Arizona State Retirement System

INVESTMENT COMMITTEE

February 9, 2015

A COMPONENT UNIT OF THE STATE OF ARIZONA ■ DELIVERING SERVICE WITH PRIDE

ARIZONA STATE RETIREMENT SYSTEM

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Paul Matson
Director

AGENDA

NOTICE OF A PUBLIC MEETING OF THE
ARIZONA STATE RETIREMENT SYSTEM (ASRS)
INVESTMENT COMMITTEE

3300 North Central Avenue
14th Floor Conference Room
Phoenix, Arizona 85012

Monday, February 9, 2015
3:00 p.m.

Pursuant to A.R.S. § 38-431.02, notice is hereby given to the members of the Arizona State Retirement System (ASRS) Investment Committee (IC) and to the general public that the ASRS Investment Committee will hold a public meeting February 9, 2015 beginning at 3:00 p.m., in the 14th Floor Conference Room of the Arizona State Retirement System office, 3300 North Central Avenue, Phoenix, Arizona. Trustees of the Committee may attend either in person or by telephone conference call.

This is a regularly scheduled meeting of the Investment Committee; however, due to possible attendance by other ASRS Board Trustees, this meeting may technically become a meeting of the Board or one of its Committees. Actions taken will be consistent with Investment Committee governance procedures. Actions requiring Board authority will be presented to the full Board for final decision.

The Chair may take public comment during any agenda item. If any member of the public wishes to speak to a particular agenda item, they should complete a Request to Speak form indicating the item and provide it to the Committee Administrator.

This meeting will be teleconferenced to the ASRS office in Tucson, 7660 E. Broadway Blvd., Suite 108, Tucson, AZ 85710. The conference call to Tucson will be disconnected after 15 minutes if there are no attendees in the Tucson audience.

The Agenda for the meeting is as follows:

1. Call to Order; Roll Call (*estimated time 4 min.*).. Mr. Tom Connelly
Chair, Investment Committee

2. Presentation, Discussion, and Appropriate Action Regarding the ASRS Asset Allocation Study *(Action item; estimated time 140 min.)* ....Mr. Paul Matson
Director, ASRS
....Mr. Gary Dokes
Chief Investment Officer, ASRS
....Mr. Allan Martin
Partner, NEPC
....Mr. Chris Levell
Partner, NEPC

3. Requests for Future Agenda Items (*Informational and discussion item; estimated time 5 min*.) ....
   .... Mr. Tom Connelly
   ....Mr. Gary Dokes

4. Call to the Public.. Mr. Tom Connelly

Those wishing to address the ASRS Committee are required to complete a Request to Speak form before the meeting indicating their desire to speak. Request to Speak forms are available at the sign-in desk and should be given to the Committee Administrator. Trustees of the Committee are prohibited by A.R.S. § 38-431.01(G) from discussing or taking legal action on matters raised during an open call to the public unless the matters are properly noticed for discussion and legal action. As a result of public comment, the Committee Chair may direct staff to study and/or reschedule the matter for discussion and decision at a later date.

5. The next ASRS Investment Committee Meeting is scheduled for Monday, February 23, 2015 at 2:30 p.m., at 3300 N. Central Avenue, 14th Floor Conference room, Phoenix, Arizona.

6. Adjournment of the ASRS Investment Committee Meeting

A copy of the agenda background material provided to Committee Trustees (with the exception of material relating to possible executive sessions) is available for public inspection at the ASRS offices located at 3300 North Central Avenue, 14th Floor, Phoenix, Arizona, and 7660 East Broadway Boulevard, Suite 108, Tucson, Arizona. The agenda is subject to revision up to 24 hours prior to meeting. These materials are also available on the ASRS website (https://www.azasrs.gov/web/BoardCommittees.do) approximately 48 hours prior to the meeting.

Persons with a disability may request a reasonable accommodation such as a sign language interpreter or alternate formats of this document by contacting Tracy Darmer, ADA Coordinator at (602) 240-5378 in Phoenix, at (520) 239-3100, ext. 5378 in Tucson or 1-800-621-3778, ext. 5378 outside metro Phoenix or Tucson. Requests should be made as early as possible to allow time to arrange the accommodations.

Dated February 4, 2015

ARIZONA STATE RETIREMENT SYSTEM

Gloria Trujillo	Gary Dokes
Committee Administrator	Chief Investment Officer

Agenda Item #1

ARIZONA STATE RETIREMENT SYSTEM

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Paul Matson
Director

MEMORANDUM

TO: The Arizona State Retirement System (ASRS) Investment Committee (IC)

FROM: Mr. Paul Matson, Director
Mr. Gary R. Dokes, Chief Investment Officer (CIO)
Mr. Allan Martin, NEPC
Mr. Chris Levell, NEPC

DATE: February 9, 2015

RE: **Agenda Item #2**: Presentation, Discussion, and Appropriate Action Regarding the ASRS Asset Allocation Study

Purpose
To present the Asset Allocation Study analyses for discussion with IC Trustees.

Recommendation
NEPC and ASRS recommend the IC consider recommending to the Board the approval of the ASRS Asset Allocation Policy Schematic as denoted in Exhibit A in the presentation.

Background
As a result of many discussions and analyses over the past several months, NEPC and ASRS developed a final recommended new Strategic Asset Allocation Policy (SAAP) which incorporates strategic investment themes while providing the ability to take advantage of present and anticipated opportunities in the financial markets

The proposed primary changes (and rationale) to ASRS existing asset allocation policy are as follows:

- Reduce Allocations to Public U.S. Equities, Emerging Market Debt, Commodities, Core Bonds, Emerging Market Equity, and High Yield Debt
  - Rationale: Reduce growth-reliant and higher volatility exposures, and allow for increased allocation to credit opportunities.

- Increase Allocations to Private Debt, Public Non-U.S. Equities, Real Estate, and Private Equity
  - Rationale: Reduce net foreign exposures, reallocate foreign exposures to developed equity markets, and maintain a comprehensive set of asset class exposures especially to private markets where capital availability is needed.

- Add Treasuries as a separate asset class, and retain Infrastructure and Farmland/Timber, each with a 0% Target
  - Rationale: Increase the inflation linked and real asset opportunity-set while maintaining sensitivity to timing of entry and alignment of interest between asset class vehicle and underlying long-lived assets

- Rename “GTAA” to “Multi-Asset Class Strategies” and reduce allocation from 10% to 5% with a 0-12% target range, and partially restructure by replacing some beta exposure with alpha exposure
  - Rational: Denoting these strategies “above-the-line” more clearly reflects the nature of the beta or alpha strategies risk/return profiles and improves operational management and reporting

- Establish Policy Target Ranges primarily at the broad asset class categories
  - Rational: Controls for risk while still maintaining flexibility for tactical opportunities

- Remove Minimum Passive % Targets for public equity and fixed income
  - Rationale: Consistent with Investment Beliefs and reflects ASRS perspectives on asset class efficiencies.

Mr. Allan Martin from NEPC will participate in the IC meeting in person and Mr. Chris Levell, NEPC, via phone. Mr. Kien Trinh will participate via phone.

Attachments:

1. ASRS/NEPC Asset Allocation Study – PowerPoint
2. ASRS Portfolio Risk Reports - State Street Analytic System

Arizona State Retirement System

Asset Allocation Study

February 9, 2015

Paul Matson, Director, ASRS
Gary Dokes, Chief Investment Officer, ASRS
Allan Martin, Partner, NEPC
Chris Levell, ASA, CFA, CAIA, Partner, NEPC

NEPC, LLC

Background

- **Dynamic Strategic Asset Allocation Policy (SAAP) Study Approach**
  - Periodicity of the study should be better aligned to capture evolving or changing investment opportunities.
  - ASRS SAAP Study to be conducted as warranted or triennially, whichever is shorter.
    - Reasonable to be initiated by the Director and CIO with the concurrence of the Investment Committee and Board Chairs.

- **Decision Making Methodology**
  - Identify available asset classes and investing strategies
    - Analyze primary characteristics; assess their suitability and comprehensiveness for institutional portfolios.
    - Evaluate sources of returns, risks, and diversification in terms of quantitative and qualitative considerations.
  - Utilize breadth of asset allocation tools for additional analysis
    - Mean-variance optimization, risk budgeting, factor analysis, scenario analysis, probabilities, etc.
    - Understand limitations of each to construct inclusive view

- **Asset Allocation Policy Investment Themes**
  - Increase Diversification
  - Capture Tactical Opportunities Available as a Result of Market Dislocation
  - Optimize Risk-Adjusted Return in an Expected Low Return Environment
  - Maintain Significant Liquidity
  - Remain Fee and Cost Conscious

- **Asset allocation discussions have occurred over the past several months between Investment Committee Trustees, ASRS Staff, and NEPC to understand and develop the proposed changes to the ASRS Strategic Asset Allocation Policy (SAAP) Benchmark.**

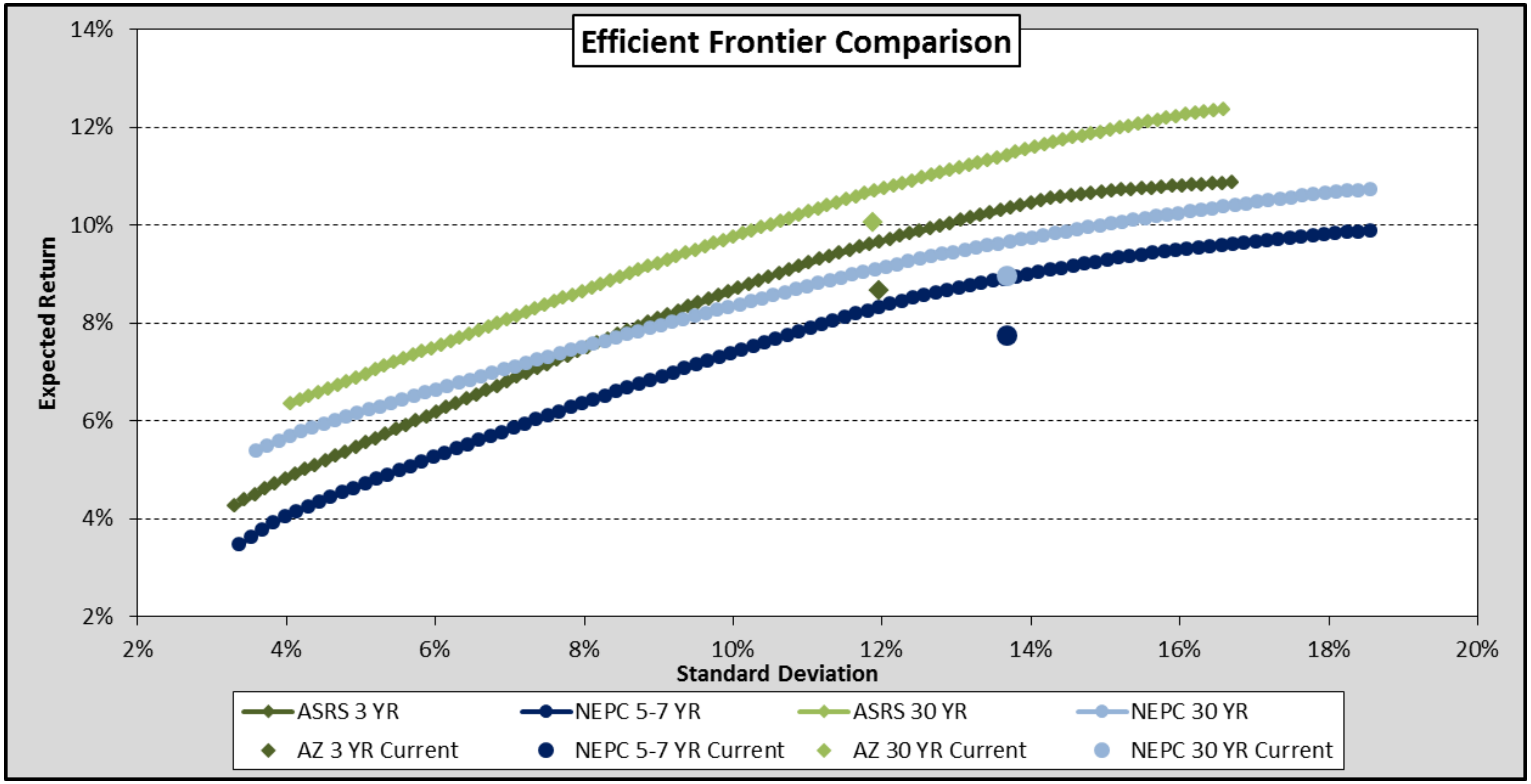
- **ASRS Staff and NEPC worked closely to identify key themes and proposed changes to the ASRS SAAP.**
  - ASRS Staff developed consensus asset class assumptions for comparison with a focus on each IMD portfolio manager's view of the asset classes they cover.
  - NEPC's assumptions are more conservative (lower returns, higher volatility) across most asset classes utilized.

- **Analysis completed using NEPC 5-7 year assumptions**
  - Despite being more conservative than ASRS Staff assumptions, broad asset allocation conclusions were similar.
    - Optimizing sub-asset class structure was very different.
  - Time horizon provides balance between strategic views and long-term return target.
    - 5-7 year assumptions maintains strategic business cycle focus without being too focused on very near-term.
    - 30 year assumptions considered for efficiency, long term target, and actuarial purposes, but not for strategic analysis.
  - Allows for direct comparisons across analysis types.

	Geometric Returns				Volatility			
	IMD 3 Yr	IMD 30 Yr	NEPC 5-7 Yr	NEPC 30 Yr	IMD 3 Yr	IMD 30 Yr	NEPC 5-7 Yr	NEPC 30 Yr
Cash	1.03%	3.42%	1.75%	3.25%	0.96%	0.93%	1.00%	1.00%
LIBOR	1.35%	3.63%	2.00%	3.50%	1.38%	1.38%	1.00%	1.00%
Treasuries	2.03%	4.01%	1.75%	3.50%	5.85%	5.70%	5.50%	5.50%
IG Corp Credit	3.47%	5.22%	3.25%	4.75%	7.38%	7.18%	7.50%	7.50%
MBS	2.30%	4.28%	2.00%	3.75%	6.59%	6.17%	7.00%	7.00%
TIPS	2.53%	4.50%	2.25%	4.00%	7.34%	7.17%	7.50%	7.50%
High-Yield Bonds	4.47%	6.00%	4.00%	5.75%	12.86%	12.46%	13.00%	13.00%
Global Bonds (U)	1.34%	3.07%	1.00%	2.25%	8.48%	8.43%	9.00%	9.00%
Global Bonds (H)	1.45%	3.16%	*1.17%*	*2.42%*	5.10%	4.88%	5.00%	5.00%
EMD (External)	5.00%	7.01%	4.50%	6.00%	12.06%	12.06%	12.00%	12.00%
EMD (Loc Currency)	5.64%	7.19%	5.50%	6.75%	14.78%	14.78%	15.00%	15.00%
Large Cap Equities	8.62%	9.85%	6.00%	7.50%	15.03%	15.03%	17.50%	17.50%
SMid Cap Equities	9.62%	10.85%	6.00%	7.75%	18.12%	18.12%	21.00%	21.00%
Int'l Equities (U)	9.05%	10.68%	7.00%	8.00%	17.56%	17.56%	21.00%	21.00%
Int'l Equities (H)	9.67%	11.30%	*7.49%*	*8.48%*	17.56%	17.56%	17.50%	17.50%
EM Int'l Equities	9.40%	11.72%	9.00%	9.25%	23.20%	23.20%	26.00%	26.00%
Private Equity	8.48%	9.97%	8.50%	9.50%	24.51%	23.51%	27.00%	27.00%
Private Debt	9.00%	8.00%	7.50%	8.00%	8.13%	8.13%	17.00%	17.00%
Private Real Assets	7.23%	7.81%	8.00%	7.75%	21.22%	20.22%	23.00%	23.00%
Real Estate	8.00%	9.00%	6.50%	6.50%	12.00%	12.00%	15.00%	15.00%
Commodities	4.09%	5.55%	5.25%	5.75%	17.60%	17.60%	18.00%	18.00%
Hedge Funds	5.41%	7.17%	5.75%	6.75%	9.90%	9.90%	9.00%	9.00%
Long Treasuries	3.03%	4.33%	2.50%	4.00%	11.81%	11.60%	12.00%	12.00%
Long Credit	4.85%	5.92%	5.25%	5.75%	13.59%	13.07%	14.00%	14.00%
Core Bonds	2.60%	4.43%	2.30%	3.98%	6.32%	6.27%	6.03%	6.03%

Note:
NEPC inflation assumption is 3.0% for 5-7 year period and 3.25% for 30 year period.
Returns shown are geometric.
Volatility defined as standard deviation of investment returns.

Efficient Frontier Analysis



- **Significant variation in assumptions leads to wide range of efficient frontiers and expected risk/return levels for current target.**

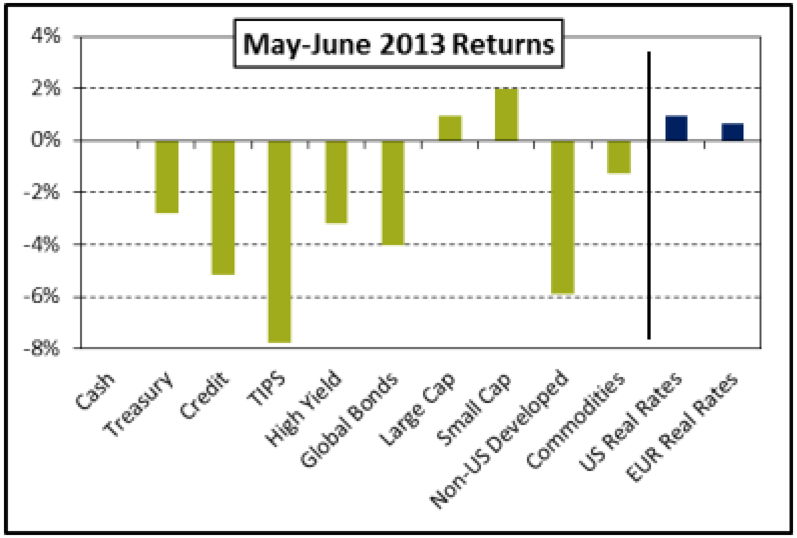
- **Portfolios are all below respective efficient frontiers – partially due to strategic decisions, partially due to frontier constraints.**

Note:
Efficient frontiers based on arithmetic returns.

Key Themes for 2015

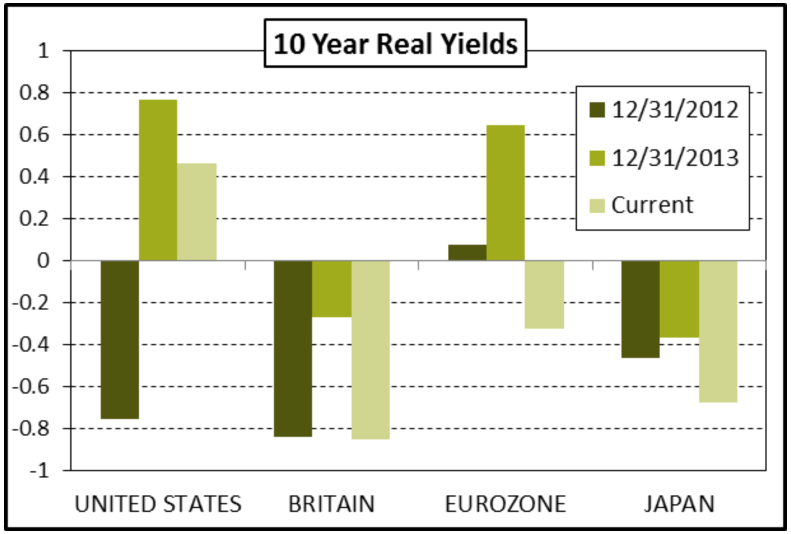
- **Balance potential for short-term strength with an acknowledgement of lofty recent returns relative to global growth**
  - Reallocate risk as appropriate while maintaining downside protection as a counterweight
- **Public U.S. equity and credit markets similarly valued vs. history; near-term favors stocks**
  - Credit's limited upside from potential investment grade spread compression, overall reduction in liquidity and proliferation of ETFs contribute to asymmetry
  - Real estate and direct lending (though less liquid) can be a substitute for high yield
  - Manage private commitments and maintain liquidity to exploit downturns
- **Non-U.S. equity markets have not experienced the same rally as U.S. equities**
  - Valuations and monetary easing support overweight; downside risks point to caution
    - Muted return expectations are sensitive to binary policy decisions (upside and downside)
  - Emerging growth expectations have compressed
    - Commodity driven countries face pressures but U.S. strength supports exporters
    - Fundamental strength vs. developed world likely to win in the long run
  - Be globally diversified, hedge developed currency risks, and don't flee emerging markets
- **We are one year closer to rate hikes by the Federal Reserve**
  - Curve has shifted in anticipation making both cash/short duration and long bonds relatively more attractive than core duration
  - Long rates likely range bound due to dynamics of supply (shrinking deficits) and demand (increasing LDI hedgers, global investors, aging population of savers)
  - Barbell of long treasuries and cash can offer similar core bond duration, volatility, yield, and a higher sensitivity to recession protection (counterweight)

- **Many investors surprised by market impact of Bernanke's taper comments in Spring 2013**
  - The primary driver was a change in underlying global real yields
  - Market discount rates increased driving down present values
  - And the surprise change in expectations of tighter policy spooked sentiment
  - U.S. market strength may not persist with a repeat occurrence



Source: Bloomberg as of 11/30

- **Real yields in 2014 reversed the normalization trend of 2013 and are a key component of lower 5-7 year expected returns in 2015**
  - U.S. gave up far less than other developed markets
  - Gravity of low interest rates in Germany and Japan may draw U.S. rates lower

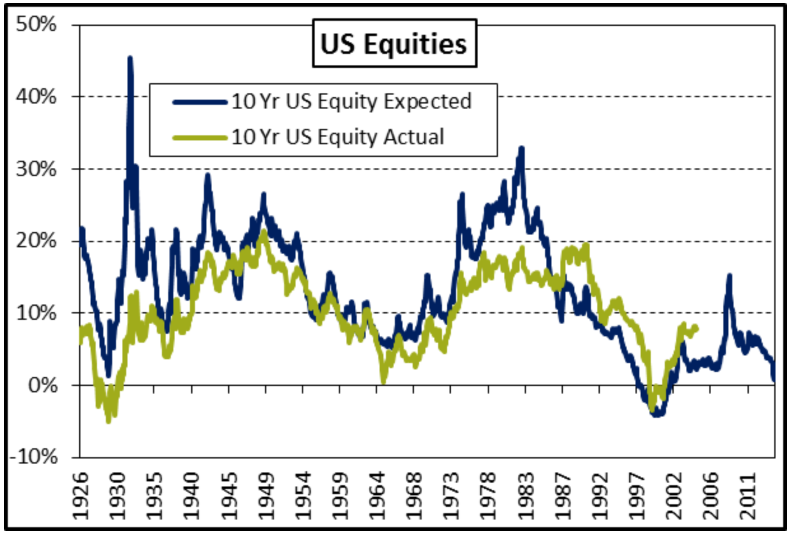


Source: Bloomberg as of 11/30

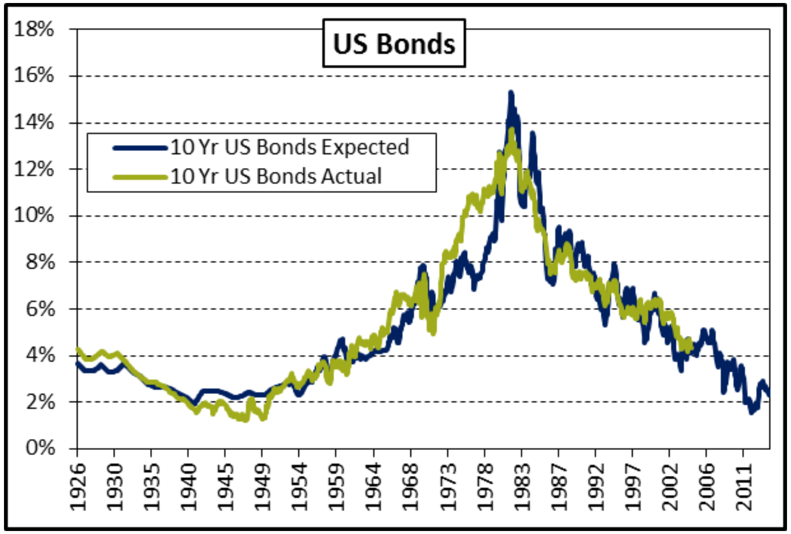
- **Investors must adjust to changing global market environment to meet return objectives and/or balance risk**
  - Financialization of markets, secular decline in risk-free rates, central bank driven financial repression

- **Expected low return world creates challenges that investors must address in order to effectively meet and exceed long-term objectives**
  - Take more risk
  - Take risk more efficiently
  - Increase funding/contributions

- **Traditional approaches will likely be challenged**
  - Particularly true of strategies reliant on index construction independent of investor objectives



Source: Shiller Data, Morningstar Direct, NEPC as of 11/30



Source: Shiller Data, Morningstar Direct, NEPC as of 11/30

SAAP Recommendation and Analysis

Note: All of the analysis provided on the following pages is based on NEPC's 5-7 Year Capital Market Assumptions, except where noted.

February 9, 2015 Investment Committee Meeting Objective

- **NEPC and ASRS Staff recommend that the Investment Committee "Recommend to the full Board the approval of the ASRS Strategic Asset Allocation Policy Schematic as denoted in Exhibit A".**

ASRS Strategic Asset Allocation Policy Schematic

(Exhibit A)

Asset Class	Policy	Range	Benchmark
Tactical Cash (Unassetized)	0%	(0 - 3%)	
Operating Cash (Unassetized)	0%		
Operating Cash (Assetized)	0%		
Total Cash	**0%**		
Treasuries (Long Duration)	0%	(0 - 10%)	Barclays LT Treasuries
Core Bonds	11%		Barclays Aggregate
Interest Rate Sensitive	11%		
High Yield	4%		Barclays High Yield
Private Debt	10%	(8 - 12%)	S&P/LSTA Leveraged Loan Index+ 2.5%
Opportunistic Debt	0%	(0 - 3%)	Investment Specific
Total Fixed Income	**25%**	**(18 - 35%)**	
Large Cap	20%		S&P 500
Mid Cap	3%		S&P 400
Small Cap	3%		S&P 600
US Public Equity	26%	(16 - 36%)	
Developed Large Cap	17%		MSCI EAFE
Developed Small Cap	2%		MSCI EAFE Small Cap
Emerging	5%		MSCI EM
Non-US Public Equity	24%	(14 - 34%)	
Private Equity	8%	(6 - 10%)	Russell 2000
Opportunistic Equity	0%	(0 - 3%)	Investment Specific
Total Equity	**58%**	**(48 - 65%)**	
Commodities	2%	(0 - 4%)	Bloomberg Total Return
Real Estate	10%	(8 - 12%)	NCREIF ODCE
Infrastructure	0%	(0 - 3%)	Investment Specific
Farmland and Timber	0%	(0 - 3%)	Investment Specific
Opportunistic Inflation Linked	0%	(0 - 3%)	Investment Specific
Total Inflation Linked Assets	**12%**	**(10 - 16%)**	
Multi-Asset Class strategies	**5%**	**(0 - 12%)**	Investment Specific
TOTAL	**100%**		

Notes:
1) Total Opportunistic Equity, Debt and Inflation-Linked in aggregate will not exceed 10% of the Total Fund market value and is a) tactical in nature, outside of the SAAP benchmark and b) within the SAAP benchmark but are absolute return oriented.
2) Tactical cash viewed as a defensive and tactical vehicle, will be consistent with House Views and may be employed as a hedge to dampen the effects of anticipated negative returns to the aggregate market value of the Total Fund.
3) Operating cash includes a nominal balance to cover unexpected derivations in cash flow requirements. Equitized operating cash includes excess cash balances that are exposed to the markets using futures and/or ETFs to minimize cash drag while facilitating larger internal and external fund obligations.
4) Multi-Asset Class strategies invest tactically within and across asset classes, seeking to exploit quantitative or fundamental drivers of asset class returns or risk allocations as market conditions warrant.

Allocations for Analysis and Discussion

	Current Target	NEPC & Staff Recommendation	60/40	Alternative	Risk Parity
Cash	0%	0%	0%	0%	-90%*
Large Cap Equities	23%	20%	35%	15%	14%
Small/Mid Cap Equities	10%	6%	10%	5%	4%
Int'l Equities (Unhedged)	14%	17%	12%	5%	1%
Int'l Equities Small Cap (U)	3%	2%	0%	0%	0%
Int'l Equities (Hedged)	0%	0%	0%	5%	16%
Emerging Int'l Equities	6%	5%	3%	5%	6%
Total Public Equity	**56%**	**50%**	**60%**	**35%**	**41%**
Private Equity	7%	8%	0%	10%	0%
Total Equity	**63%**	**58%**	**60%**	**45%**	**41%**
Core Bonds	13%	11%	25%	0%	0%
Treasuries	0%	0%	0%	0%	-6%
IG Corp Credit	0%	0%	0%	0%	7%
High-Yield Bonds	5%	4%	5%	0%	2%
MBS	0%	0%	0%	0%	2%
Global Bonds (Unhedged)	0%	0%	5%	0%	1%
EMD	4%	0%	0%	0%	3%
TIPS	0%	0%	0%	0%	24%
Global I/L	0%	0%	0%	0%	10%
US 10 Yr Treasuries	0%	0%	0%	0%	29%
US 10 Yr Sovereigns	0%	0%	0%	0%	48%
Long Duration (Treas)	0%	0%	0%	5%	5%
Global Multi-Sector Fixed Income	0%	0%	0%	10%	0%
Absolute Return Fixed Income	0%	0%	0%	5%	0%
Total Public Fixed Income	**22%**	**15%**	**35%**	**20%**	**125%**
Private Debt	3%	10%	0%	5%	0%
Total Fixed Income	**25%**	**25%**	**35%**	**25%**	**125%**
Real Assets	0%	0%	0%	0%	0%
Real Estate	8%	10%	0%	0%	0%
REITs	0%	0%	5%	0%	1%
Commodities	4%	2%	0%	0%	20%
Total Inflation Linked	**12%**	**12%**	**5%**	**0%**	**21%**
Hedge Funds	0%	0%	0%	10%	0%
Hedge Funds - Macro	0%	0%	0%	0%	2%
Global Asset Allocation	0%	0%	0%	10%	0%
Risk Parity	0%	0%	0%	10%	0%
GTAA/Multi-Asset	0%	5%	0%	0%	0%
Total Other	**0%**	**5%**	**0%**	**30%**	**2%**
Sec Lending Financing	-20%	-10%	0%	0%	0%
Sec Lending	20%	10%	0%	0%	0%

	Current Target	NEPC & Staff Recommendation	60/40	Alternative	Risk Parity
Expected Return (5-7 Yrs)	***6.5%***	***7.0%***	**5.4%**	**6.4%**	**5.6%**
Standard Deviation (5-7 Yrs)	***13.7%***	***13.6%***	**12.3%**	**12.2%**	**12.4%**
Sharpe Ratio (5-7 Yrs)	***0.35***	***0.39***	**0.30**	**0.38**	**0.31**
Expected Return (30 Yrs)	***7.8%***	***8.1%***	**6.9%**	**7.6%**	**7.0%**

Note:
1) Current Target includes 0% allocation to GTAA/Multi-Asset to account for change in methodology going forward with respect to treatment of GTAA/Multi-Asset strategies.
2) Some totals may not add exactly due to rounding.
3) 'Alternative' allocation represents commonly used themes from NEPC observations and actions to reflect a diversified alternative to a traditional 60/40 portfolio.

*Negative cash figure represents financing costs of leverage from shorting LIBOR and Global LIBOR.

Expectations based on geometric return assumptions.

Summary of Recommended Changes

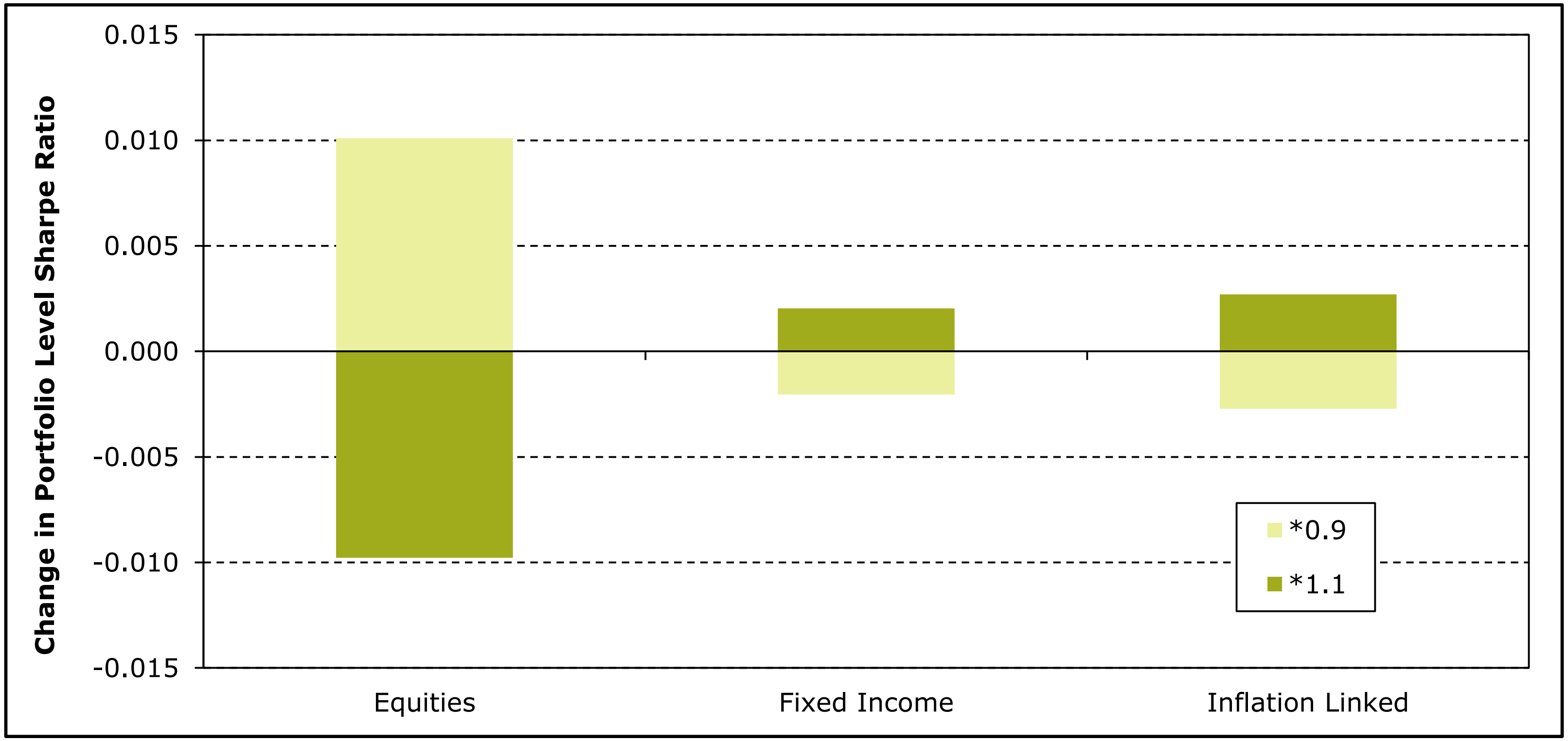
	Current Target	NEPC & Staff Recommendation	Change
Cash	0%	0%	-
Large Cap Equities	23%	20%	-3%
Small/Mid Cap Equities	10%	6%	-4%
Int'l Equities (Unhedged)	14%	17%	3%
Int'l Equities Small Cap (U)	3%	2%	-1%
Int'l Equities (Hedged)	0%	0%	-
Emerging Int'l Equities	6%	5%	-1%
Total Public Equity	**56%**	**50%**	**-6%**
Private Equity	7%	8%	1%
Total Equity	**63%**	**58%**	**-5%**
Core Bonds	13%	11%	-2%
Treasuries	0%	0%	-
IG Corp Credit	0%	0%	-
High-Yield Bonds	5%	4%	-1%
MBS	0%	0%	-
Global Bonds (Unhedged)	0%	0%	-
EMD	4%	0%	-4%
TIPS	0%	0%	-
Global I/L	0%	0%	-
US 10 Yr Treasuries	0%	0%	-
US 10 Yr Sovereigns	0%	0%	-
Long Duration (Treas)	0%	0%	-
Global Multi-Sector Fixed Income	0%	0%	-
Absolute Return Fixed Income	0%	0%	-
Total Public Fixed Income	**22%**	**15%**	**-7%**
Private Debt	3%	10%	7%
Total Fixed Income	**25%**	**25%**	**-**
Real Assets	0%	0%	-
Real Estate	8%	10%	2%
REITs	0%	0%	-
Commodities	4%	2%	-2%
Total Inflation Linked	**12%**	**12%**	**-**
Hedge Funds	0%	0%	-
Hedge Funds - Macro	0%	0%	-
Global Asset Allocation	0%	0%	-
Risk Parity	0%	0%	-
GTAA/Multi-Asset	0%	5%	5%
Total Other (Multi-Asset)	**0%**	**5%**	**5%**

**Asset classes in italics are representative of those used in comparable portfolios, but not applicable to current target or NEPC & Staff Recommended asset mix.*

- Reduction in traditional U.S. equities
  - Reflects lower return outlook after strong rally over recent years, as well as higher valuations
  - Reduction is moderated by stronger U.S. economic outlook
- Increase in international equities
  - Represents globally diversified orientation
- Modest increase to private equity allocation
  - Seek alternative option to maintain return target
  - Understanding of stretched valuations in public markets

- Reduction across traditional U.S. fixed income assets
  - Core reduction recognizes low starting point for yields
- Significant increase to private debt target
  - Seek robust returns in low yield environment
  - Consistent with theme of diversifying equity risk
- Addition of Long Duration line item with 0% target
  - Long treasuries offer an attractive correlation profile and deflationary hedge in relation to portfolio growth orientation – but entry point is not currently attractive

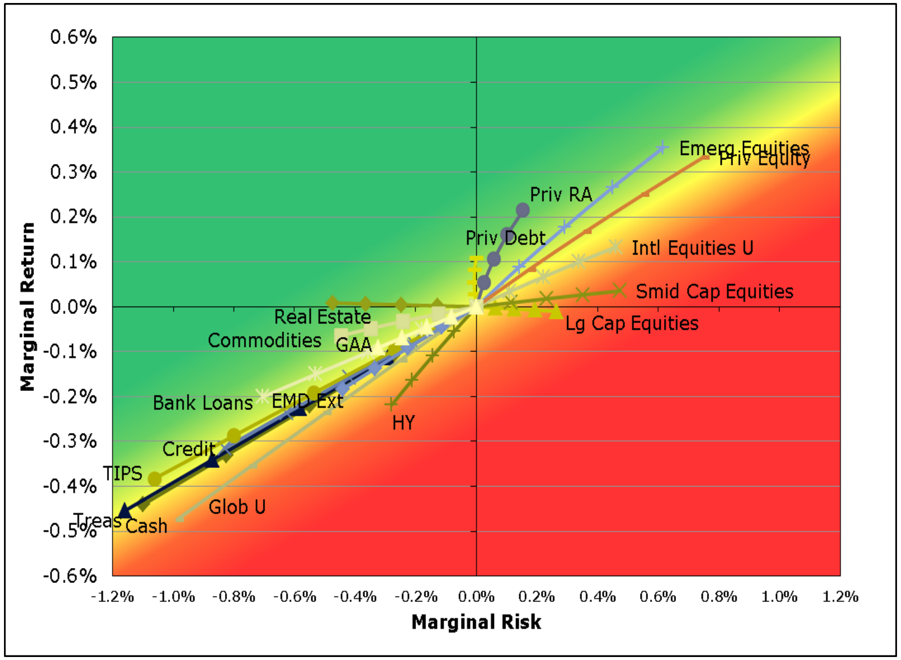
- Decrease to commodities target; add to real estate
  - Energy environment provides roll yield headwind for liquid commodity strategies
  - Opportunities may be better accessed through illiquids
- Bring GTAA/Multi-Asset ‘above the line’
  - Consistent with change in portfolio evaluation



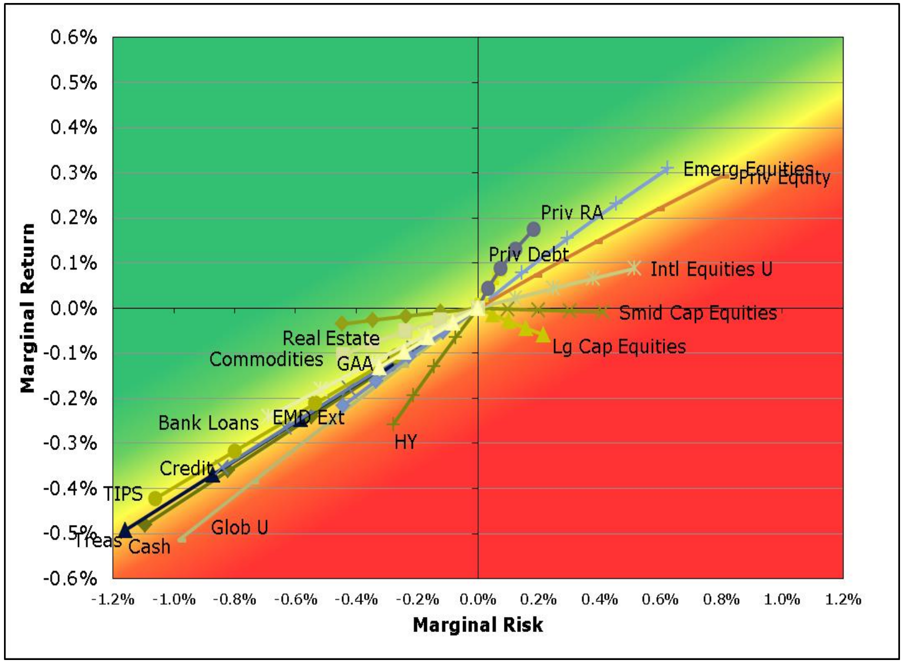
- **All else equal, an increase in absolute equity exposure would cause a decline in expected Sharpe ratio**
  - Supports small adjustment to upper bound of equity range
- **Potential increases to fixed income and inflation linked show expected efficiency gains**
  - Supports similar ranges to both sleeves but a small increase in lower bounds of each range to reflect the diversification benefits of each

Opportunity Set (Heat Map) Analysis

Current Target

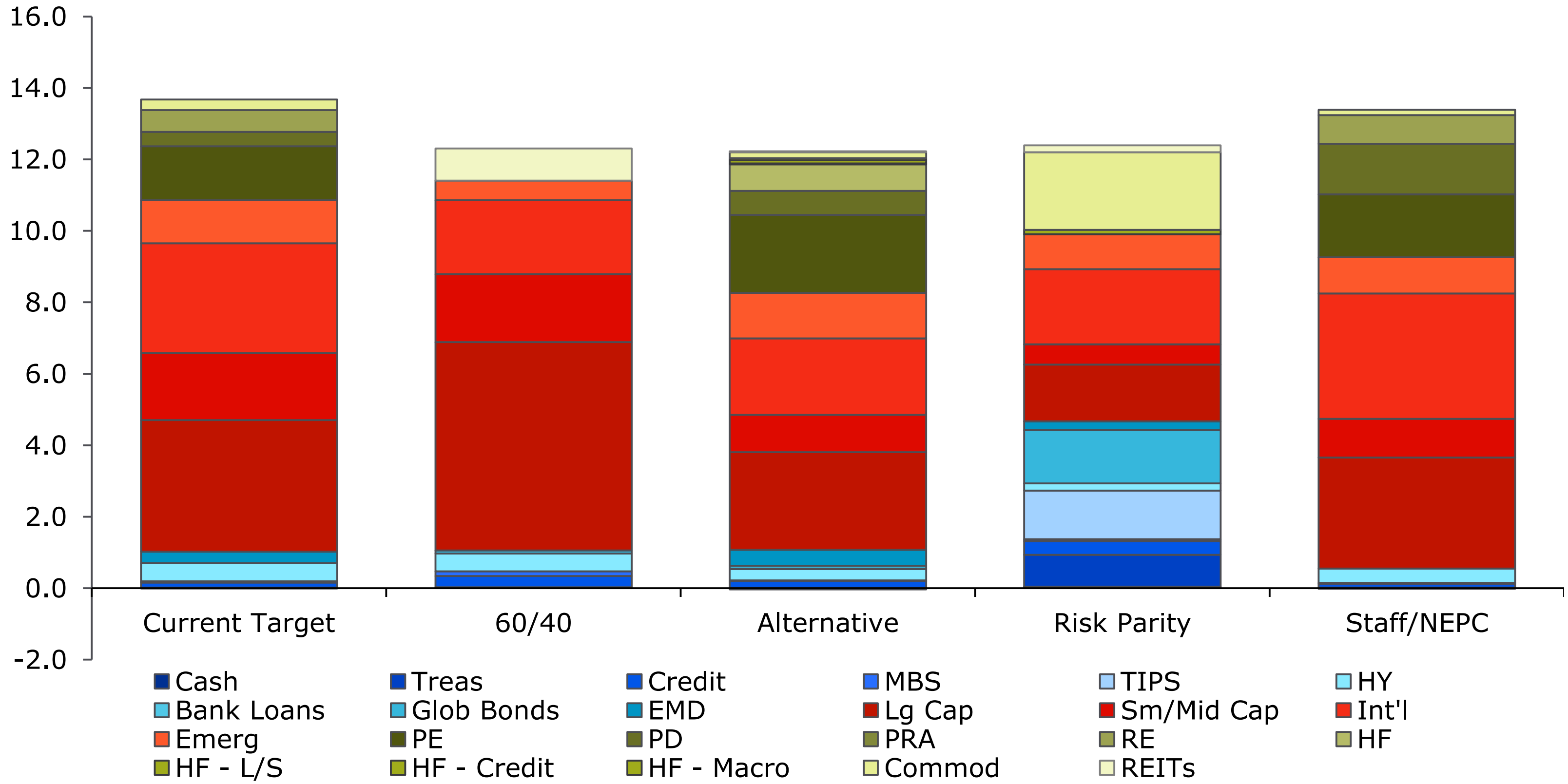


NEPC & Staff Recommendation



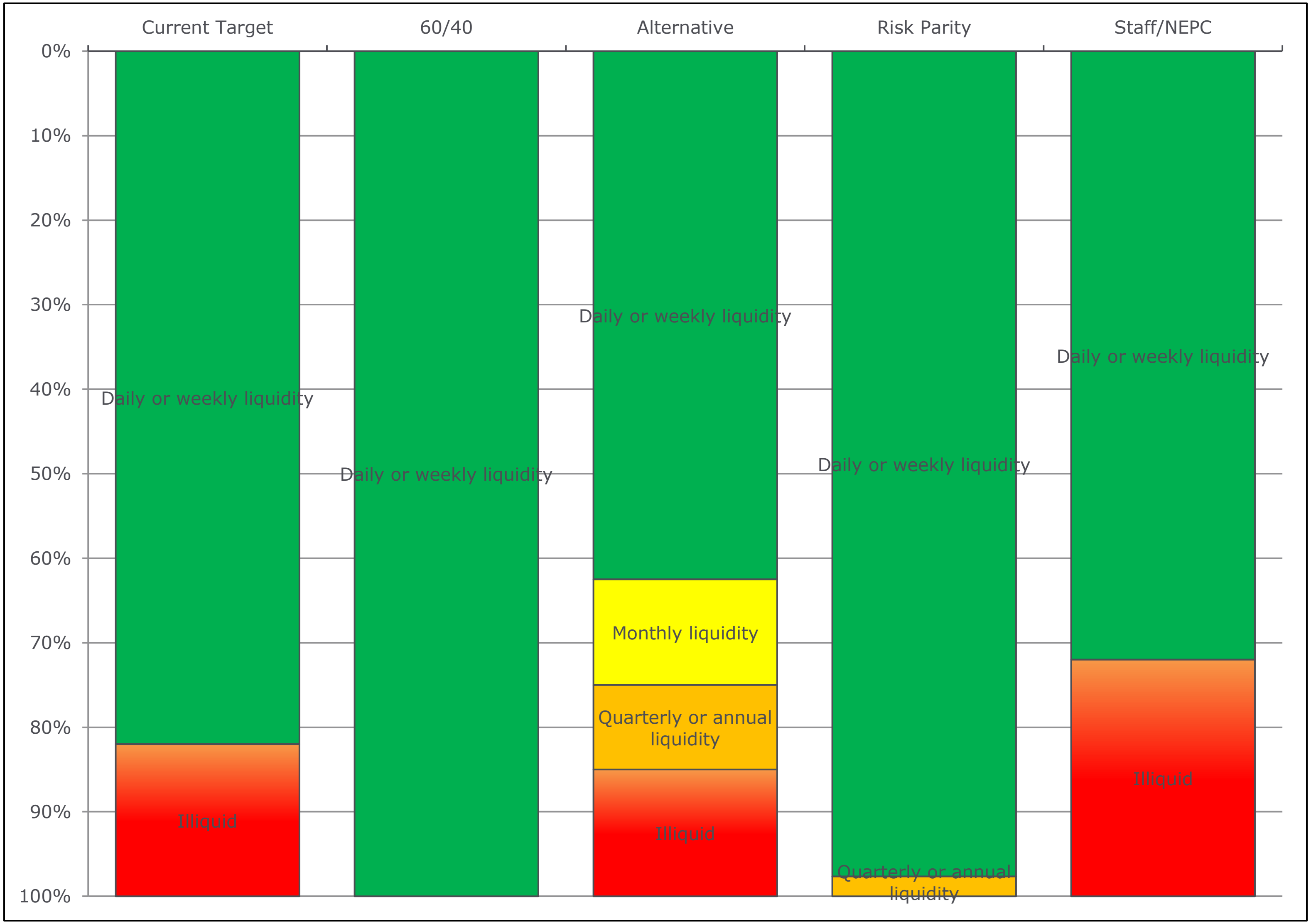
- **Current target is well diversified with marginal opportunities to increase portfolio efficiency**
- **Higher allocation to private markets ‘flattens’ the opportunity set in the NEPC & Staff Recommended asset mix**

Risk Budgeting Analysis



- **Recommendation carries similar level of risk as current target**
  - Higher risk budget allocated to private markets
  - Comparison portfolios have lower absolute risk but lower expected returns
- **Despite traditional equity reduction, recommendation still heavily biased toward long equity risk**
  - Consistent with historical orientation and long-term goals

Liquidity Profiles



*Based on target allocations, actual implementation may vary

Probability Analysis

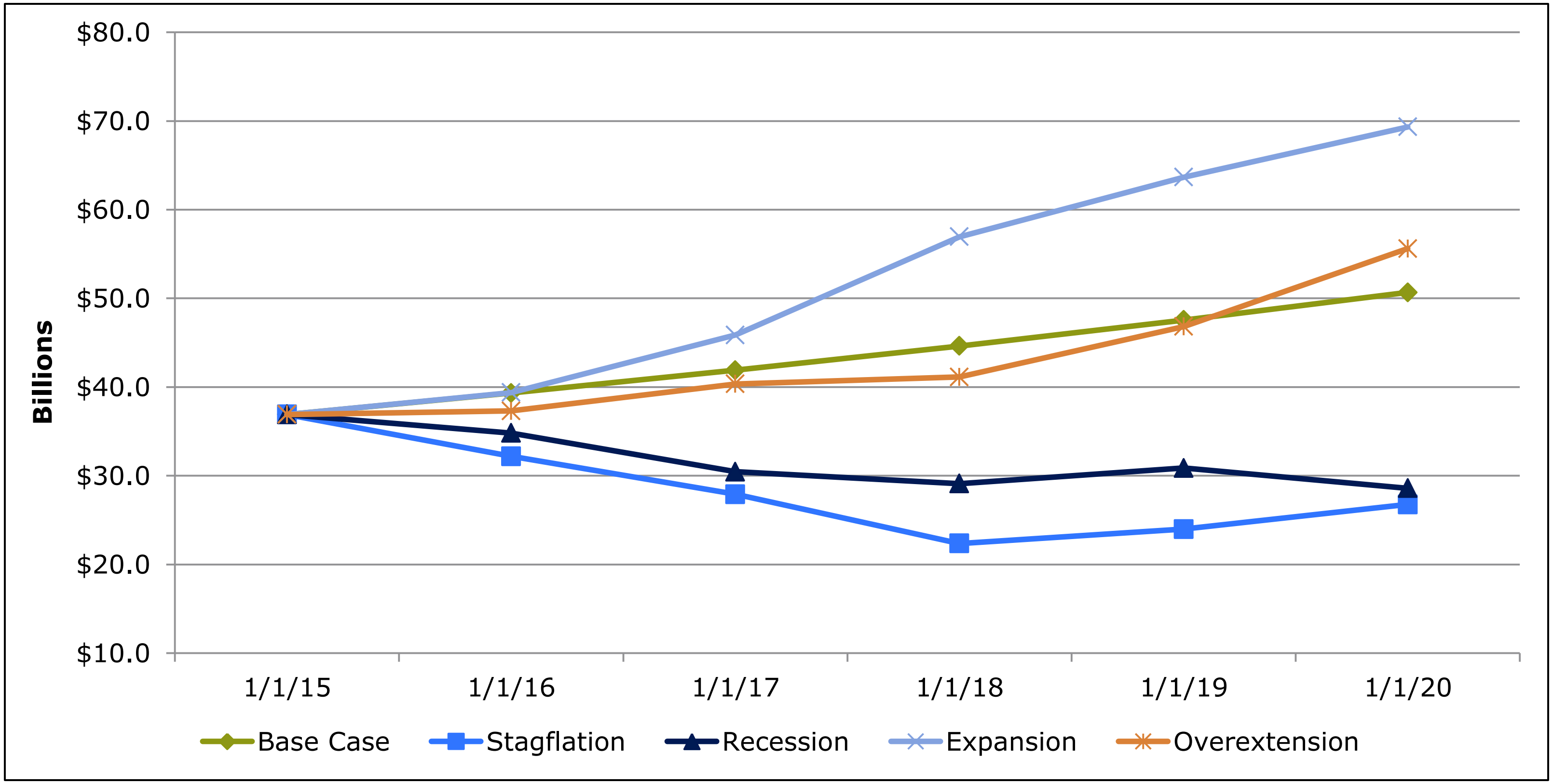
	Using NEPC 5-7 Year Assumptions				
	Current Target	60/40	Alternative	Risk Parity	NEPC & Staff Recommendation
Probability of 1-Year Return Under -5%	19.9%	19.9%	17.6%	19.6%	18.8%
Probability of 1-Year Return Under 0%	31.6%	33.0%	30.1%	32.5%	30.2%
Probability of 1-Year Return Over 5%	54.5%	51.3%	54.5%	52.0%	56.0%
Probability of 1-Year Return Over 8%	45.8%	41.6%	44.7%	42.4%	47.2%
Probability of 3-Year Return Under -5%	7.2%	7.2%	5.3%	6.9%	6.2%
Probability of 3-Year Return Under 0%	20.3%	22.4%	18.3%	21.6%	18.4%
Probability of 3-Year Return Over 5%	57.8%	52.3%	57.7%	53.4%	60.3%
Probability of 3-Year Return Over 8%	42.7%	35.7%	40.9%	37.0%	45.2%
Probability of 5-Year Return Under -5%	2.9%	2.9%	1.9%	2.8%	2.4%
Probability of 5-Year Return Under 0%	14.2%	16.3%	12.1%	15.5%	12.3%
Probability of 5-Year Return Over 5%	60.0%	52.9%	59.9%	54.4%	63.2%
Probability of 5-Year Return Over 8%	40.6%	31.8%	38.3%	33.4%	43.8%

Relatively high potential upside but less relative downside protection

Best downside protection but absolute risk limits upside

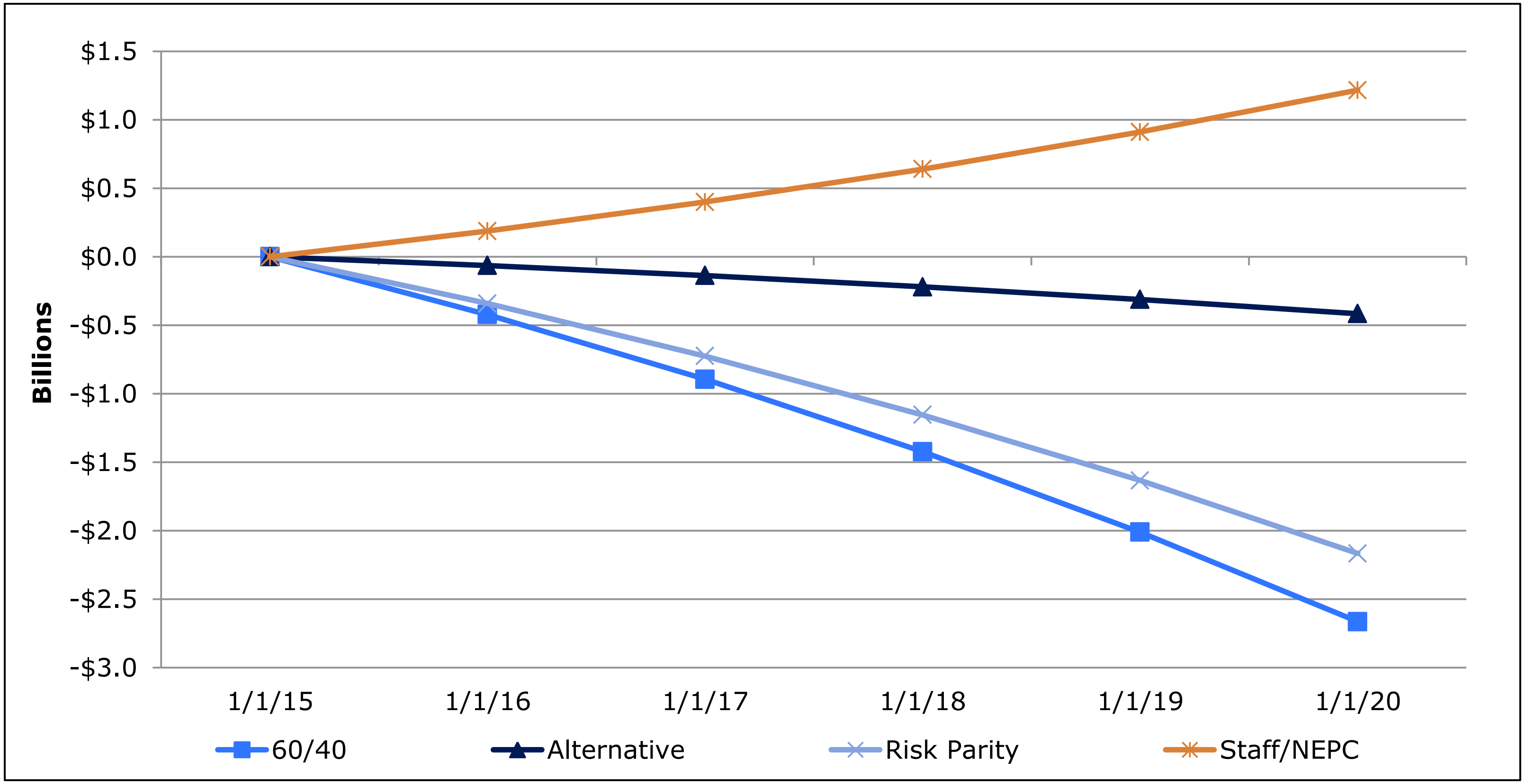
Good downside protection while providing most upside

	Using NEPC 30 Year Assumptions				
	Current Target	60/40	Alternative	Risk Parity	NEPC & Staff Recommendation
Probability of 30-Year Return Under 0%	0.1%	0.1%	0.0%	0.1%	0.1%
Probability of 30-Year Return Under 5%	13.5%	20.2%	12.0%	19.2%	10.7%
Probability of 30-Year Return Over 8%	46.1%	30.8%	43.2%	32.5%	51.3%
Probability of 30-Year Return Over 10%	18.4%	8.2%	14.3%	9.0%	22.0%



Note: Analysis does not include assumptions for liabilities or other cash flow items and is calculated using current assets (as of 12/31) only

- **Strong equity bias means portfolio loses assets in lower than expected growth scenarios and performs positively when growth meets or exceeds expectations**

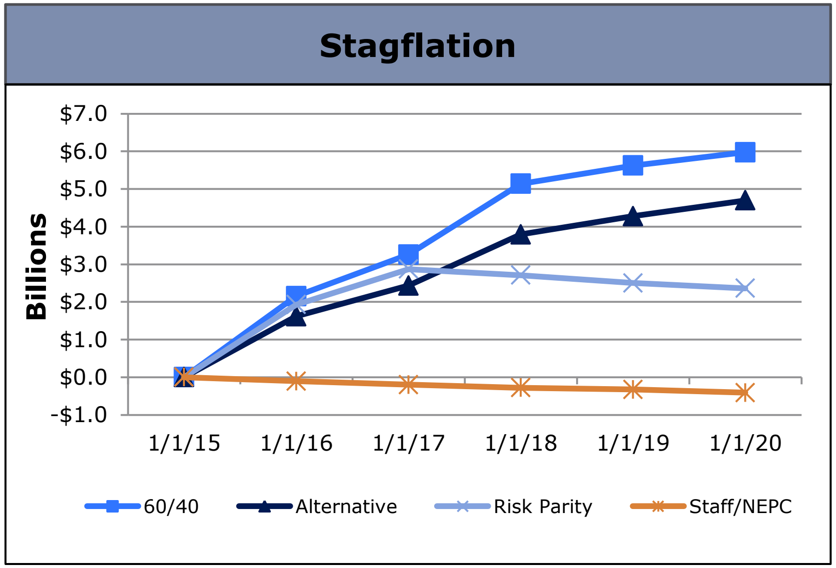


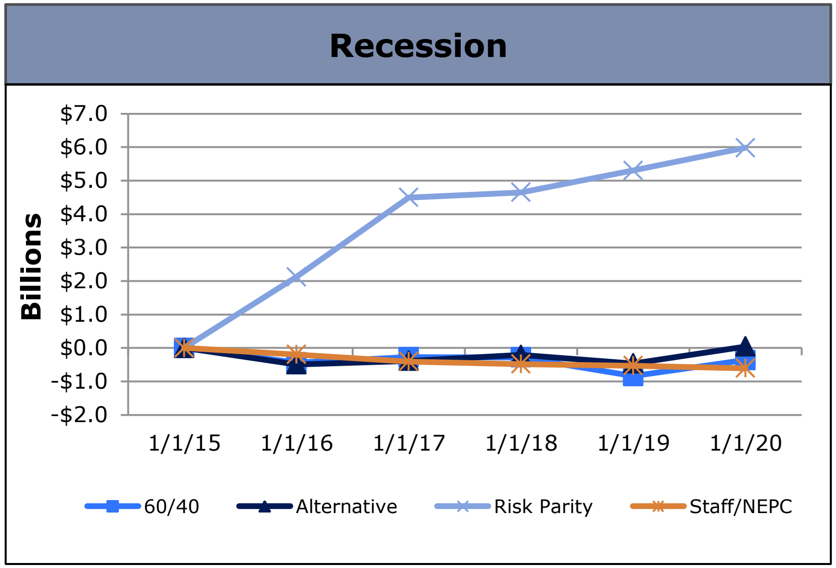
Note: Analysis does not include assumptions for liabilities or other cash flow items and is calculated using current assets (as of 12/31) only

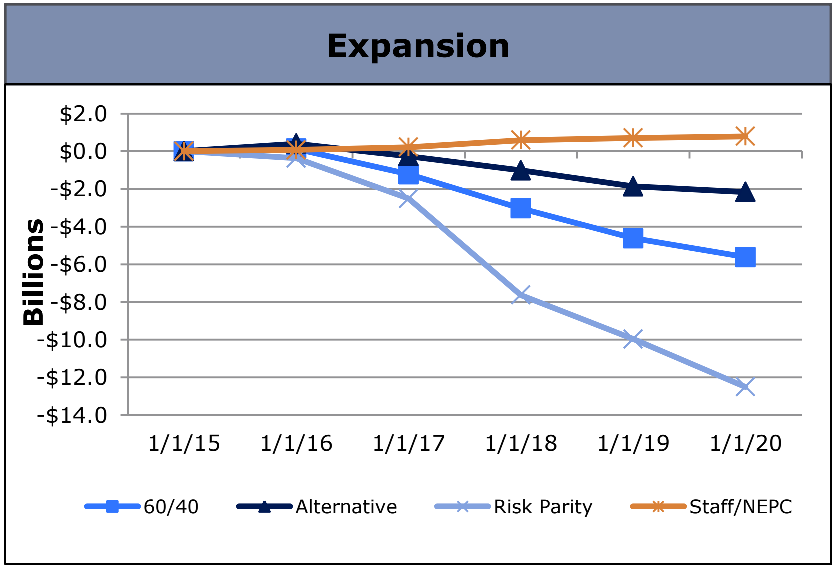
- **Recommendation outperforms current target in the base case**
  – Higher expected return achieved with similar risk target

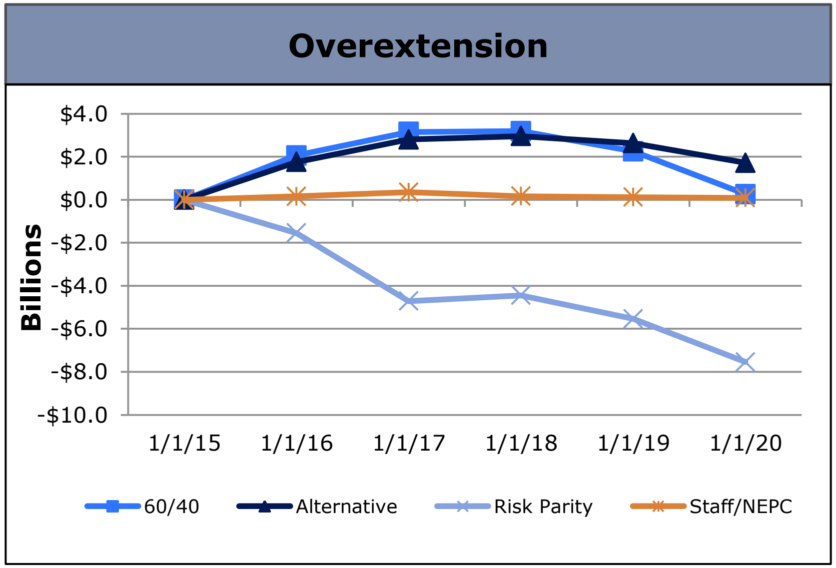
- **Other mixes have lower return expectations**

Scenario Analysis – Change from Current Target

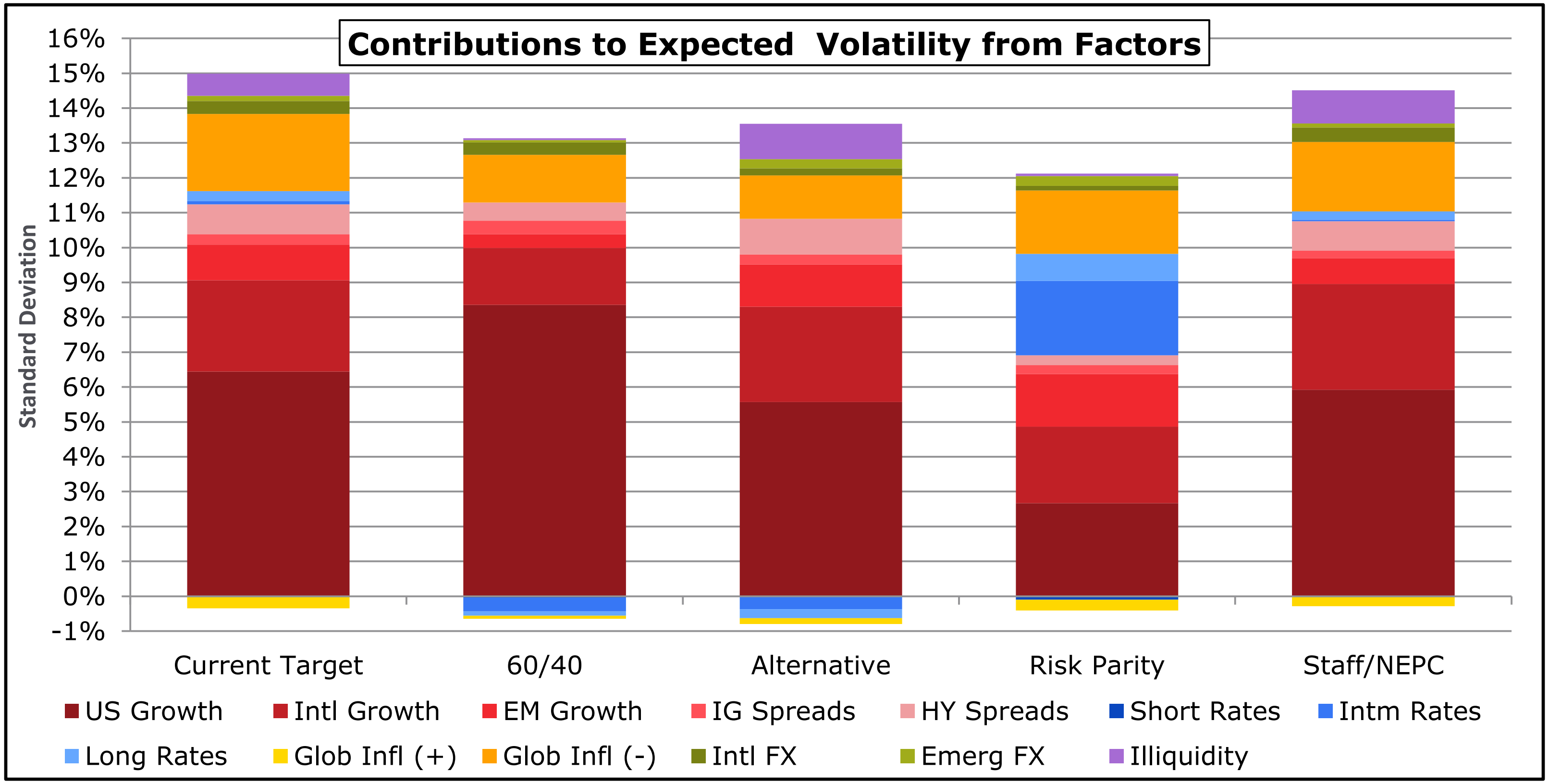






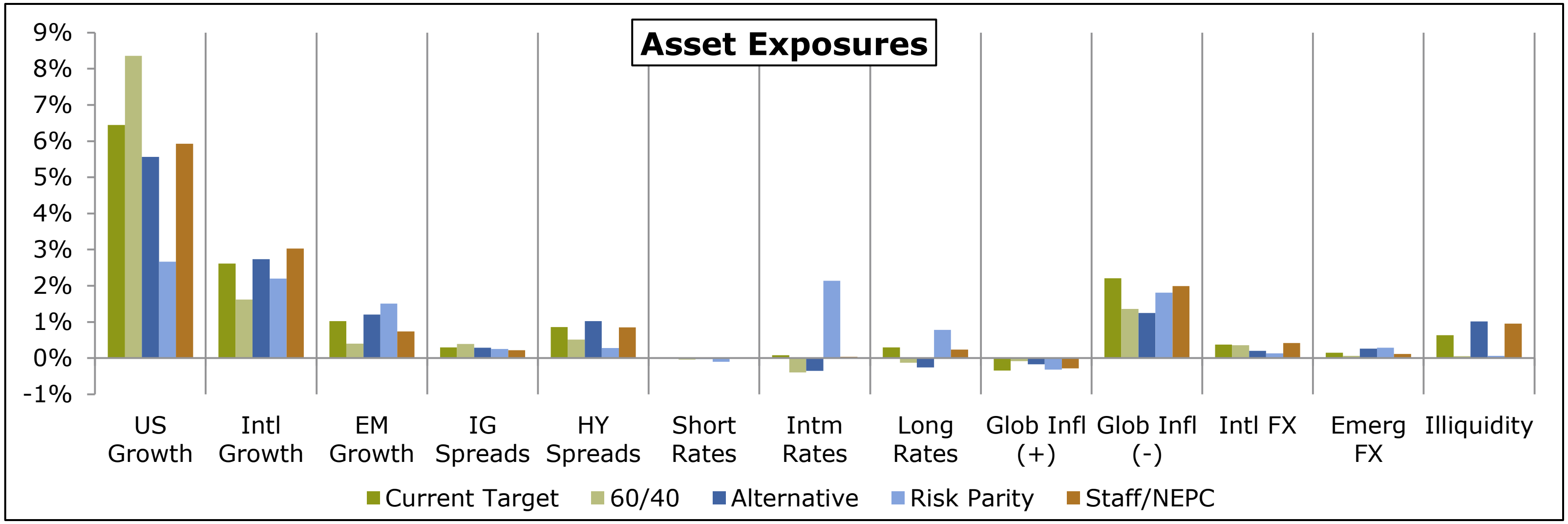


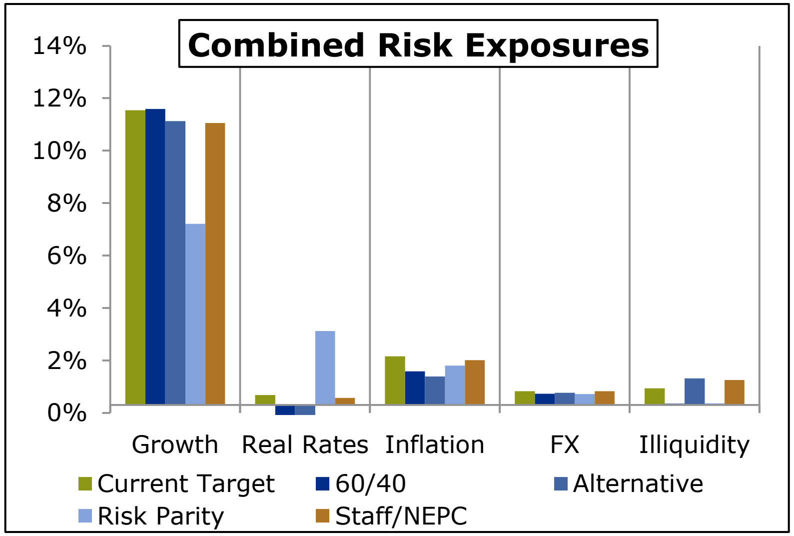
Note: Analysis does not include assumptions for liabilities or other cash flow items and is calculated using current assets (as of 12/31) only

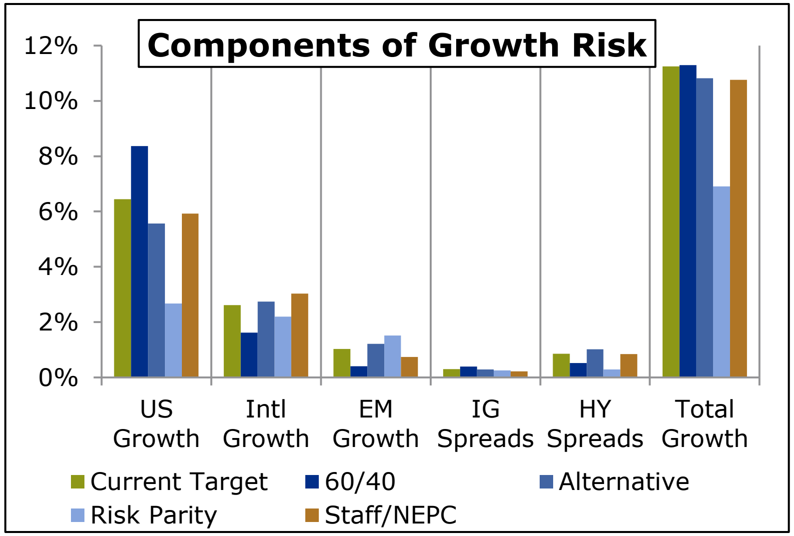


- **Large majority exposure to growth in all mixes except risk parity**
- **Recommended mix carries slightly lower growth exposure and increases risk exposure to illiquidity**

Factor Analysis – Breakdown







Appendix: SAA Policy History

Strategic Asset Allocation Policy (SAAP) History

- 7/1/75 – 12/31/79 – 40% S&P 500/60% Barclays Capital Aggregate
- 1/1/80 – 12/31/83 – 50% S&P 500/50% Barclays Capital Aggregate
- 1/1/84 – 12/31/91 – 60% S&P 500/40% Barclays Capital Aggregate
- 1/1/92 – 12/31/94 – 50% S&P 500/10% MSCI EAFE/40% Barclays Capital Aggregate
- 1/1/95 – 6/30/97 – 45% S&P 500/15% MSCI EAFE/40% Barclays Capital Aggregate
- 7/1/97 – 12/31/99 – 50% S&P 500/15% MSCI EAFE/35% Barclays Capital Aggregate
- 1/1/00 – 9/30/03 – 53% S&P 500/17% MSCI EAFE/30% Barclays Capital Aggregate
- 10/1/03 – 12/31/06 – 53% S&P 500/15% MSCI EAFE/ACWI ex-U.S.[1]/26% Barclays Capital Aggregate/6% NCREIF ODCE (lagged one quarter)
- 1/1/07 – 10/31/2009 – 31% S&P 500/7% S&P 400/7% S&P 600/18% MSCI ACWI ex-U.S./5% Russell 2000 (lagged one quarter)/26% Barclays Capital Aggregate/6% NCREIF ODCE (lagged one quarter)
- 11/1/2009 – 6/30/2012 – 28% S&P 500/6% S&P 400/6% S&P 600/13% MSCI EAFE/2% MSCI EAFE Small Cap/3% MSCI Emerging Markets/7% Russell 2000 (lagged one quarter)/24% Barclays Capital Aggregate/2% Barclays Capital High Yield/6% NCREIF ODCE (lagged one quarter)/3% Dow Jones/UBS Commodities Index
- **7/1/2012 – Present – 23% S&P 500/5% S&P 400/5% S&P 600/14% MSCI EAFE/3% MSCI EAFE Small Cap/6% MSCI Emerging Markets/7% Russell 2000 (lagged one quarter)/13% Barclays Capital Aggregate/5% Barclays Capital High Yield/4% JP Morgan GBI-EM Global Diversified/3% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/8% NCREIF ODCE (lagged one quarter)/4% Dow Jones/UBS Commodities Index**

- *Interim SAA Policy: 25% S&P 500/5% S&P 400/5% S&P 600/14% MSCI EAFE/3% MSCI EAFE Small Cap/6% MSCI Emerging Markets/6% Russell 2000 (lagged one quarter)/14% Barclays Capital Aggregate/5% Barclays Capital High Yield/4% JP Morgan GBI-EM Global Diversified/3% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/6% NCREIF ODCE (lagged one quarter)/4% Dow Jones/UBS Commodities Index

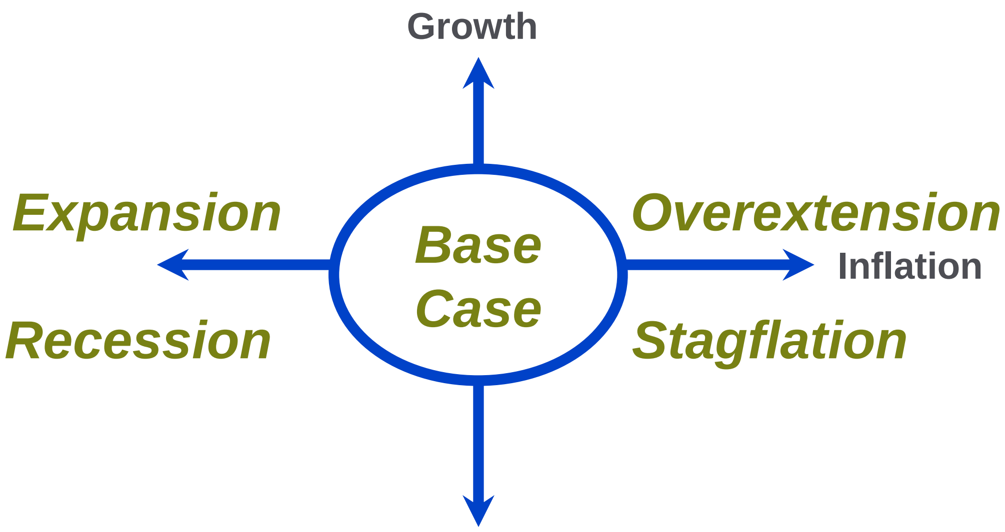
Note: Interim SAA Policy includes a proration of 1% Private Equity and 2% Real Estate, which are unfunded. Private Equity was prorated to domestic equity; Real Estate was prorated to domestic equity and fixed income. Recently approved Strategic Asset Allocation Policy effective July 1, 2012.

[1]MSCI EAFE/ACWI ex-U.S. Benchmark is the MSCI EAFE Index prior to 10/1/2005 and the MSCI ACWI ex-U.S. thereafter.

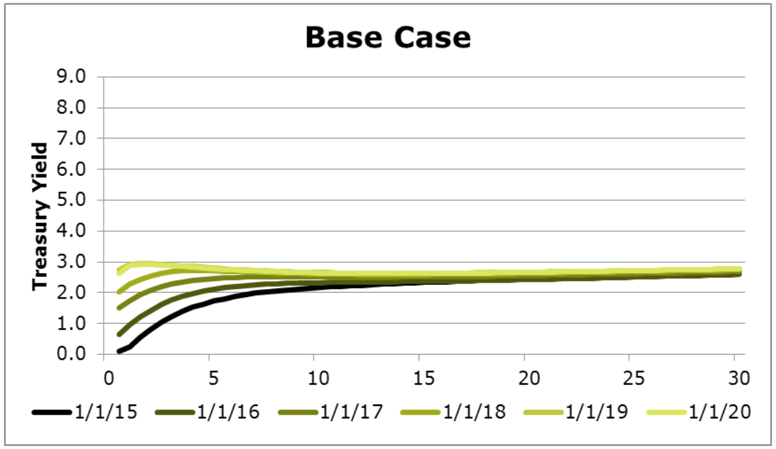
Note: All MSCI indices changed from Gross to Net of dividend withholding taxes effective 1/1/2014.

Appendix: Scenario and Factor Assumptions

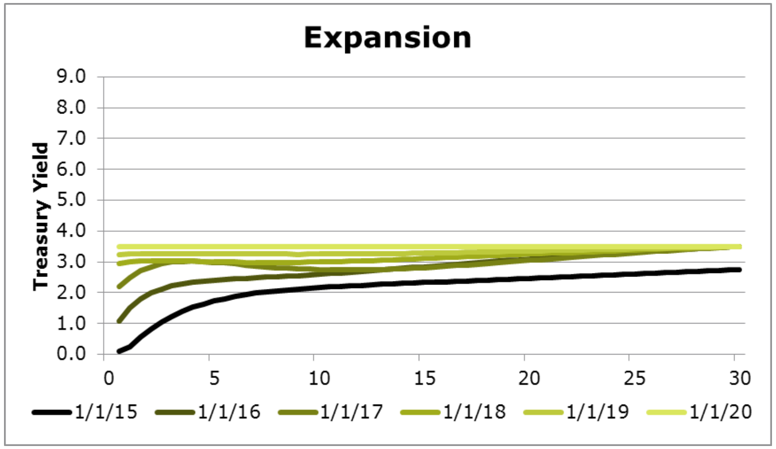
- **NEPC Scenario Analysis tests the viability of alternative asset mixes under multiple economic scenarios**
  - Allows better understanding of risk exposures under contrasting inflation and economic growth regimes
  - Can understand the effect on both assets and liabilities (funded status)



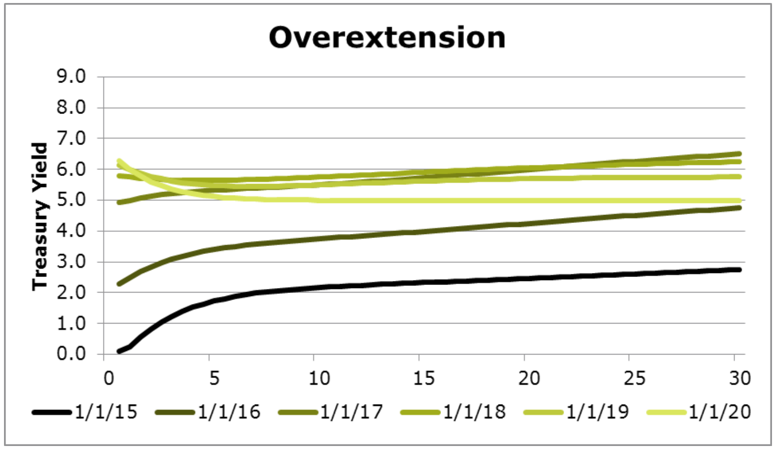
- **Base Case**
  - Asset returns over 5 year period in line with NEPC 2015 5-7 Year Assumptions
  - No volatility



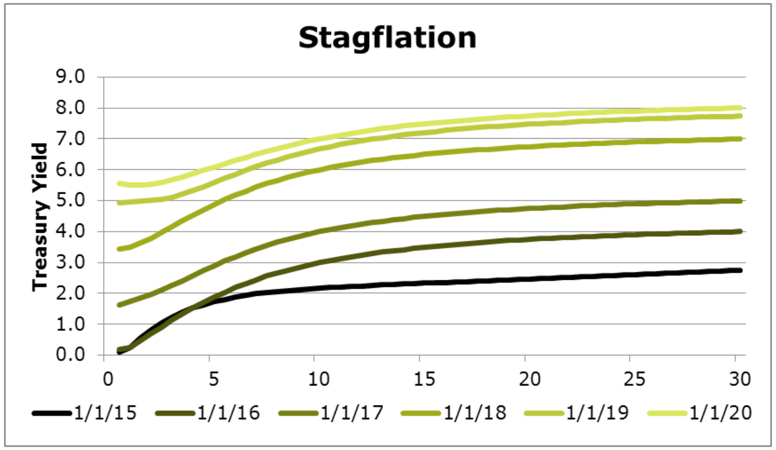
- **Expansion**
  - Economy is growing by a strong, but seemingly sustainable level
  - Bond yields are stable, inflation is manageable, equities and other high volatility asset classes perform quite well in this environment
  - Historical example: 2004-2006
  - *Large cap equities time-series: 10%, 17%, 28%, 12%, 10%*



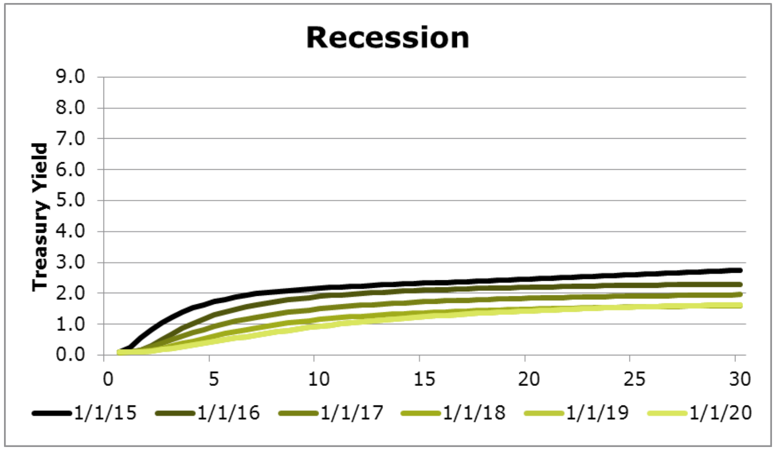
- **Overextension**
  - Economy is growing at a rapid pace, inflation increases significantly – booming times but at the cost of future growth
  - Bond yields move higher as a result of inflation; high yield does well with confidence in the economy
  - Equities, real estate, and commodities fuel rapid expansion
  - Historical example: Vietnam War era (1967-1971)
  - *Large cap equities time-series: 12%, 16%, 0%, 12%, 16%*



- **Stagflation**
  - Two problems – (1) the economy is not growing, (2) inflation has skyrocketed
    - Inflation is sticky – once it gets high, it stays high for several years
    - Fed has limited options to kick-start economy because easing only promotes further inflation
  - Equities sag; bonds lose real value; real assets such as TIPS perform well on a relative basis because they are linked to inflation
  - Historical example: flat stock market and double digit inflation of the mid-1970s
  - *Large cap equities time-series: -8%, -12%, -15%, 9%, 12%*



- **Recession**
  - Economy stalls – there is a flight to quality as investors lose confidence
    - Equity markets fall
    - Bond yields fall
  - Interest-sensitive securities (bonds, especially long duration bonds) will perform well in this environment
  - Historical example: early 1990s
  - *Large cap equities time-series: -8%, -18%, -8%, 4%, -10%*



NEPC’s Macroeconomic Risk Factors

- **We focus on five key underlying macroeconomic risk factors**
  – Sub-factors used for modeling purposes in order to express differences in risk outlook

- **Volatility becomes a function of factor movements relative to expectations**
  – Example: Experience volatility when real rates rise more than expected; not necessarily when any rise occurs

- **Factor analysis is a risk exercise**
  – Investment recommendations also reflect how we expect an investor will be compensated for holding each risk factor

Growth	Real Rates	Inflation	Currency	Illiquidity
Domestic Growth	Short Real Rates	Rising Global Inflation	Developed vs. Base	Contractual Illiquidity
Developed Int’l Growth	Intermediate Real Rates	Falling Global Inflation	Emerging vs. Base	Pricing Illiquidity
Emerging Growth	Long Real Rates			
IG Credit Spreads				
HY Credit Spreads				

Risk/Reward of Factor Exposures

Growth

- **Common and easily obtainable source of return, but brings volatility that may be difficult to hedge away without sacrificing return**

Real Rates

- **Generally lower return and volatility than growth factor; may be a lone bright spot in low/negative growth environment**

Inflation

- **Sensitivity to higher inflation is present in almost all investments but can be partially offset through a real assets program**

Currency

- **Introduces additional volatility with a small risk premium from emerging currencies but without a positive expected return from developed currencies**

Illiquidity

- **Attractive supplemental return source from being willing to lock up money contractually or taking on investments with lower market liquidity, but may introduce additional risks beyond traditional measures of volatility**

Benefits

- **Avoid misleading diversification**
- **Improved perspective on where risk is being taken and how changing market conditions will impact the portfolio**
- **Understand benefits of adding new asset classes**

Challenges

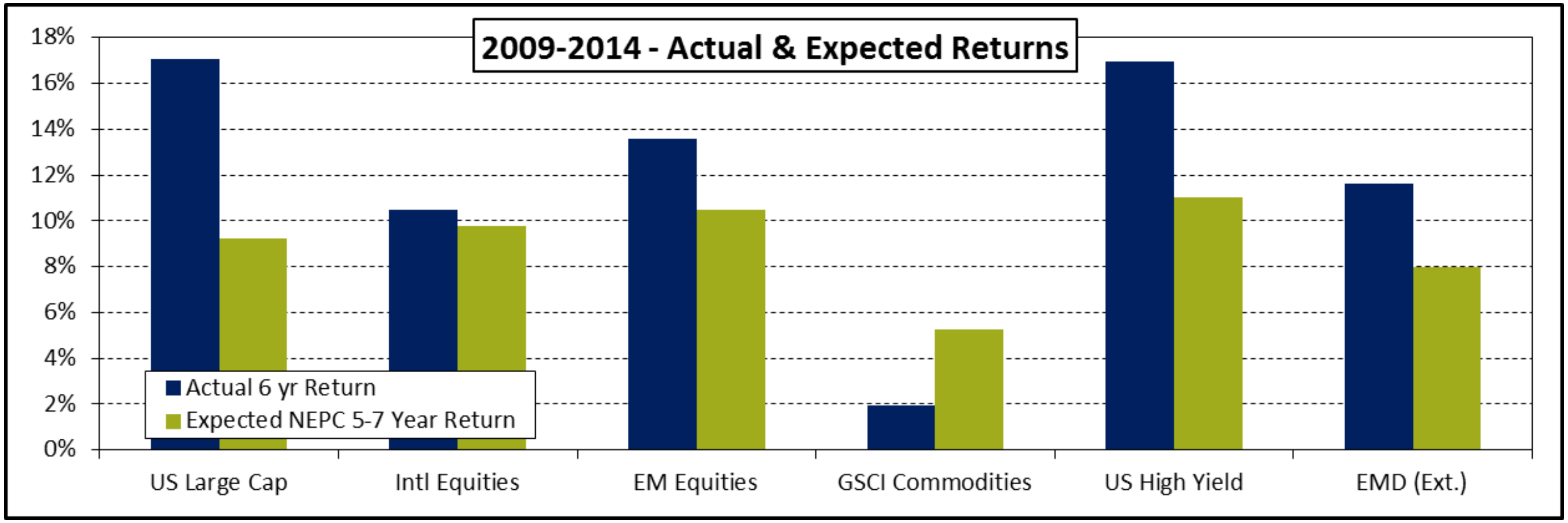
- **May be difficult to obtain (or even define) data for investment program's unique definition of risk factors, particularly inflation**
- **Traditional ways of "bucketing" asset classes may be difficult**
- **Still uses portfolio theory framework which can oversimplify risk, particularly over shorter time periods**

Appendix: NEPC 2015 Capital Market Assumptions Development

Extreme Outperformance Since Crisis; Understand Long-Term Implications

- **Returns have been exceptional since the global financial crisis**
  - Results dramatically outpaced expectations during a period of elevated uncertainty
  - Volatility spiked at times but overall experience well below expectations
- **Low realized volatility fuels shortsighted view for long-term investors**
  - Benefits of diversification are questioned but should be a cornerstone of success
- **NEPC's capital market forecasts cover a 5-7 year horizon which is unlikely to look like most recent trailing periods**
  - End point sensitivity pronounced; annualized returns for diversified investors show an 11.9% return for 3 years, 9.2% return for 5 years and 4.7% for 7 years
  - Last three years' results unlikely to continue for the next 5-7 years
- **Easy monetary policy supports near-term returns beyond what fundamentals may otherwise indicate**
  - Europe and Japan may provide further stimulus but effectiveness of extended easy monetary policy wanes in today's low yield environment
  - U.S. strength can spur consumption and buoy global growth but profit margins may compress impacting valuations
  - Timing is key, but difficult to pinpoint; risk balance is encouraged
- **30 year forecasts are lower, challenging feasibility of success**
  - Extension of easy monetary policy has stymied expectations of higher yields
  - Low long-term rates drive return expectations back towards levels seen prior to 2013
  - Conventional approaches may fall short going forward

Remember How Far We've Come…But How Much Further Can We Go?



Source: Bloomberg and NEPC as of 11/30

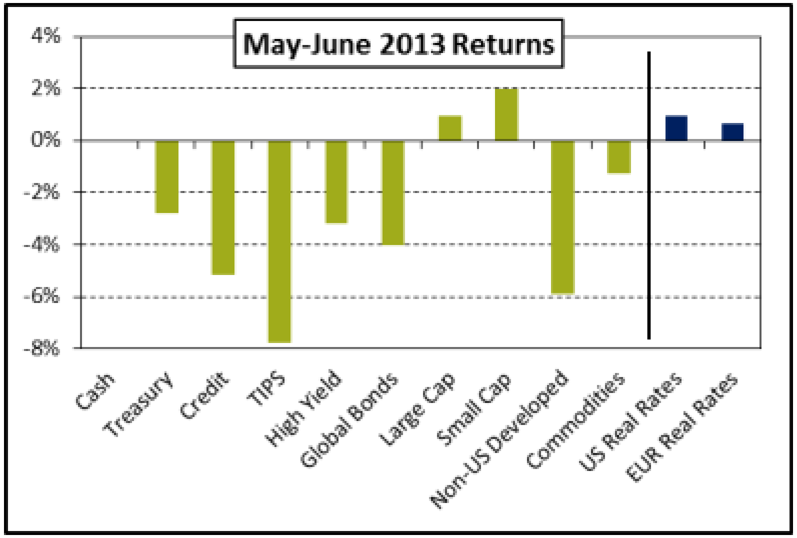
- **NEPC's 2009 5-7 assumptions were eye-popping relative to previous years**
  - Result of significant sell-off in the midst of the global financial crisis
- **Most fundamental forecasting models suggested even higher returns**
  - We discounted original expectations heavily given tremendous path uncertainty at that time
    - Still in the midst of drawdowns, frozen credit markets, unprecedented monetary policy
  - If we could have offered certainty of our expectations, most would have seized it
- **Patient, long-term investors have been rewarded beyond our expectations**
  - Tremendously beneficial in healing balance sheets, funded positions, grant making stability, etc.
  - But important to recall the range of outcomes that have been in play along the way
    - Quantitative Easing, Eurozone stability, etc.
- **Low yields and core fundamentals suggest muted returns looking forward**

- **Since the crisis, we expected and experienced a range of outcomes**
  - Great uncertainty was a dominant theme over the last 6 years
- **Burned by losses and illiquidity, many institutions exercised caution**
  - Participate smartly in upside with dislocated credit markets but mitigate potential downside by diversifying growth risk away from long-only equity
- **Unconventional global monetary policies were unfamiliar & untested**
  - Diverse underlying economic conditions across regions complicated the issue
- **Politics, both national and "geo", have proven to be a challenge**
  - "Fiscal cliff", debt ceiling, socio-economic divide
  - European "dis-union", austerity measures, periphery unemployment
  - Japan's lost (two plus) decade(s), Abenomics
  - Unpredictable state actors such as Russia, Iran, North Korea, etc.
- **Markets have forged ahead with cautious optimism tied to improving U.S. economic conditions and continued easy global monetary policy**
  - Still a large range of outcomes
  - Complacency is fertile ground for volatility and loss
  - Tilt towards fundamental strength as U.S. recovers
  - Maintain diversification (economic hedges) to mitigate tail risk

- **Balance potential for short-term strength with an acknowledgement of lofty recent returns relative to global growth**
  - Reallocate risk as appropriate while maintaining downside protection as a counterweight
- **Public U.S. equity and credit markets similarly valued vs. history; near-term favors stocks**
  - Credit's limited upside from potential investment grade spread compression, overall reduction in liquidity and proliferation of ETFs contribute to asymmetry
  - Real estate and direct lending (though less liquid) can be a substitute for high yield
  - Manage private commitments and maintain liquidity to exploit downturns
- **Non-U.S. equity markets have not experienced the same rally as U.S.**
  - Valuations and monetary easing support overweight; downside risks point to caution
    - Muted return expectations are sensitive to binary policy decisions (upside and downside)
  - Emerging growth expectations have compressed
    - Commodity driven countries face pressures but U.S. strength supports exporters
    - Fundamental strength vs developed likely to win in the long run
  - Be globally diversified, hedge developed currency risks, and don't flee emerging markets
- **We are one year closer to rate hikes by the Federal Reserve**
  - Curve has shifted in anticipation making both cash/short duration and long bonds relatively more attractive than core duration
  - Long rates likely range bound due to dynamics of supply (shrinking deficits) and demand (increasing LDI hedgers, global investors, aging population of savers)
  - Barbell of long treasuries and cash can offer similar core bond duration, volatility, yield, and a higher sensitivity to recession protection (counterweight)

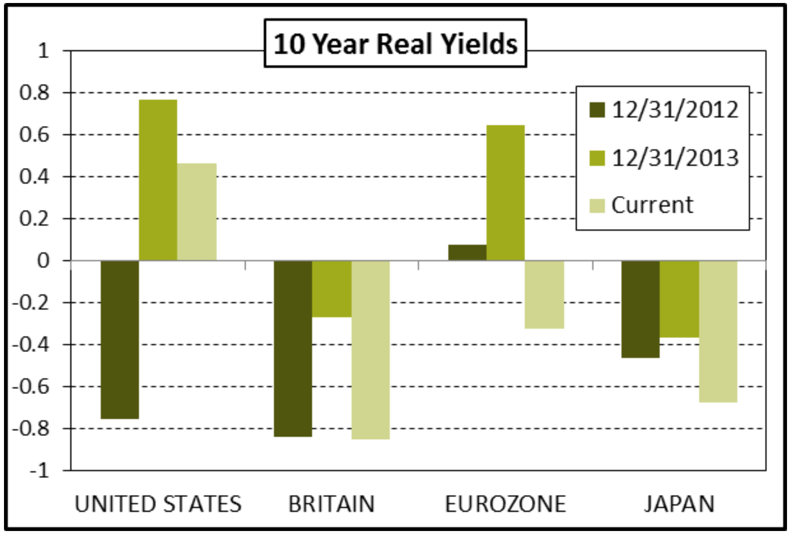
Importance of Real Yields on Global Market Returns; Caution to our Optimism

- **Many investors surprised by market impact of Bernanke's taper comments in Spring 2013**
  - The Primary driver was a change in underlying global real yields
  - Market discount rates increased driving down present values
  - And the surprise change in expectations of tighter policy spooked sentiment
  - U.S. market strength may not persist with a repeat occurrence



Source: Bloomberg as of 11/30

- **Real yields in 2014 reversed the normalization trend of 2013 and are a key component of lower 5-7 year expected returns in 2015**
  - U.S. gave up far less than other developed markets
  - Gravity of low interest rates in Germany and Japan may draw U.S. rates lower



Source: Bloomberg as of 11/30

- **Combination of historical data and forward looking analysis**
  - Expected returns based on current market pricing and forward looking estimates
  - Volatility based on history, while recognizing current uncertainty
  - Correlations based on a mix of history and current trend
- **Historical data is used to frame current market environment as well as to compare to similar historical periods**
  - Historical index returns, volatility, correlations, valuations, and yields
- **Forward-looking analysis is based on current market pricing and a building blocks approach**
  - Return equals yield + changes in price (valuation, defaults, etc.)
  - Use of key economic observations (inflation, real growth, dividends, etc.)
  - Structural themes (supply and demand imbalances, capital flows, etc.)
- **Assumptions prepared by Asset Allocation Committee**
  - Asset Allocation team plus members of various consulting practice groups meet throughout Q4 to develop themes and assumptions
  - Public markets, hedge funds and private markets teams provide market insights
- **Assumptions and Actions reviewed and approved by Partners Research Committee**

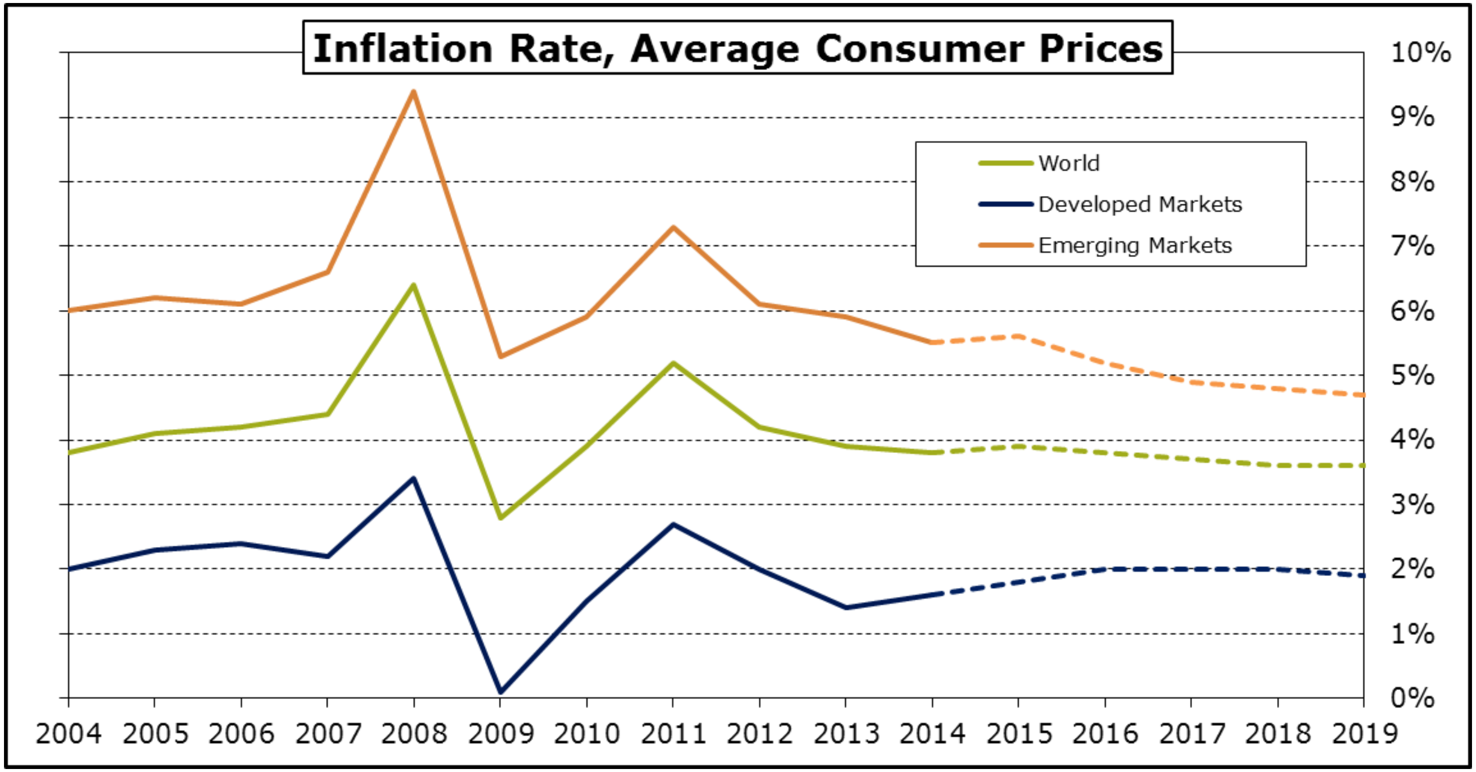
Themes for 2015 Asset Class Assumptions

- **5-7 year return expectations lower relative to prior year**
  - Broadly expected return outlook remains subdued
  - Strong performance of domestic equity markets leads to reduction in expectations
  - Lower yields relative to prior year reduce bond market forecasts
  - Decrease in expectations for credit markets reflect normalization of default rates
  - Hedge Fund expectations increased due to anticipation of greater divergences across and within global markets
  - Private asset class adjustments mirror changes in liquid risky asset classes
- **30-year returns have similar themes to 5-7 year forecasts**
  - Yield decreases flow through to longer-term returns in fixed income
  - Equity markets reduced modestly
- **Volatility expectations reduced incrementally in certain asset classes**
  - Real Estate and Private Debt reductions echo more normalized asset class environment
  - Volatility increased for unhedged asset classes to reflect central bank divergences

Changes To Assumption Development

- **We continue to refine and enhance our process where appropriate**
  - Changes are evolutionary rather than revolutionary
    - Global Inflation-Linked Bonds now represent a USD hedged exposure
- **Improved modeling of Real Estate to more accurately reflect the underlying economic and market fundamentals**
  - Refined model sensitivity to changes in occupancy rates, supply, and new construction
  - Enhanced Cap Rate assumption to better reflect forward Treasury rates and spreads
- **Added Real Estate Investment Trust (REITs)**
  - Recognizing the unique role of REITs within a broad real estate allocation
- **Refined Emerging Market Debt Local Currency forecast model to better reflect underlying country forward rates**
  - Developed improved local yield curve forecast for major EM countries
  - Accounts for the significant exposure of a select number of countries in the index
- **Further refined term premium adjustment in fixed income model**
  - Accounts for the higher risk of longer dated maturities
- **Enhanced Risk Parity portfolio construction with the addition of a global cash and LIBOR assumption to reflect global leverage rates**
  - Divergence in expected global cash rates between the U.S. and develop world necessitated the change to reflect implicit leverage costs

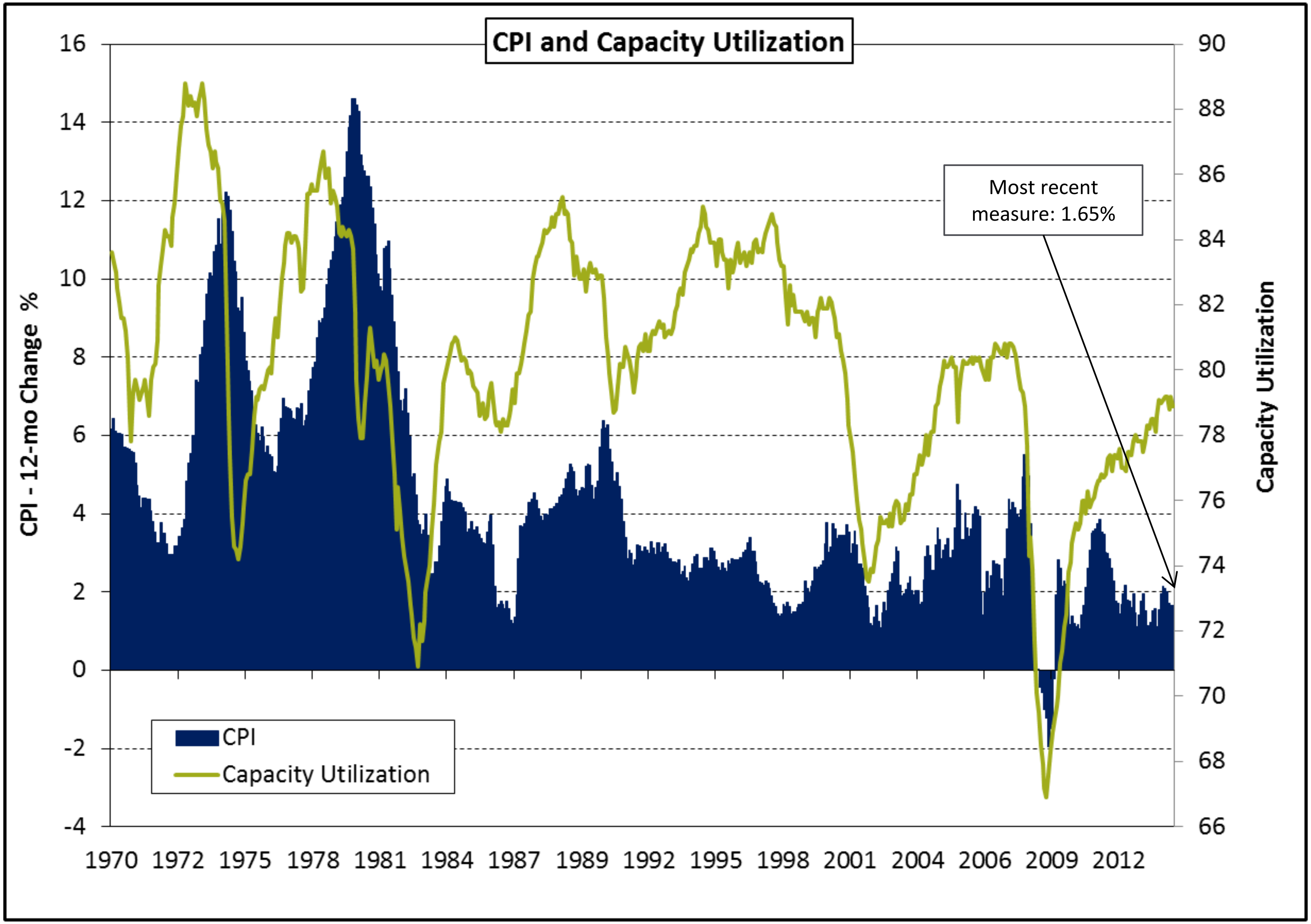
- **Inflation is an integral component of our asset allocation assumptions**
  - An essential building block for projecting returns in stocks, bonds, and commodities
- **There are several measures of inflation used to inform our view, all with some type of shortcomings**
  - Global forecasts, local consumer and producer price indices, TIPS break-even inflation
- **Institutional investment pools will experience asset inflation globally, encompassing both developed and emerging countries**
  - We use a 3% global inflation projection over the next 5-7 years
    - Akin to assuming purchasing power parity holds across markets
  - Can be different from inflation experienced in local country liabilities or spending needs
    - For example our expectation of U.S. CPI is 2.25% over 5-7 years
- **Muted credit growth leaves inflation expectations unchanged in the near term, pressure for higher long-term inflation continues to build**
  - Money supply (M2) continued to expand in 2014 while velocity remains depressed
  - Global monetary policy likely to remain stimulative in 2015
- **Given increasing long-term inflation pressures, a modestly higher inflation assumption (3.25%) is used for determining 30 year return expectations**



Source: IMF

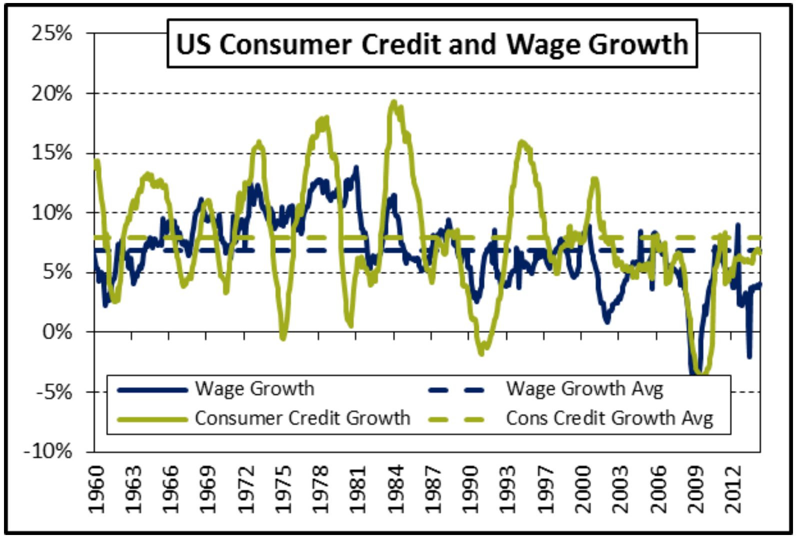
- **World inflation forecasts range from 3.6-3.9% annually over the next five years**
  - Investment programs biased toward developed markets would likely experience something less than the global average

Realized Inflation Has Stayed Low

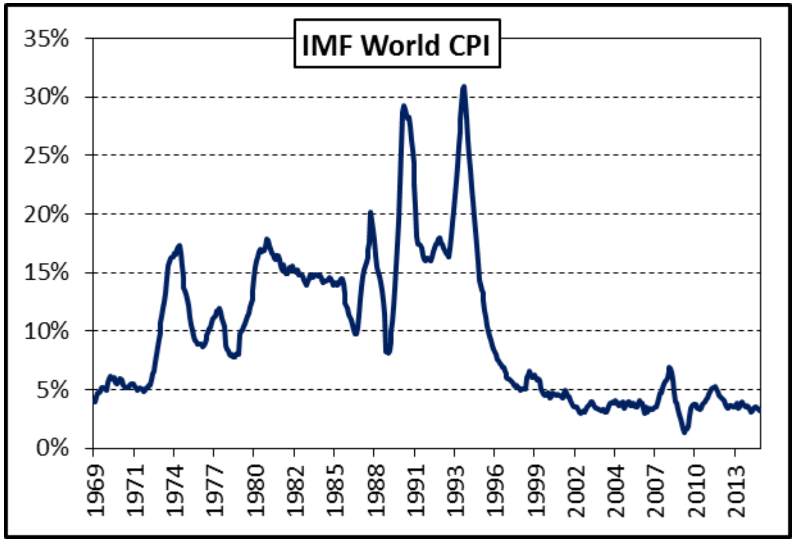


Source: St. Louis Fed as of 11/30

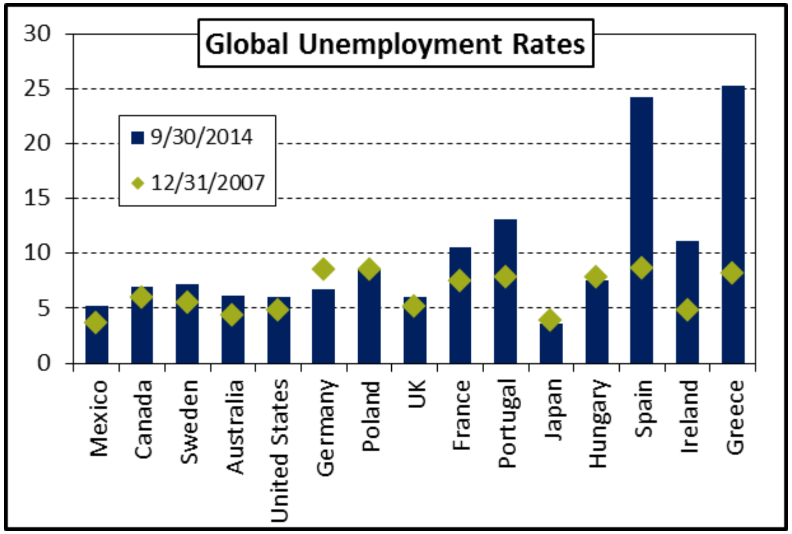
Economic Factors Driving Inflation Remain Subdued



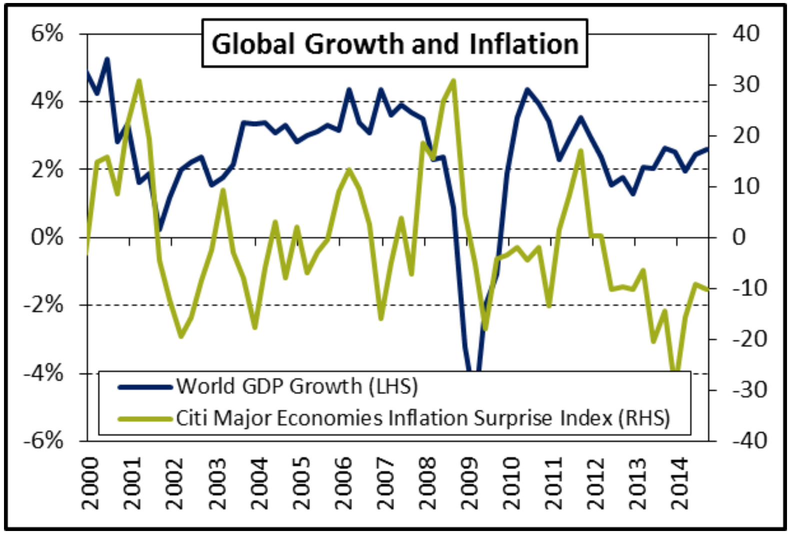
Source: Board of Governors of the Federal Reserve System as of 10/1



Source: Bloomberg as of 9/30



Source: Bloomberg as of 9/30



Source: Bloomberg as of 9/30

Geometric Expected Return			
Asset Class	**2014**	**2015**	**2015-2014**
Cash	1.50%	1.75%	0.25%
Treasuries	2.00%	1.75%	-0.25%
IG Corp Credit	3.50%	3.25%	-0.25%
MBS	2.25%	2.00%	-0.25%
*Core Bonds**	*2.53%*	*2.30%*	*-0.23%*
TIPS	2.50%	2.25%	-0.25%
High-Yield Bonds	4.50%	4.00%	-0.50%
Bank Loans	5.00%	4.50%	-0.50%
Global Bonds (Unhedged)	1.25%	1.00%	-0.25%
Global Bonds (Hedged)	1.38%	1.17%	-0.21%
EMD External	5.00%	4.50%	-0.50%
EMD Local Currency	5.75%	5.50%	-0.25%
Large Cap Equities	6.25%	6.00%	-0.25%
Small/Mid Cap Equities	6.25%	6.00%	-0.25%
Int'l Equities (Unhedged)	7.25%	7.00%	-0.25%
Int'l Equities (Hedged)	7.50%	7.50%	0.00%
Emerging Int'l Equities	9.50%	9.00%	-0.50%
Private Equity	8.75%	8.50%	-0.25%
Private Debt	8.00%	7.50%	-0.50%
Private Real Assets	7.75%	8.00%	0.25%
Real Estate	6.25%	6.50%	0.25%
Commodities	5.00%	5.25%	0.25%
Hedge Funds	5.50%	5.75%	0.25%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

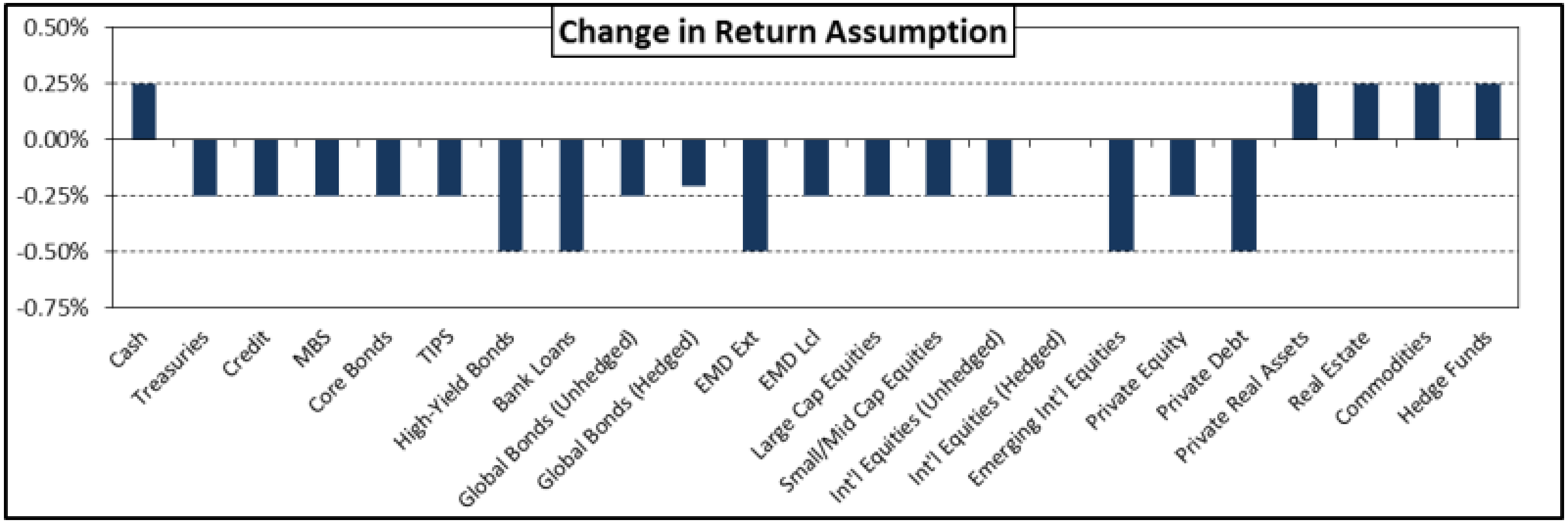
Geometric Expected Return			
Asset Class	**2014**	**2015**	**2015-2014**
Cash	3.75%	3.25%	-0.50%
Treasuries	4.00%	3.50%	-0.50%
IG Corp Credit	5.25%	4.75%	-0.50%
MBS	4.25%	3.75%	-0.50%
*Core Bonds**	*4.40%*	*3.98%*	*-0.42%*
TIPS	4.50%	4.00%	-0.50%
High-Yield Bonds	6.00%	5.75%	-0.25%
Bank Loans	6.25%	6.00%	-0.25%
Global Bonds (Unhedged)	3.00%	2.25%	-0.75%
Global Bonds (Hedged)	3.13%	2.42%	-0.71%
EMD External	7.00%	6.00%	-1.00%
EMD Local Currency	7.25%	6.75%	-0.50%
Large Cap Equities	7.75%	7.50%	-0.25%
Small/Mid Cap Equities	8.00%	7.75%	-0.25%
Int'l Equities (Unhedged)	8.25%	8.00%	-0.25%
Int'l Equities (Hedged)	8.50%	8.49%	-0.01%
Emerging Int'l Equities	9.50%	9.25%	-0.25%
Private Equity	9.75%	9.50%	-0.25%
Private Debt	8.25%	8.00%	-0.25%
Private Real Assets	7.75%	7.75%	0.00%
Real Estate	6.50%	6.50%	0.00%
Commodities	6.00%	5.75%	-0.25%
Hedge Funds	7.00%	6.75%	-0.25%

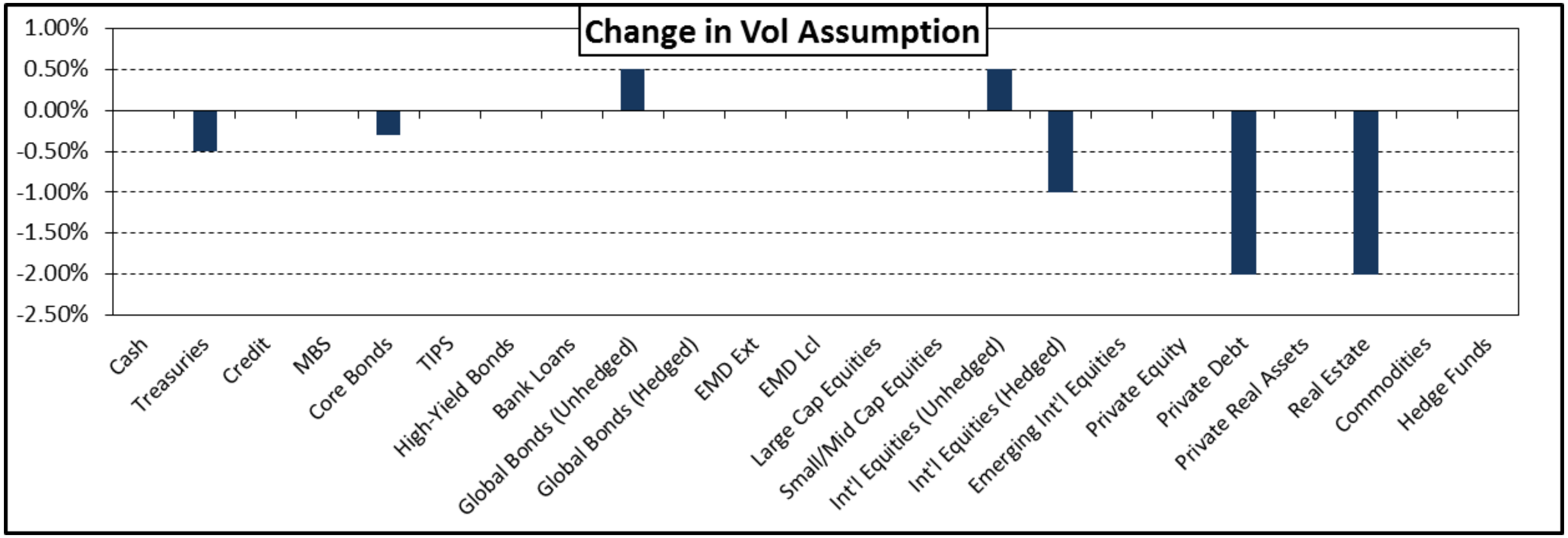
* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

Volatility			
Asset Class	**2014**	**2015**	**2015-2014**
Cash	1.00%	1.00%	
Treasuries	6.00%	5.50%	-0.50%
IG Corp Credit	7.50%	7.50%	
MBS	7.00%	7.00%	
*Core Bonds**	*6.32%*	*6.03%*	*-0.29%*
TIPS	7.50%	7.50%	
High-Yield Bonds	13.00%	13.00%	
Bank Loans	8.00%	8.00%	
Global Bonds (Unhedged)	8.50%	9.00%	0.50%
Global Bonds (Hedged)	5.00%	5.00%	
EMD External	12.00%	12.00%	
EMD Local Currency	15.00%	15.00%	
Large Cap Equities	17.50%	17.50%	
Small/Mid Cap Equities	21.00%	21.00%	
Int'l Equities (Unhedged)	20.50%	21.00%	0.50%
Int'l Equities (Hedged)	18.50%	17.50%	-1.00%
Emerging Int'l Equities	26.00%	26.00%	
Private Equity	27.00%	27.00%	
Private Debt	19.00%	17.00%	-2.00%
Private Real Assets	23.00%	23.00%	
Real Estate	17.00%	15.00%	-2.00%
Commodities	18.00%	18.00%	
Hedge Funds	9.00%	9.00%	

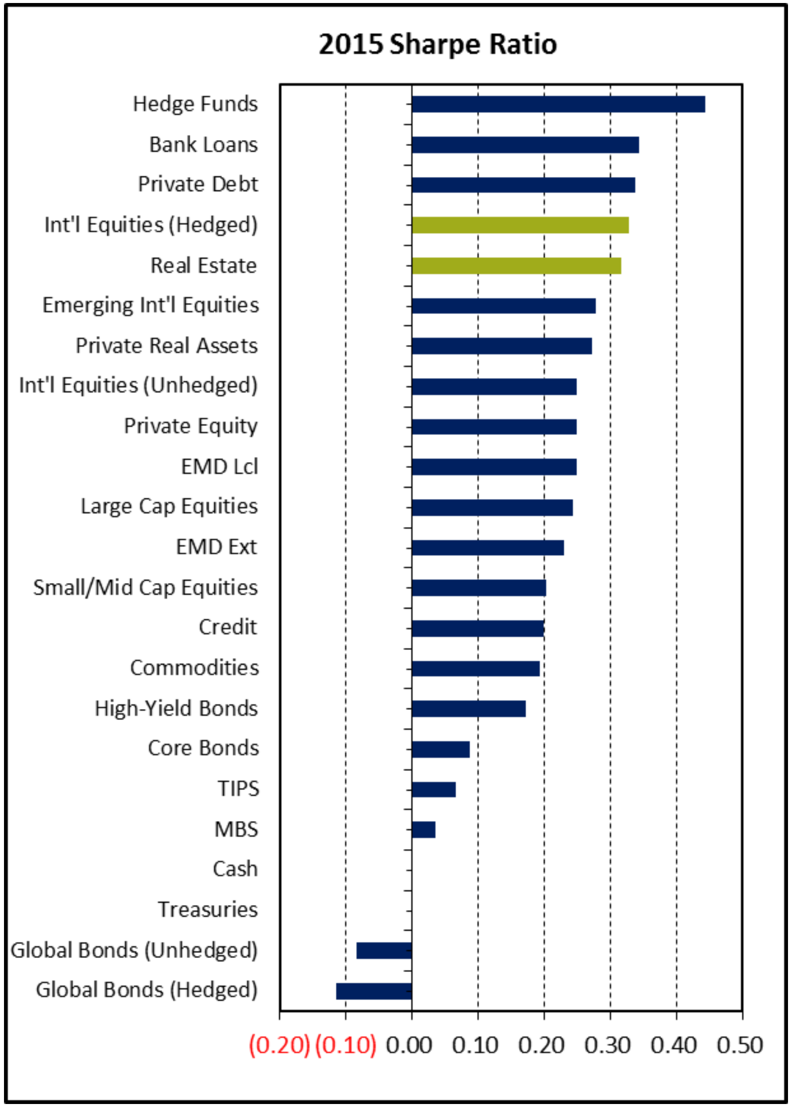
* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

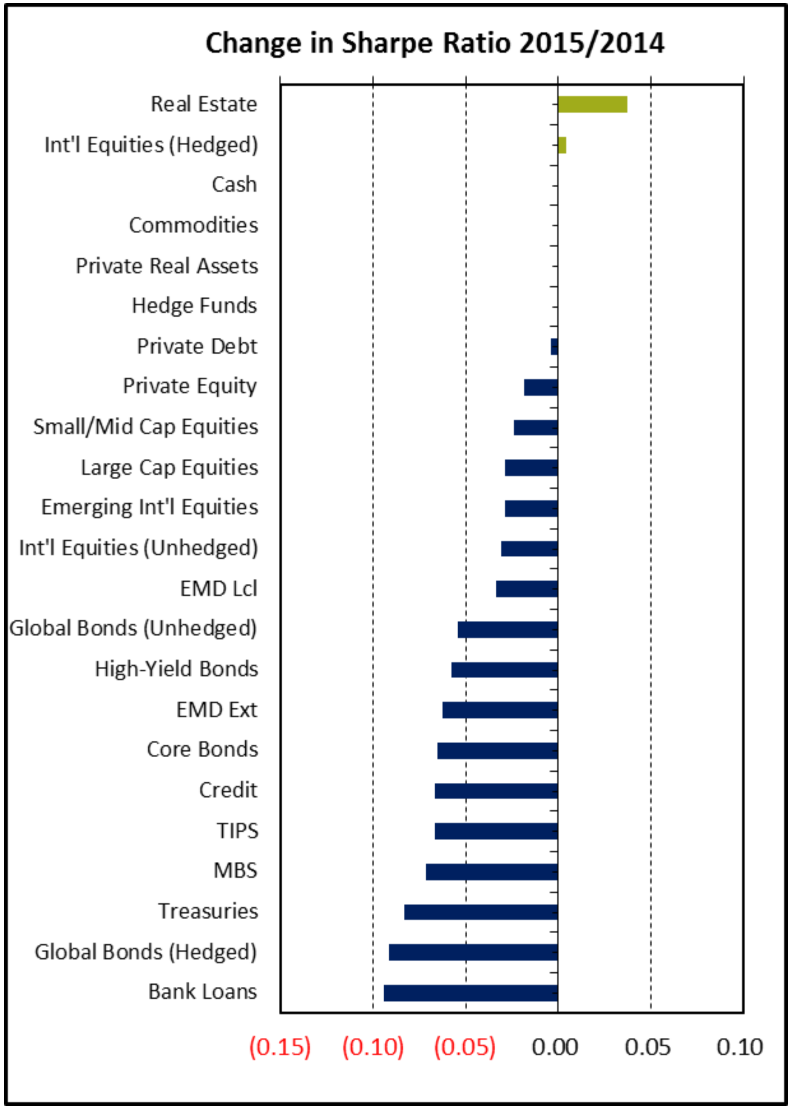
Summary of Changes to 2015 Return and Volatility Expectations



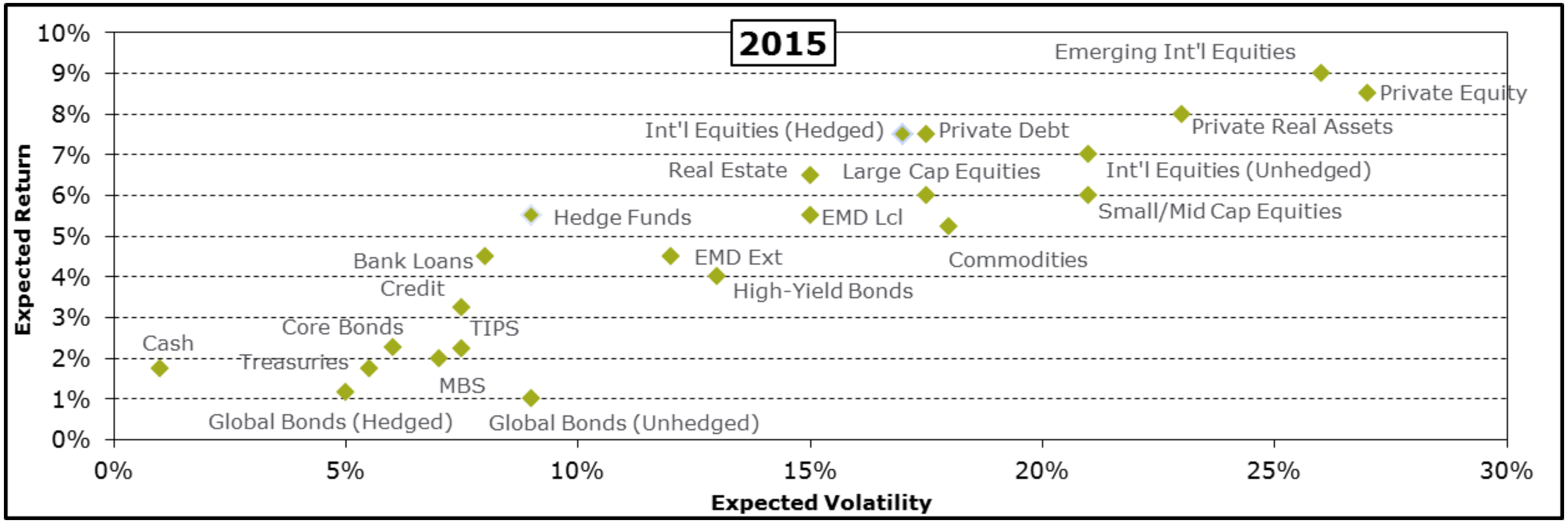


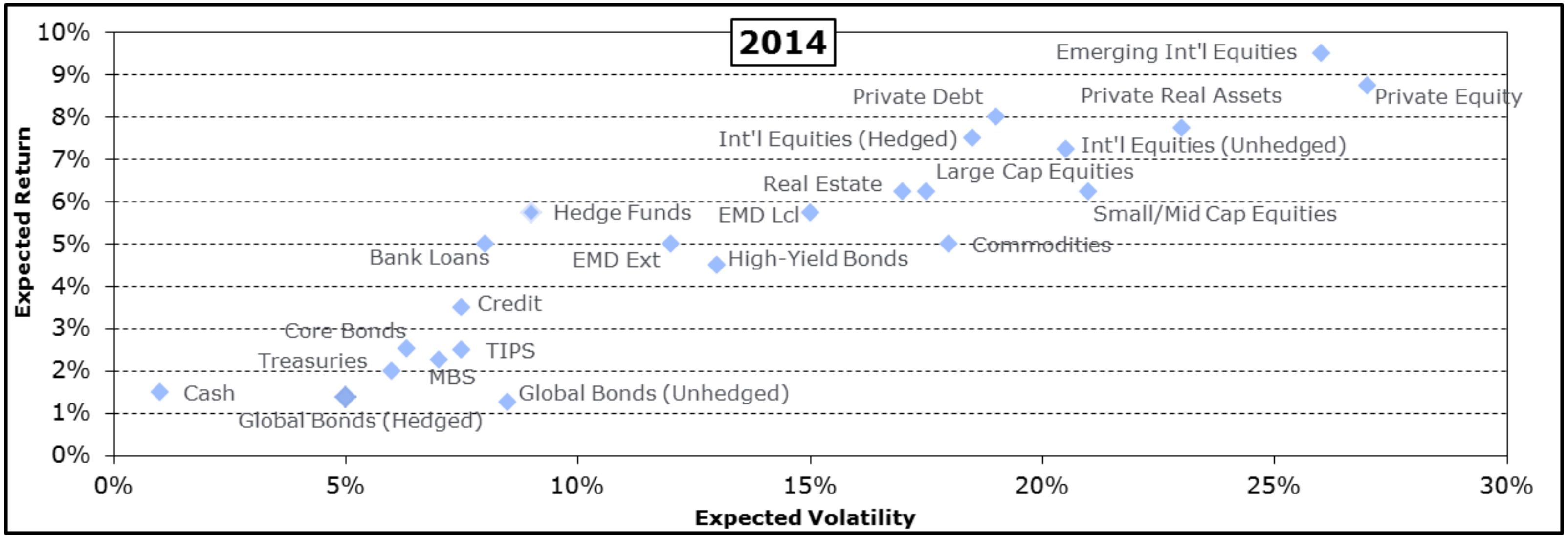
Relative Asset Class Attractiveness



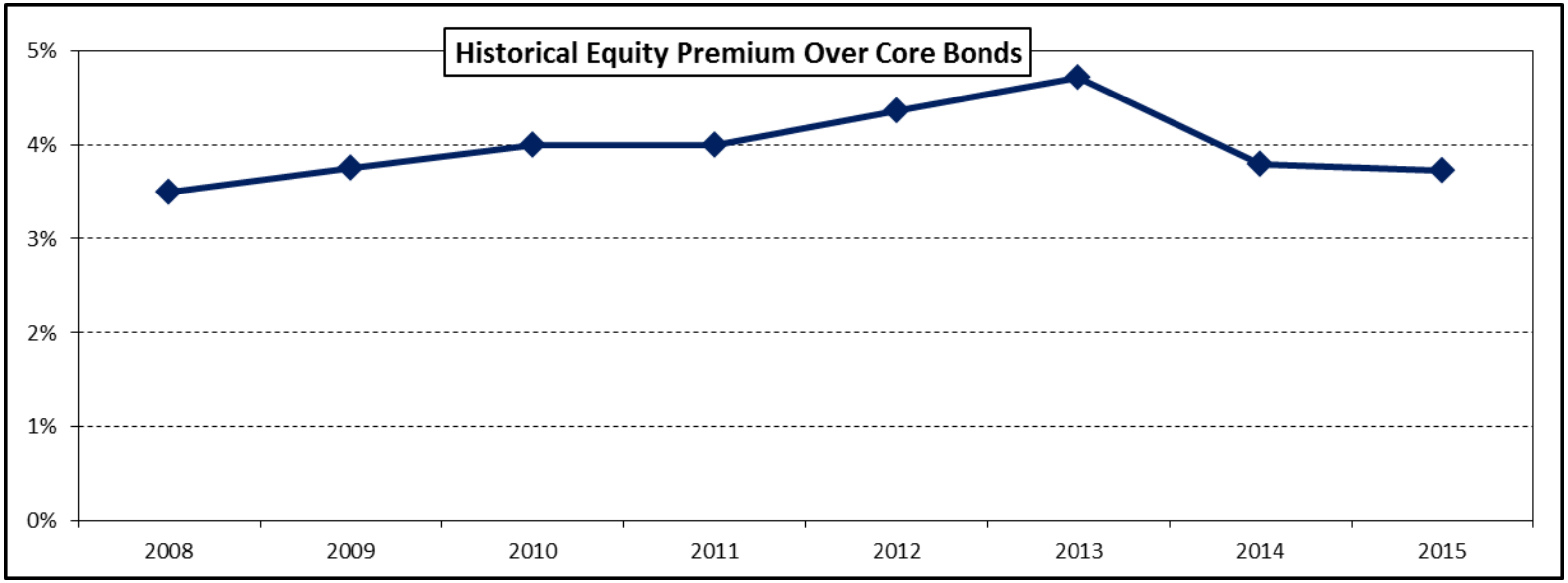


Risk/Reward Comparison



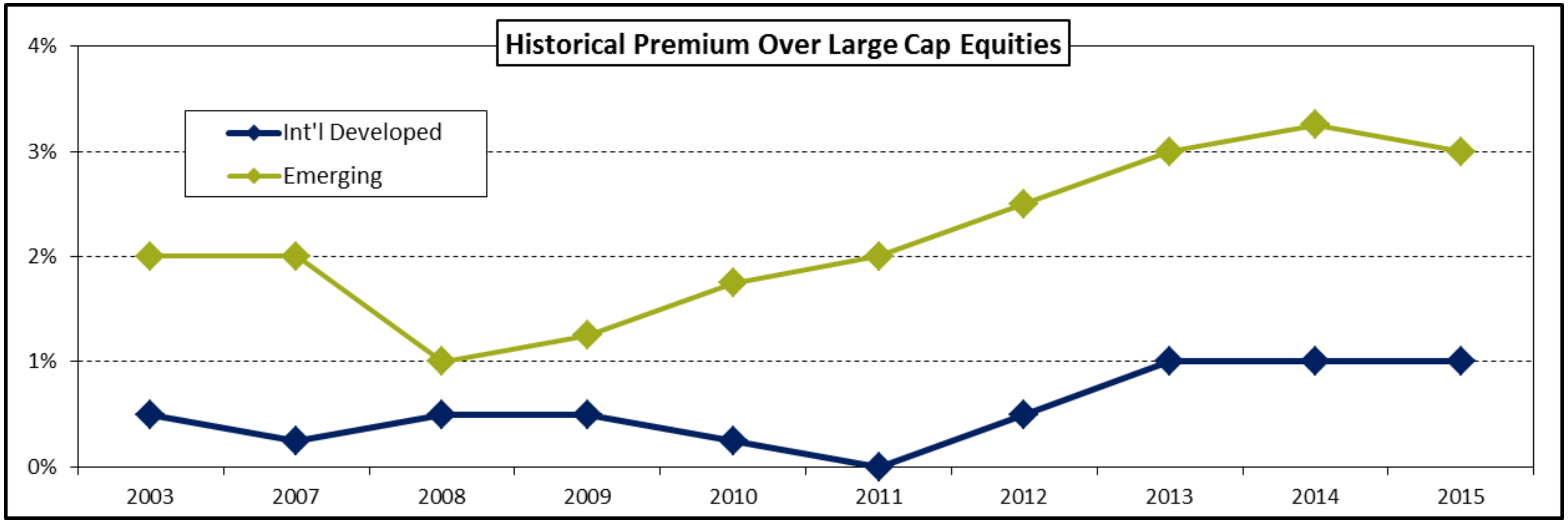


Asset Class	Historical Long Term Geometric Average[1]	5-to-7 Year NEPC Assumptions 2008	2009	2010	2011	2012	2013	2014	2015
Cash	3.5%	4.00%	3.00%	2.00%	2.00%	1.25%	0.75%	1.50%	1.75%
Core Bonds[2]	7.9%	5.00%	5.50%	3.75%	3.00%	2.88%	2.03%	2.53%	2.30%
Large Cap	10.1%	8.50%	9.25%	7.75%	7.00%	7.25%	6.75%	6.25%	6.00%
International[3]	9.1%	9.00%	9.75%	8.00%	7.00%	7.75%	7.75%	7.25%	7.00%
US Equity Premium Over Core Bonds		3.50%	3.75%	4.00%	4.00%	4.37%	4.72%	3.72%	3.70%



1. Reflects average since inception (1926 except as noted below) of the respective index through 11/30/2014
2. LB/BC Aggregate reflects average compound annual return since 1976
3. International reflects average annual return since 1970

Comparison of International Equity and U.S. Large Cap Equity Expectations

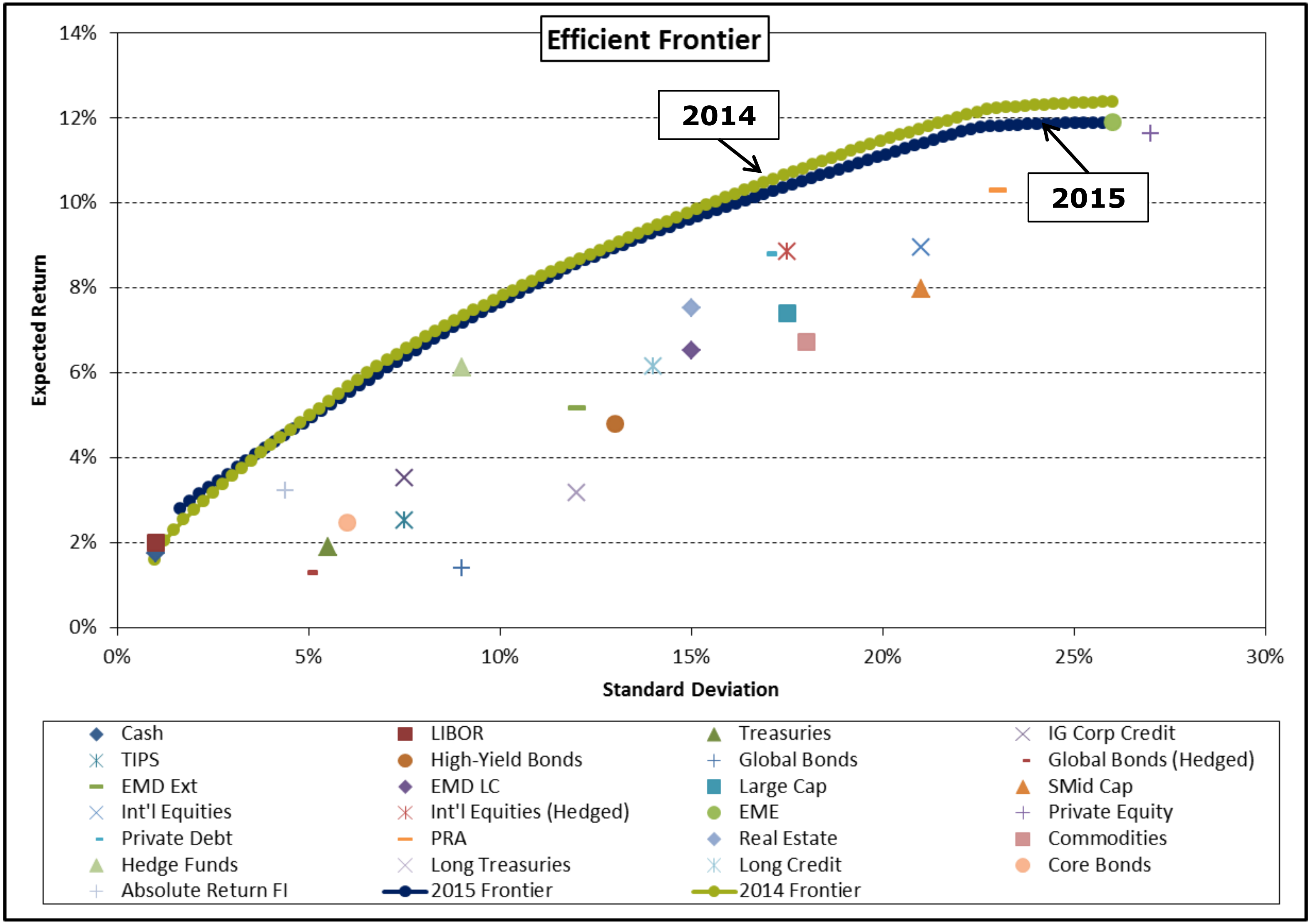


- **Total return expectations for non-U.S. Equities are lower vs. last year**
- **Yet expectations for U.S. equities are reduced as well**
  - Consistent spread of 1% for developed non-U.S. relative to U.S. Large Cap
  - Decreased premium for emerging equity as growth expectations shrank further
- **Meaningful downside risks remain in developed and emerging world**
- **While we expect investors to be compensated over 5-7 years with a higher relative return for holding non-U.S. equities, it is appropriate to use active management to mitigate exposure to downside risks**

2015 Correlations

Asset Class	Cash	Treas	Credit	MBS	TIPS	HY	Glob Bonds	Glob (H)	EMD (Ext)	EMD (Loc)	Large Cap	Sm/ Mid	Intl Eq	Intl Eq (H)	EM Eq	Priv Eq	Priv Debt	Priv Real	Real Estate	Cmdy	Hedge Funds
Cash	1.00																				
Treasuries	0.20	1.00																			
IG Corp Credit	0.10	0.65	1.00																		
MBS	0.25	0.90	0.75	1.00																	
TIPS	0.00	0.65	0.60	0.70	1.00																
High-Yield Bonds	-0.05	0.20	0.55	0.30	0.20	1.00															
Global Bonds (Unhedged)	0.10	0.50	0.50	0.45	0.40	0.10	1.00														
Global Bonds (Hedged)	0.15	0.80	0.65	0.70	0.65	0.20	0.60	1.00													
EMD (External)	0.05	0.35	0.65	0.35	0.30	0.60	0.25	0.35	1.00												
EMD (Local Currency)	0.05	0.30	0.60	0.25	0.25	0.60	0.30	0.25	0.80	1.00											
Large Cap Equities	-0.10	-0.10	0.45	0.10	0.00	0.65	0.00	-0.10	0.55	0.65	1.00										
Small/Mid Cap Equities	-0.15	-0.15	0.45	0.10	-0.10	0.70	-0.05	-0.15	0.55	0.60	0.90	1.00									
Int'l Equities (Unhedged)	-0.10	0.00	0.30	0.05	-0.05	0.65	0.35	0.00	0.60	0.70	0.70	0.60	1.00								
Int'l Equities (Hedged)	0.00	0.00	0.30	0.05	-0.05	0.65	0.05	0.00	0.60	0.65	0.75	0.65	0.85	1.00							
Emerging Int'l Equities	-0.10	-0.10	0.25	-0.10	-0.10	0.70	0.05	-0.05	0.70	0.80	0.60	0.65	0.70	0.70	1.00						
Private Equity	-0.20	-0.15	0.30	0.10	-0.10	0.60	-0.15	-0.20	0.35	0.40	0.70	0.75	0.60	0.65	0.45	1.00					
Private Debt	0.00	-0.35	0.15	-0.15	-0.10	0.65	-0.10	-0.10	0.50	0.60	0.60	0.65	0.75	0.75	0.80	0.65	1.00				
Private Real Assets	0.15	-0.20	0.05	-0.15	0.00	0.40	-0.05	-0.05	0.40	0.40	0.55	0.60	0.50	0.50	0.50	0.65	0.60	1.00			
Real Estate (Core)	0.25	-0.05	0.15	0.05	0.10	0.25	0.05	-0.05	0.20	0.30	0.40	0.40	0.35	0.40	0.30	0.50	0.40	0.40	1.00		
Commodities	0.10	-0.10	0.10	-0.10	0.30	0.20	0.10	-0.10	0.35	0.45	0.30	0.30	0.35	0.35	0.40	0.25	0.30	0.45	0.30	1.00	
Hedge Funds	0.00	-0.20	0.35	-0.15	0.20	0.60	0.05	-0.20	0.55	0.60	0.60	0.65	0.70	0.65	0.70	0.75	0.80	0.65	0.25	0.50	1.00

Efficient Frontier Comparison

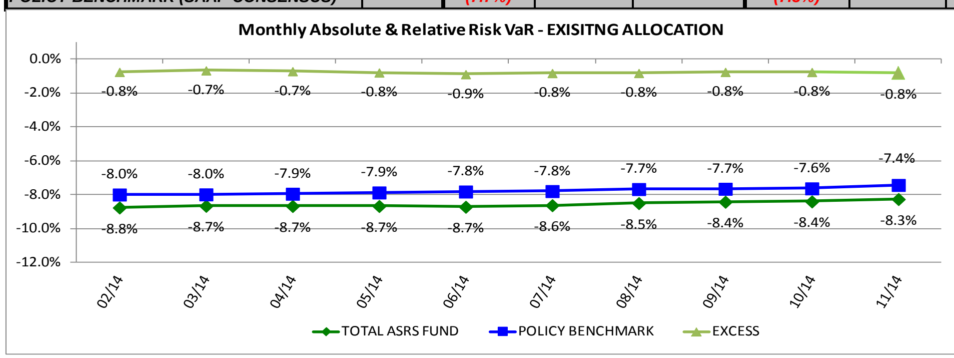


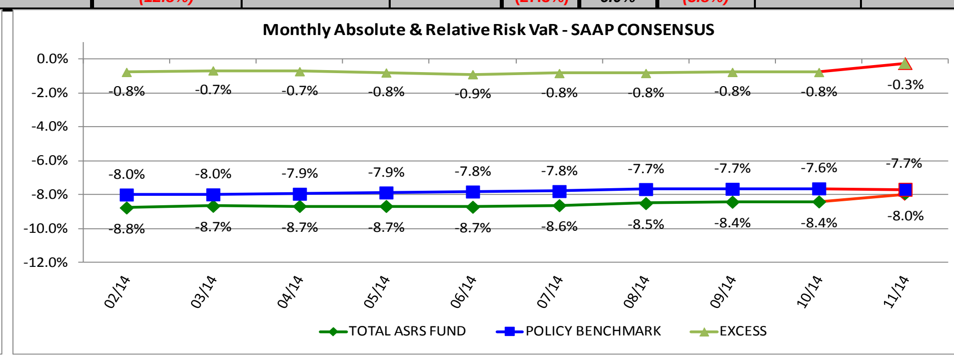
ARIZONA STATE RETIREMENT SYSTEM **TOTAL PLAN RISK ALLOCATION OVERVIEW**

As of November 30, 2014

Strategy	$ Value	% Value	Historical VaR 95%	HVaR Contri 95%	HVaR Contri % to Total	Parametric VaR 95%	PVaR Contri 95%	PVaR Contri % to Total	Exp Tail Loss 95%	Exp Tail Loss Contri 95%	Exp Tail Loss Contri % to Total	Max Loss	Std Dev	Downside Risk (8%)	Downside Risk Contri (8%)	Downside Risk Contri (8%) to Total
EXISITNG ALLOCATION MONTHLY RISK																
MASTER CASH	$ 314,709,480	1%	(0.0%)	(0.0%)	0.0%	(0.0%)	(0.0%)	0.0%	(0.0%)	(0.0%)	0.0%	(0.0%)	0.0%	(0.6%)	(0.0%)	0.0%
TOTAL FIXED INCOME	$ 4,343,894,317	13%	(2.4%)	(0.1%)	1.6%	(2.1%)	(0.1%)	1.9%	(3.7%)	(0.2%)	1.7%	(5.6%)	1.3%	(1.4%)	(0.1%)	2.1%
US EQUITY	$ 11,387,229,162	34%	(9.5%)	(3.4%)	41.2%	(8.9%)	(2.9%)	38.4%	(15.8%)	(5.3%)	39.6%	(30.6%)	6.2%	(4.5%)	(1.5%)	38.4%
INTERNATIONAL EQUITY	$ 6,959,931,665	21%	(10.5%)	(1.9%)	22.9%	(10.2%)	(2.0%)	26.3%	(16.3%)	(3.2%)	24.1%	(36.8%)	6.8%	(4.9%)	(1.0%)	25.4%
REAL ESTATE	$ 1,734,432,272	5%	(12.6%)	(0.7%)	7.9%	(11.5%)	(0.6%)	7.4%	(20.3%)	(1.0%)	7.4%	(39.0%)	7.5%	(5.7%)	(0.3%)	7.3%
FARMLAND & TIMBER	$ 146,009,313	0%	(9.4%)	(0.0%)	0.5%	(8.4%)	(0.0%)	0.5%	(15.3%)	(0.1%)	0.5%	(29.8%)	5.6%	(4.4%)	(0.0%)	0.5%
PRIVATE EQUITY	$ 2,172,192,527	6%	(12.4%)	(0.8%)	9.6%	(11.1%)	(0.7%)	8.9%	(19.2%)	(1.2%)	9.1%	(36.1%)	7.3%	(5.5%)	(0.4%)	9.0%
PRIVATE DEBT	$ 1,282,068,751	4%	(7.2%)	(0.2%)	2.7%	(6.6%)	(0.2%)	3.1%	(12.4%)	(0.5%)	3.4%	(25.1%)	4.4%	(3.5%)	(0.1%)	3.2%
OPPORTUNISTIC EQUITY	$ 338,102,859	1%	(11.6%)	(0.1%)	1.4%	(10.2%)	(0.1%)	1.3%	(18.1%)	(0.2%)	1.3%	(34.3%)	6.8%	(5.2%)	(0.1%)	1.3%
OPPORTUNISTIC DEBT	$ 1,035,665,948	3%	(6.1%)	(0.2%)	2.0%	(5.9%)	(0.2%)	2.3%	(11.4%)	(0.3%)	2.6%	(23.8%)	4.1%	(3.3%)	(0.1%)	2.4%
GLOBAL INFLATION LINKEI	$ 724,820,162	2%	(7.3%)	(0.1%)	1.3%	(7.4%)	(0.1%)	1.5%	(11.8%)	(0.2%)	1.5%	(24.9%)	4.6%	(3.8%)	(0.1%)	1.6%
GTAA	$ 3,314,886,024	10%	(7.3%)	(0.7%)	8.9%	(6.8%)	(0.7%)	8.6%	(11.8%)	(1.2%)	8.6%	(25.8%)	4.4%	(3.6%)	(0.3%)	8.9%
GRAND TOTAL	**$ 33,753,942,480**	**100%**	**(8.3%)**	**(8.3%)**	**100.0%**	**(7.6%)**	**(7.6%)**	**100.0%**	**(13.4%)**	**(13.4%)**	**100.0%**	**(28.2%)**	**5.2%**	**(3.9%)**	**(3.9%)**	**100.0%**
POLICY BENCHMARK (EXISTING)			***(7.4%)***			***(6.8%)***			***(11.9%)***			***(25.4%)***	**5.9%**	***(3.5%)***		

Strategy	$ Value	% Value	Historical VaR 95%	HVaR Contri 95%	HVaR Contri % to Total	Parametric VaR 95%	PVaR Contri 95%	PVaR Contri % to Total	Exp Tail Loss 95%	Exp Tail Loss Contri 95%	Exp Tail Loss Contri % to Total	Max Loss	Std Dev	Downside Risk (8%)	Downside Risk Contri (8%)	Downside Risk Contri (8%) to Total
SAAP CONSENSUS REALLOCATION SCENARIO RISK																
MASTER CASH	$ 314,709,480	1%	(0.0%)	(0.0%)	0.0%	(0.0%)	(0.0%)	0.0%	(0.0%)	(0.0%)	0.0%	(0.0%)	0.0%	(0.6%)	(0.0%)	0.0%
TOTAL FIXED INCOME	$ 5,414,391,944	16%	(2.3%)	(0.1%)	1.7%	(1.9%)	(0.1%)	2.0%	(3.3%)	(0.2%)	1.7%	(5.2%)	1.3%	(1.3%)	(0.1%)	2.2%
US EQUITY	$ 8,107,431,014	24%	(9.5%)	(2.4%)	30.2%	(8.8%)	(2.1%)	27.6%	(15.7%)	(3.7%)	28.7%	(30.4%)	6.2%	(4.5%)	(1.1%)	27.6%
INTERNATIONAL EQUITY	$ 7,483,782,476	22%	(10.8%)	(2.2%)	27.3%	(10.2%)	(2.2%)	29.1%	(16.3%)	(3.5%)	26.6%	(36.3%)	6.8%	(4.9%)	(1.1%)	28.2%
REAL ESTATE	$ 3,118,242,698	9%	(12.6%)	(1.1%)	13.3%	(11.5%)	(1.0%)	13.6%	(20.3%)	(1.8%)	13.7%	(39.0%)	7.5%	(5.7%)	(0.5%)	13.5%
FARMLAND & TIMBER	$ 146,009,313	0%	(9.4%)	(0.0%)	0.6%	(8.4%)	(0.0%)	0.5%	(15.3%)	(0.1%)	0.5%	(29.8%)	5.6%	(4.4%)	(0.0%)	0.5%
PRIVATE EQUITY	$ 2,494,594,158	7%	(12.4%)	(0.9%)	11.2%	(11.1%)	(0.8%)	10.4%	(19.2%)	(1.4%)	10.8%	(36.1%)	7.3%	(5.5%)	(0.4%)	10.5%
PRIVATE DEBT	$ 3,118,242,698	9%	(7.2%)	(0.5%)	6.5%	(6.6%)	(0.6%)	7.8%	(12.4%)	(1.1%)	8.5%	(25.1%)	4.4%	(3.5%)	(0.3%)	8.0%
OPPORTUNISTIC EQUITY	$ 338,102,859	1%	(11.6%)	(0.1%)	1.5%	(10.2%)	(0.1%)	1.3%	(18.1%)	(0.2%)	1.4%	(34.3%)	6.8%	(5.2%)	(0.1%)	1.3%
OPPORTUNISTIC DEBT	$ 1,035,665,948	3%	(6.1%)	(0.2%)	2.1%	(5.9%)	(0.2%)	2.3%	(11.4%)	(0.3%)	2.6%	(23.8%)	4.1%	(3.3%)	(0.1%)	2.5%
GLOBAL INFLATION LINKEI	$ 623,648,539	2%	(7.3%)	(0.1%)	1.2%	(7.4%)	(0.1%)	1.3%	(11.8%)	(0.2%)	1.3%	(24.9%)	4.6%	(3.8%)	(0.1%)	1.4%
MULTI-ASSSET CLASS	$ 1,559,121,349	5%	(7.3%)	(0.4%)	4.5%	(6.8%)	(0.3%)	4.1%	(11.8%)	(0.5%)	4.2%	(25.8%)	4.4%	(3.6%)	(0.2%)	4.3%
GRAND TOTAL (SAAP CON	**$ 33,753,942,480**	**100%**	**(8.0%)**	**(8.0%)**	**100.0%**	**(7.5%)**	**(7.5%)**	**100.0%**	**(13.0%)**	**(13.0%)**	**100.0%**	**(27.5%)**	**5.2%**	**(3.8%)**	**(3.8%)**	**100.0%**
POLICY BENCHMARK (SAAP CONSENSUS)			***(7.7%)***			***(7.3%)***			***(12.8%)***			***(27.3%)***	***6.0%***	***(3.8%)***		





Observations assuming an instantaneous allocation change to the SAAP CONSENSUS

-Total Plan Risk drops from -8.26% to -7.98% resulting in a 28bps risk reduction.

- This is supported by the allocation reduction in US EQUITIES which is the largest contributor to risk. The current allocation of 34% is reduced to 24% for a 10% allocation decrease.
- Increasing the PRIVATE DEBT exposure from the current 4% allocation to 9%, helps further reduce Total Plan Risk due to its relatively lower correlation and risk in comparison to US EQUITIES.
- The risk reduction is mitigated by the increased allocation to riskier asset classes such as REAL ESTATE, currently 5% to 9%, and INTL EQUITY from 21% to 22%.

-The Policy Benchmark increases from -7.42% to -7.71% resulting in a 29bps risk increase.

- This is supported due to the reduction in the US FIXED INCOME asset class, and the the increase into REAL ESTATE.

ARIZONA STATE RETIREMENT SYSTEM
As of November 30, 2014

TOTAL PLAN STRESS TESTS

Strategy	$ Value	% Value	Black Monday - 5 Day	Gulf War - 5 Day	Bond Crash: Feb 94 - May 94	Asian Crisis 97-98 - 5 day	Russian Crisis - 5 Day	Nasdaq Correction: July 98 - Aug 98	Russian Debt Crisis Aug-Oct	IR Steepening: Sept 98 - Nov 98	Emerging Markets Rally: Jan 99 - May 99	Fed Tightening: April - June 99	Nasdaq Rally: Nov 99 - Jan 00	9/11 Attack - 5 Day	09-10-2008	S&P 500 -20%	IR Parallel Shift +100bps	Spread Up 100bps	Inflation +1%	Gold Shock -20%	Oil Shock -20%
			Historical Scenarios													**Predictive Scenarios**					
EXISITNG ALLOCATION STRESS TESTS																					
MASTER CASH	$ 314,709,480	1%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL FIXED INCOME	$ 4,343,894,317	13%	1.0	(0.6)	(3.7)	1.0	0.7	2.5	6.9	(0.6)	(1.6)	(0.8)	(1.1)	1.6	(5.0)	(0.1)	(4.7)	(0.3)	0.3	0.0	(0.0)
US EQUITY	$ 11,387,229,162	34%	(27.4)	(6.0)	(7.7)	(8.3)	(12.1)	(19.3)	(15.6)	8.6	7.9	2.8	4.1	(11.7)	(26.7)	(20.2)	0.0	0.0	(0.0)	3.0	(1.2)
INTERNATIONAL EQUITY	$ 6,959,931,665	21%	(11.8)	(5.9)	(3.4)	(6.8)	(2.9)	(12.8)	(9.6)	10.1	11.6	(0.3)	5.9	(4.8)	(28.5)	(7.1)	0.0	(0.0)	(0.0)	1.3	(0.2)
REAL ESTATE	$ 1,734,432,272	5%	(12.2)	(2.7)	(3.5)	(3.7)	(5.4)	(8.6)	(6.9)	3.9	3.5	1.3	1.9	(5.2)	(28.0)	(9.0)	0.0	0.0	0.0	0.0	0.0
FARMLAND & TIMBER	$ 146,009,313	0%	(27.2)	(6.0)	(7.8)	(8.2)	(12.0)	(19.1)	(15.4)	8.6	7.8	2.8	4.1	(11.6)	(27.0)	(20.0)	0.0	0.0	0.0	0.0	0.0
PRIVATE EQUITY	$ 2,172,192,527	6%	(32.4)	(7.1)	(9.3)	(9.8)	(14.3)	(22.8)	(18.4)	10.3	9.3	3.3	4.9	(13.8)	(26.9)	(23.8)	0.0	0.0	0.0	0.0	(0.0)
PRIVATE DEBT	$ 1,282,068,751	4%	(10.6)	(2.3)	(3.1)	(3.2)	(4.7)	(7.5)	(6.0)	3.4	3.1	1.1	1.6	(4.5)	(20.1)	(7.8)	(0.0)	(0.0)	0.0	0.0	0.0
OPPORTUNISTIC EQUITY	$ 338,102,859	1%	(31.1)	(6.9)	(8.9)	(9.4)	(13.8)	(21.9)	(17.7)	9.9	8.9	3.2	4.7	(13.3)	(27.1)	(22.9)	0.0	0.0	0.0	0.0	0.0
OPPORTUNISTIC DEBT	$ 1,035,665,948	3%	(13.9)	(3.1)	(4.0)	(4.2)	(6.2)	(9.8)	(7.9)	4.4	4.0	1.4	2.1	(5.9)	(22.4)	(10.2)	(0.0)	0.0	0.0	0.0	0.0
GLOBAL INFLATION LINKED	$ 724,820,162	2%	(0.0)	0.0	0.0	(0.0)	(0.0)	(0.0)	0.0	(0.0)	0.0	0.0	0.0	(0.0)	(16.5)	0.0	(0.0)	0.0	0.0	(3.9)	(3.6)
GTAA	$ 3,314,886,024	10%	(14.9)	(4.4)	(5.7)	(5.3)	(6.4)	(11.8)	(8.4)	6.0	5.4	0.8	2.8	(6.5)	(21.8)	(11.2)	(1.0)	0.0	0.1	1.4	(0.8)
GRAND TOTAL	**$ 33,753,942,480**	**100.0%**	**(17.0)**	**(4.7)**	**(5.5)**	**(5.8)**	**(7.0)**	**(12.8)**	**(9.4)**	**6.7**	**6.5**	**1.3**	**3.3**	**(7.1)**	**(23.1)**	**(12.3)**	**(0.7)**	**(0.3)**	**0.0**	**1.3**	**(0.6)**
POLICY BENCHMARK (EXISTING)			**(14.7)**	**(4.4)**	**(6.1)**	**(5.4)**	**(5.8)**	**(11.7)**	**(7.4)**	**6.7**	**6.5**	**1.0**	**3.1**	**(6.0)**	**(20.5)**	**(10.5)**	**(1.4)**	**(0.8)**	**0.1**	**1.4**	**(0.7)**

SAAP CONSENSUS REALLOCATION STRESS TESTS																					
MASTER CASH	$ 314,709,480	1%	0.0	(0.0)	(0.0)	0.0	0.0	0.0	0.0	0.0	(0.0)	(0.0)	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	0.0	0.0	0.0
TOTAL FIXED INCOME	$ 5,414,391,944	16%	0.9	(0.6)	(4.0)	0.8	0.6	2.0	6.9	(0.4)	(1.4)	(0.7)	(1.1)	1.5	(4.4)	(0.1)	(4.9)	(1.8)	0.3	0.0	(0.1)
US EQUITY	$ 8,107,431,014	24%	(27.3)	(6.0)	(7.7)	(8.3)	(12.1)	(19.0)	(15.5)	8.5	7.8	2.8	4.1	(11.7)	(26.6)	(20.1)	0.0	0.0	(0.0)	3.3	(1.2)
INTERNATIONAL EQUITY	$ 7,483,782,476	22%	(12.4)	(6.3)	(3.1)	(7.0)	(3.2)	(13.3)	(10.7)	10.1	11.6	(0.6)	5.6	(5.2)	(28.1)	(8.2)	(0.0)	0.0	0.0	2.1	(0.8)
REAL ESTATE	$ 3,118,242,698	9%	(12.7)	(2.8)	(3.6)	(3.8)	(5.6)	(8.9)	(7.2)	4.0	3.6	1.3	1.9	(5.4)	(28.0)	(9.3)	(0.0)	0.0	0.0	0.0	(0.4)
FARMLAND & TIMBER	$ 146,009,313	0%	(27.2)	(6.0)	(7.8)	(8.2)	(12.0)	(19.1)	(15.4)	8.6	7.8	2.8	4.1	(11.6)	(27.0)	(20.0)	0.0	0.0	0.0	0.0	(1.2)
PRIVATE EQUITY	$ 2,494,594,158	7%	(32.3)	(7.1)	(9.2)	(9.8)	(14.3)	(22.7)	(18.3)	10.2	9.3	3.3	4.9	(13.8)	(26.9)	(23.7)	(0.0)	0.0	0.0	0.0	(1.5)
PRIVATE DEBT	$ 3,118,242,698	9%	(11.0)	(2.4)	(3.2)	(3.3)	(4.9)	(7.8)	(6.2)	3.5	3.2	1.1	1.7	(4.7)	(20.4)	(8.1)	(0.0)	(0.2)	0.0	0.0	(0.5)
OPPORTUNISTIC EQUITY	$ 338,102,859	1%	(31.0)	(6.8)	(8.9)	(9.4)	(13.7)	(21.9)	(17.6)	9.8	8.9	3.2	4.7	(13.2)	(27.1)	(22.8)	0.0	0.0	0.0	0.0	(1.4)
OPPORTUNISTIC DEBT	$ 1,035,665,948	3%	(14.1)	(3.1)	(4.0)	(4.3)	(6.3)	(10.0)	(8.0)	4.5	4.1	1.5	2.1	(6.0)	(22.5)	(10.4)	(0.0)	0.0	0.0	0.0	(0.6)
GLOBAL INFLATION LINKED	$ 623,648,539	2%	(0.0)	0.0	0.0	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	0.0	0.0	0.0	(0.0)	(16.2)	0.0	0.0	0.0	0.0	(4.1)	(3.6)
MULTI-ASSSET CLASS	$ 1,559,121,349	5%	(15.5)	(4.5)	(5.4)	(5.5)	(6.7)	(12.3)	(9.2)	6.2	5.6	0.9	2.9	(6.8)	(22.3)	(11.7)	(0.7)	0.2	0.1	1.7	(1.0)
GRAND TOTAL (SAAP CON	**$ 33,753,942,480**	**100.0%**	**(15.3)**	**(4.3)**	**(5.0)**	**(5.3)**	**(6.2)**	**(11.6)**	**(8.5)**	**6.2**	**6.1**	**1.0**	**3.0**	**(6.3)**	**(22.2)**	**(11.2)**	**(0.8)**	**(0.3)**	**0.1**	**1.3**	**(0.8)**
POLICY BENCHMARK (SAAP CONSENSUS)			**(14.3)**	**(4.4)**	**(5.1)**	**(5.6)**	**(5.6)**	**(11.7)**	**(8.1)**	**6.8**	**6.9**	**0.9**	**3.3**	**(5.9)**	**(22.3)**	**(10.3)**	**(0.8)**	**(0.3)**	**0.1**	**0.9**	**(0.8)**

Observations of Stress Sceanarios assuming an instantaneous allocation change to the SAAP CONSENSUS

- Scenarios including broad equity declines such as the Lehman Crisis and Black Monday see an improvement with losses reduced in the range of 30bps to 165bps.
- Fixed Income scenarios such as Interest Rate Increases and Spread Increases have minimal increased losses in the range of 1bps to 10bps.
- Commodity scenarios such as Oil and Gold shocks have marginal increased losses ranging from 10bps to 20bps.

Arizona State Retirement System
Investment Beliefs

FRAME OF REFERENCE

The following *Investment Beliefs* have been established to ensure the development of congruent and synergistic investment strategies, and to ensure the effective and efficient allocation of resources. These *Investment Beliefs* determine the general paradigm within which investment strategies are developed, investment ideas are reviewed, and investment decisions are implemented.

Modifications to these *Investment Beliefs* will occur if experiential, academic, conceptual, and/or practical perspectives suggest that a superior belief system exists.

INVESTMENT BELIEFS

1. Asset Class Decisions are Key

In general, decisions with respect to which asset classes and sub-asset classes to invest in, and the allocations to these asset classes and sub-asset classes, have a greater impact on total fund investment returns than decisions in which specific securities to invest.

2. Theories and Concepts Must be Sound

Over longer periods of time, investment outcomes (e.g. rates of return, volatility) conform to logical theories and concepts. Significant deviations (e.g. internet bubble, pre-subprime erosion of risk premiums) from theoretically and conceptually sound investment constructs are usually not sustainable and are typically self-reverting.

3. House Capital Market Views Are Imperative

The development and articulation of sound *House Views* (e.g. views on interest rates, corporate spreads, asset valuations) will ensure consistency among investment decisions, clarity of investment direction, baselines for debates, and conformity of understanding.

4. Investment Strategies Must be Forward Looking

Investment strategies will be developed based on forward-looking insights, rather than simply on successful strategies of the past.

Asset class valuations and security valuations are significantly affected by endogenous outcomes (e.g. earnings, GDP growth rates, competitive barriers) that are probabilistic, and these outcomes are typically well analyzed by the investment industry.

Asset class valuations and security valuations are also significantly affected by random outcomes (e.g. natural disasters, certain supply & demand shocks) that are virtually unpredictable, and these outcomes are typically not analyzed directly by the investment industry.

Asset class valuations and security valuations are also significantly affected by exogenous outcomes (e.g. foreign policies, global cultural interactions) that can possibly be modeled, and these outcomes are typically not analyzed by the investment industry.

5. Public Markets are Generally Informationally Efficient

Asset Class Valuations

Asset class valuations (e.g. stock market levels versus interest rate levels) are often in equilibrium with one another, but anomalous situations do occur which result in disequilibria between asset class valuations. These disequilibria offer valuable investment opportunities which we will pro-actively seek and capitalize on.

Security Valuations

Security valuations (e.g. IBM versus Cisco) are often in equilibrium with one another, but private markets and anomalous public market situations do occur which result in disequilibria between security valuations. These disequilibria offer valuable investment opportunities which we will pro-actively seek and capitalize on.

The extent of informational efficiency varies across asset classes.

Private markets offer significant opportunities for asset mispricing and manager excellence which we will pro-actively seek and capitalize on.

6. Market Frictions are Highly Relevant

Market frictions (e.g. management fees, carried interest, revenue sharing, expenses, costs, transaction spreads, market impacts, taxes, commissions) can be significantly detrimental to investment performance and as a result transactions will be initiated only to the extent there is a strong level of conviction that they will result in increased investment returns or decreased risks net of all market frictions.

7. Internal Investment Professionals are the Foundation of a Successful Investment Program

In-house investment management capability engaged in direct portfolio management results in superior investment decision-making.

In-house investment management pro-actively monitors capital markets in order to determine mispricing opportunities & allocate capital and will successfully increase risk adjusted returns.

In-house investment professionals are more closely aligned with, and have a better understanding of, the purpose and risk & reward tolerance of the ASRS than external parties.

In-house investment professionals will impact direct investment negotiations, better align economic interests, and influence investment industry conditions (e.g. private deal structures, fee levels, introduction of innovative products & strategies).

8. External Investment Management is Beneficial

External investment organizations can often offer greater expertise, resources, and/or flexibility than internal personnel for various investment strategies.

9. Investment Consultants

Investment consultants will be effectively utilized in the following four general categories, and utilization of consultants will be focused on situations where there is a demonstrable need in at least one of the four areas:

- Independence: When oversight or controls should be enhanced
- Perspective: When internal perspectives are not broad enough
- Special Skills: When internal skills are not deep enough
- Resource Allocation: When internal resources are not broad enough

10. Trustee Expertise

Trustees often have expertise in various areas of investment management, and this expertise should be utilized while ensuring separation between Board oversight and staff management.

Investment Committee of the:

Arizona State Retirement System

A Component Unit of the State of Arizona

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