April 2016
July 2016
October 2016
January 2017
April 2017
July 2017
October 2017
2018
Role of Private Asset Classes
Asset Segment Analysis
Benchmark Analysis
ALM Planning
ALM Analysis & Engagements
Risk Factor Framework
Risk Factor Implementation

Appendix

– Bear and Bull Market Periods – J.P. Morgan
– Glossary of Terms

S&P 500 composite declines from all-time highs



Characteristics of bull and bear markets

Market Corrections	Bear Markets: Market Peak	Bear Markets: Bear Return*	Bear Markets: Duration (months)*	Macro environment: Recession	Macro environment: Commodity Spike	Macro environment: Aggressive Fed	Macro environment: Extreme Valuations	Bull Markets: Bull Begin Date	Bull Markets: Bull Return	Bull Markets: Duration (months)
1 Crash of 1929 - excessive leverage, irrational exuberance	Sep 1929	-86%	33	◆			◆	Jul 1926	152%	38
2 1937 Fed Tightening - premature policy tightening	Mar 1937	-60%	63	◆		◆		Mar 1935	129%	24
3 Post WWII Crash - post-war demobilization, recession fears	May 1946	-30%	37	◆			◆	Apr 1942	158%	50
4 Flash Crash of 1962 - flash crash, Cuban Missile Crisis	Dec 1961	-28%	7				◆	Oct 1960	39%	14
5 Tech Crash of 1970 - Economic overheating, civil unrest	Nov 1968	-36%	18	◆	◆	◆		Oct 1962	103%	74
6 Stagflation - OPEC oil embargo	Jan 1973	-48%	21	◆	◆			May 1970	74%	32
7 Volcker Tightening - Whip Inflation Now	Nov 1980	-27%	21	◆	◆	◆		Mar1978	62%	33
8 1987 Crash - Program trading, overheating markets	Aug 1987	-34%	3				◆	Aug 1982	229%	61
9 Tech Bubble - Extreme valuations, .com boom/bust	Mar 2000	-49%	31	◆			◆	Oct 1990	417%	115
10 Global Financial Crisis - Leverage/housing, Lehman collapse	Oct 2007	-57%	17	◆	◆	◆		Oct 2002	101%	61
Current Cycle								Mar 2009	184%	80
Averages	-	-45%	25					-	150%	53

Source: FactSet, NBER, Robert Shiller, Standard & Poor's, J.P. Morgan Asset Management.
*A bear market is defined as a 20% or more decline from the previous market high. The bear return is the peak to trough return over the cycle. Periods of "Recession" are defined using NBER business cycle dates. "Commodity Spikes" are defined as significant rapid upward moves in oil prices. Periods of "Extreme Valuations" are those where S&P 500 last twelve months P/E levels were approximately two standard deviations above long-run averages. "Aggressive Fed Tightening" is defined as Federal Reserve monetary tightening that was unexpected and/or significant in magnitude.
Guide to the Markets – U.S. Data are as of September 30, 2015.

J.P.Morgan Asset Management

Source: JP Morgan Guide to the Markets, U.S. 4Q 2015 as of September 30, 2015, page 15

Glossary of Terms

About this Glossary

- This document is intended to provide “at hand” access to terms that will support discussion as part of this session.

- The definitions in this document are focused on their context within this session. Some terms may have additional meaning or uses not addressed in this document.
  - Definitions may have been adapted from their original sources for ease of reading or to better reflect the primary focus of these sessions.

Glossary Contents|

Total Return

Definition

The rate of return taking into account capital appreciation/ depreciation and income. Often qualified as follows: Nominal returns are unadjusted for inflation; real returns are adjusted for inflation.[1]

For example, say you purchase a share for $10, which paid a dividend of a $1 per share, and the share is now trading at $12. Your capital appreciation in the investment is $2 or 20%, as the price of the share has increased $2 over your purchase price or cost basis. Your income return is $1, or 10%, for a total return on the shares is $3 or 30%.[2]

[1] *Source: CFA Institute Glossary*
[2] *Source: Adapted from Investopedia*

Capital Appreciation (as a component of Total Return)

Definition

A rise in the value of an asset based on a rise in market price.

Investments targeted for capital appreciation tend to have more risk than assets chosen for capital preservation and income generation, such as government bonds, municipal bonds, or dividend-paying stocks. Because of this, capital appreciation funds are considered appropriate for risk-tolerant investors.

Capital appreciation is one of two main sources of investment returns with the other being income (dividends, interest etc.).

Source: Adapted from Investopedia

Income (as a component of Total Return)

Definition

As a component of Total Return, income includes interest and dividends paid.

Source: Adapted from Investopedia

Diversification

Definition

The act of investing in a variety of securities in a way so that a failure or slump in one will not be disastrous. [1]

A risk management technique in which the positive performance of some investments is intended to neutralize the negative performance of others. The benefits of diversification will hold only if the securities in the portfolio are not perfectly correlated.[2]

[1] *Source: January 2015 Board and Executive Offsite, Portfolio Priorities and Benchmarks Session*
[2] *Source: Adapted from Investopedia*

Inflation Protection

Definition

The tendency of the price of an investment to rise along with the inflation indexes such as the Consumer Price Index (CPI). Inflation protection is analyzed by comparing returns of an investment to the changes in an inflation index.

Leverage

Definitions

1. The use of various financial instruments or borrowed capital to increase the potential return on an investment
2. The amount of debt used to finance a firm's assets. A firm with significantly more debt than equity is considered to be highly leveraged

Leverage magnifies both gains and losses.

Source: Adapted from Investopedia

Maximum Drawdown

Definition

The maximum loss of a portfolio from a peak to a trough in portfolio value. Maximum drawdown is an indicator of downside risk.

Source: Adapted from Investopedia

Sharpe Ratio

Definition:

A ratio developed by Nobel laureate William F. Sharpe to measure risk-adjusted performance. The Sharpe ratio is calculated by subtracting the risk-free rate from the rate of return for a portfolio and dividing the result by the standard deviation of the portfolio returns.

The Sharpe ratio tells us whether a portfolio's returns are due to smart investment decisions, or a result of excess risk. The greater a portfolio's Sharpe ratio, the better its risk-adjusted performance .

– For example, Manager [A] earned a 15% return, and Manager [B] earned 12%
– However, if Manager [A] took much larger risks than Manager [B], Manager [B] may have a higher Sharpe ratio

Source: Adapted from Investopedia

Volatility

Definition:

A statistical measure of the dispersion of returns for a given security, portfolio or market index. Volatility is typically measured by using the standard deviation of the security, portfolio, or index returns. Commonly, the higher the volatility, the riskier the security.

Source: Adapted from Investopedia

Benchmark

Definition

A standard or point of reference against which things may be compared or assessed.[1] A comparison portfolio; a point of reference or comparison.[2]

Benchmarks can serve multiple roles, such as:

- Defining the investment opportunity set
- Measuring performance
- Expressing program goals[3]

Sources: [1] Adapted from Google.
[2] CFA Institute Glossary
[3] January 2015 Board and Executive Offsite, Portfolio Priorities and Benchmarks Session

Absolute Return Benchmark (Benchmark Type)

Definition:

Some benchmarks are defined as an absolute return number.

For example, CalPERS' Multi-Asset Class Partners Program utilizes an absolute return benchmark of 7.5%.

Key Performance Indicator (KPI)

Definition:

A set of quantifiable measures that an organization or industry uses to gauge or compare performance in meeting strategic and operational goals. KPIs vary between organizations and industries depending on their respective priorities and/or performance criteria.

Source: Adapted from Investopedia

Peer Benchmark (Benchmark Type)

Definition:

An index based on data from a peer group of investment managers who have the same investment style. This analysis may report information such as the returns each fund generates against other similar styles. [1]

Use of a peer group as a benchmark can contextualize performance in terms of how other like-funds ("investors") are performing in a particular asset class/strategy, in a shared economic environment. Peer group benchmarks, by focusing on a narrowed sample (by style, peer definition, etc.), may have inherent biases, such as self-reporting bias or survivorship bias. Care must be taken to select peers that are pursuing similar investment strategies.

[1] *Source: Adapted from Investopedia "Manager Universe Benchmark" definition*

Asset Segment

Definition

"Asset Segment" in this session refers to the concept of decomposing broad asset classes into more granular segments by grouping like assets along distinct, quantifiable characteristics.

Bear Market

Definition

A market condition in which the prices of securities are falling. A downturn of 20% of more in multiple broad market indexes can be considered entry into a bear market.

Source: Adapted from Google and Investopedia

Bull Market

Definition

A market condition in which the prices of securities are rising.

Source: Adapted from Google and Investopedia

Gross Asset Value (GAV)

Definition

The gross value of a fund's investments. Gross asset value will exceed net asset value if the fund has liabilities.

Internal Rate of Return (IRR)

Definition

Dollar-weighted rate of return that shows profitability as a percentage, showing the return on each dollar invested. IRR equates the present value of a partnership's estimated cash flows with the present value of the partnership's costs.

Source: Adapted from CalPERS CIO Performance Report, August 2015 Investment Committee Item 6a

Net Asset Value (NAV)

Definition

Net Asset Value is determined by subtracting the liabilities from the portfolio value of a fund's securities.

Source: Adapted from Bloomberg