Arizona State Retirement System

Asset Allocation Study

May 18, 2012

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Agenda

- Asset Allocation Paradigm
- Highlights from ASRS Strategic Asset Allocation Policy Study Process
- ASRS Strategic Asset Allocation Policy Schematic (recommended)
- Primary Changes to Existing ASRS Strategic Asset Allocation Policy
- Current, Proposed and Efficient Frontier Portfolio Comparison
- Rebalancing Ranges Analysis
- Appendix – Asset Class Assumptions, Correlations and Investment Outlook (NEPC)

Asset Allocation Paradigm

- **Dynamic Strategic Asset Allocation Policy (SAAP) Study Approach**
  - Periodicity of the Study should be better aligned to capture evolving or changing investment opportunities.
  - ASRS Asset Allocation 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 their 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 Efficient Frontier Mean-Variance Analysis
    - Identify model constraints (statutory, risk tolerances, etc.)
    - Evaluate portfolio risk analyses.
- **Asset Allocation Policy Investment Themes**
  - Increase Diversification
  - Increase Returns in a Low Return Environment
  - Maintain Significant Liquidity
  - Remain Fee and Cost Conscious
  - Increase Allocations to Passive Strategies

Highlights from ASRS Strategic Asset Allocation Policy Study Process

- **February 13, 2012**
  - ASRS Director, CIO, and Staff discussed with the IC the primary topics of focus for the ASRS asset allocation study to be conducted with NEPC.
- **February 29, 2012**
  - ASRS Director and CIO visited NEPC's offices in Cambridge, MA for an initial discussion on asset allocation, among other items.
    - Purpose was to review the asset allocation process and discuss ways to enhance asset allocation process, including how to model and incorporate marginal risk; how to model securities lending; and which asset classes to consider as potential additions to the SAAP.
- **April 16, 2012**
  - NEPC and ASRS Staff reviewed NEPC's 2012 Capital Market Assumptions with the IC and provided several draft asset allocation mixes for consideration and further discussion.
    - Purpose was to provide background regarding the process used to arrive at our capital market assumptions and NEPC's outlook for the next 5-7 years. In addition, we provided background on the process utilized to arrive at the draft asset allocation mixes and solicited feedback to identify any potential areas of concern and address any questions.
- **April 30, 2012**
  - NEPC and ASRS Staff recommended the asset allocation shown in exhibit A on slide 5 for the IC's consideration and approval.
    - Purpose was to address any areas of concern and answer any questions from the prior meeting. In addition, we recommended a new SAAP for the IC to approve and ultimately recommend to the full Board.
    - ***The IC approved the new SAAP targets, ranges and benchmarks as shown in exhibit A on slide 5 for recommendation to the full Board.***

ASRS Strategic Asset Allocation Policy Schematic (recommended)

ASRS Strategic Asset Allocation Policy Schematic
(Exhibit A)

Asset Class	Policy	Range	Benchmark	Passive %
Large Cap	23%		S&P 500	
Mid Cap	5%		S&P 400	
Small Cap	5%		S&P 600	
US Equity	33%	(26 - 38%)		Min 50%
Developed Large Cap	14%		MSCI EAFE	
Developed Small Cap	3%		MSCI EAFE Small Cap	
Emerging	6%		MSCI EM	
Non-US Equity	23%	(16 - 28%)		Min 30%
Private Equity	7%	(5 - 9%)	Russell 2000	
Opportunistic Equity	0%	(0 - 3%)	Investment Specific	
Total Equity	**63%**	**(53 - 70%)**		
Core	13%		Barclays Aggregate	
High Yield	5%		Barclays HY	
US Fixed Income	18%	(8 - 28%)		Min 50%
Emerging Market Debt	4%		Investment Specific	
Opportunistic Debt	0%	(0 - 10%)	Investment Specific	
Private Debt	3%		Investment Specific	
Total Fixed Income	**25%**	**(15 - 35%)**		
Commodities	4%	(1 - 7%)	DJ UBS Total Return	
Real Estate	8%	(6 - 10%)	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%**	**(8 - 16%)**		
TOTAL	**100%**			
Global Tactical Asset Allocation (GTAA)	10%	(5 - 15%)	Total Fund Benchmark	

Note: Aggregate Opportunistic asset classes not to exceed 10%

Primary Changes to Existing ASRS Strategic Asset Allocation Policy

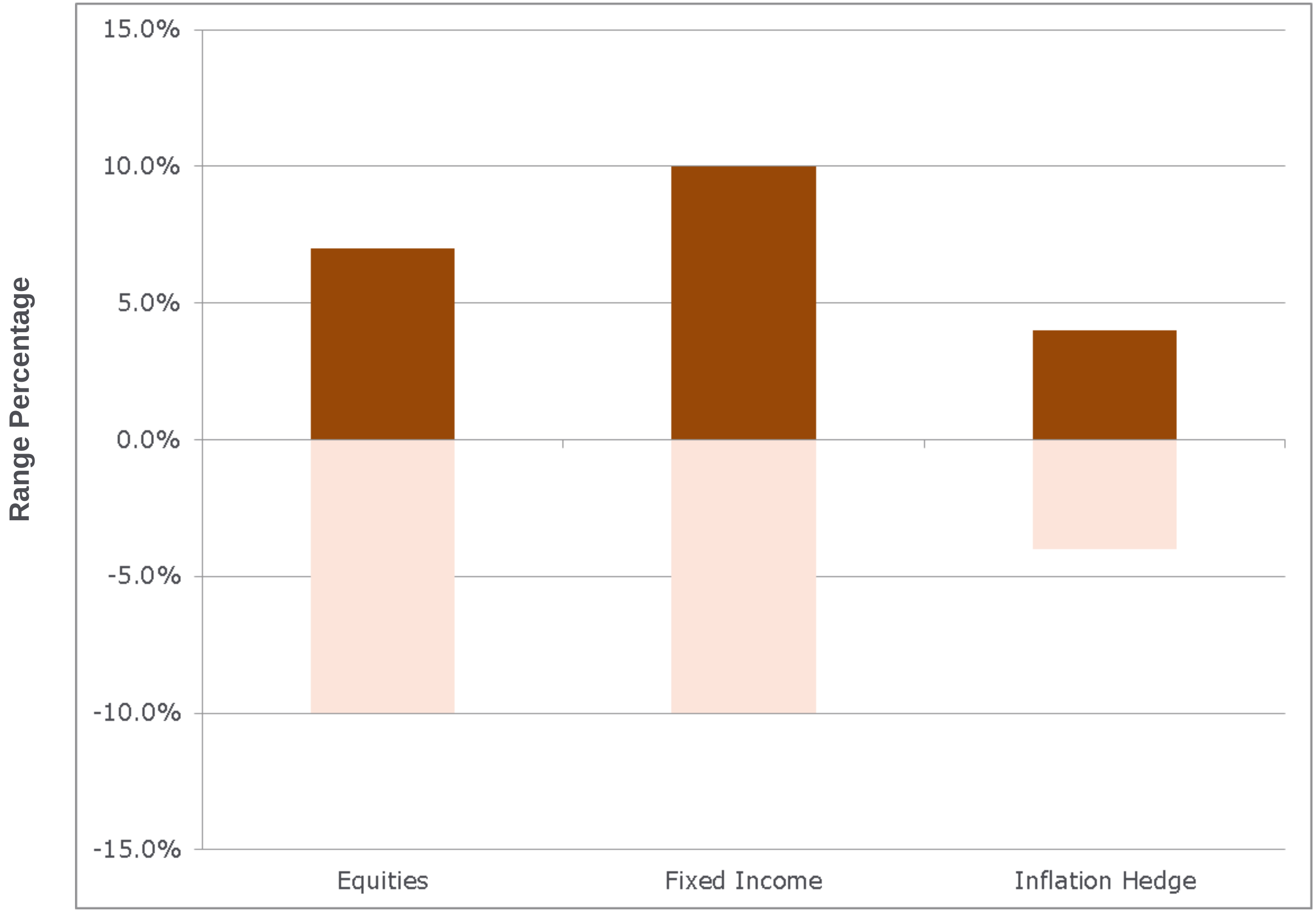
- **Reclassified investments into three (3) broad asset class categories**
  - Better alignment of the economic drivers for underlying asset classes
- **Reduced Allocation to Public U.S. Equities and U.S. Core Fixed Income**
  - Improve diversification and allow more flexibility for tactical credit opportunities
- **Increased Allocation to Public Non-U.S. Equities, EM Equity/Debt, Real Estate, Private Debt, High Yield and Commodities**
  - Improve diversification and maintain a more comprehensive set of asset class opportunities
- **Reclassified Opportunistic Investments (0-10%) in their respective broad categories**
  - Improve the specificity of asset classes and the rationale for underlying mandates
- **Added an allocation to Infrastructure and Farmland/Timber each with a 0% Target and 0-3% target range**
  - Increase the Inflation Linked opportunity set while maintaining sensitivity to timing of entry and alignment of interest between asset class vehicle and underlying long-lived assets
- **Maintained GTAA at 10% with a 5-15% target range**
  - Provides tactical overlay for alpha generation
- **Established Policy Target Ranges primarily at the broad asset class categories**
  - Controls for risk while still maintaining flexibility for tactical opportunities
- **Established Minimum Passive % Target for public equity and fixed income**
  - Consistent with Investment Beliefs and reflects perspectives on asset class efficiencies

Current, Proposed and Efficient Frontier Portfolio Comparison

	Current SAA	Current Actual	IC Recommended	Efficient Frontier
Cash	**0%**	**0%**	**0%**	**0%**
Large Cap Equities	28%	28%	23%	17%
Mid Cap Equities	6%	6%	5%	0%
Small Cap Equities	6%	6%	5%	5%
US Equity	*40%*	*40%*	*33%*	*22%*
Int’l Developed Large Cap Equities	13%	13%	14%	15%
Int'l Developed Small Cap Equities	2%	2%	3%	0%
Emerging Int'l Equities	3%	3%	6%	7%
Non US Equity	*18%*	*18%*	*23%*	*22%*
Private Equity	7%	4%	7%	15%
Opportunistic Equity	0%	0%	0%	0%
Equity Long-Short	0%	0%	0%	4%
Total Equity	**65%**	**62%**	**63%**	**63%**
Core Bonds	24%	24%	13%	10%
High-Yield Bonds	2%	3%	5%	0%
US Fixed Income	*26%*	*27%*	*18%*	*10%*
Emerging Markets Debt	0%	0%	4%	0%
Opportunistic Debt	0%	0%	0%	0%
Private Debt (Credit Opportunities)	0%	0%	3%	10%
Total Fixed Income	**26%**	**27%**	**25%**	**20%**
Commodities	3%	4%	4%	3%
Real Estate	6%	5%	8%	10%
Infrastructure	0%	0%	0%	0%
Farmland & Timber	0%	0%	0%	5%
Total Inflation-Linked Assets	**9%**	**9%**	**12%**	**18%**
*Global Tactical Asset Allocation**	*0%*	*10%*	*10%*	*0%*
Global Tactical Asset Allocation LIBOR Offset	*0%*	*-8%*	*-10%*	*0%*
*Securities Lending***	*0%*	*20%*	*20%*	*20%*
Securities Lending LIBOR Offset	*0%*	*-20%*	*-20%*	*-20%*
Total Tactical Overlay	***0%***	***2%***	***0%***	***0%***
Expected Return	***7.12%***	***7.31%***	***8.03%***	***8.70%***
Standard Dev of Asset Return	***12.8%***	***12.9%***	***13.4%***	***13.1%***
Sharpe Ratio	***0.46***	***0.47***	***0.51***	***0.57***

*** - Modeled as proportional allocations to underlying GTAA managers’ benchmarks (SAA for BW and custom BM for Windham) plus HF Low Vol net of LIBOR for BW (approximately 3.75%)**
**** - Modeled based on customized 0.25% expected return and volatility after netting for LIBOR so that capital is not allocated in the modeling.**

Rebalancing – Over/Underweight Efficiency Impact



Rebalancing Analysis Results

- **Impact of over/underweights suggests the following:**
  - Limit impact of Sharpe Ratio erosion from equity overweight through tighter upper bound
  - Utilize relatively wider range for fixed income due to lower Sharpe Ratio impact
  - Independent of other factors, allow for higher upper bound for Inflation hedging assets
    - Mitigated by nature of underlying assets (predominantly Real Estate) being illiquid
    - Suggests maintaining symmetric bands that are relatively tight to prevent unnecessary illiquidity risk

Appendix I
Asset Class Assumptions, Correlations and Investment Outlook (NEPC)

Model Inputs

- **Permissible Asset Classes and Weighting Constraints**
  - Constraints reflect liquidity, time horizon and marginal benefit analyses
    - Domestic Equity greater than International Equity
    - Domestic Small Cap less than 30% of LC and Greater than 5%
    - Emerging Equity Less than 50% of Developed International Equity
    - Core Bonds (Treas + IG Corp +MBS) has to be greater than 10%
    - RE is constrained to be between 4% and 10%
    - Private Equity Less than 15%
    - Private Debt Less than 10%
    - Private Real Assets less than 10%
  - Not all asset classes may be permissible by some plans (e.g. Private Equity, Hedge Funds)
  - Tactical Overlay modeling
    - Bridgewater Pure Alpha modeled as Hedge Funds Low Vol net of LIBOR (3.5% expected alpha)
    - The Windham Portfolio modeled based on strategic asset allocation
      - 47% S&P 500, 6% Small Cap, 18% MSCI EAFE, 26% BC Aggregate, 3% DJ-UBS
    - Securities Lending modeled with a 25 basis point expected return
    - Risk Parity modeled based on underlying asset class exposures

Development of Asset Class Assumptions

- **Return and Risk Assumptions**
  - Based on historic data, academic theory, and NEPC's assessment of current and future market conditions
  - Assumptions prepared by Asset Allocation Committee
  - Assumptions and actions reviewed and approved by Partner's Research Committee
  - Risk measured by Standard Deviation (volatility) with some recognition of recent increase
- **Correlation Assumptions**
  - Measure of similarity/dissimilarity between asset class returns
  - Based on historic data and current trends
- **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.)
- **Permissible Asset Classes and Weighting Constraints**
  - Constraints reflect liquidity, time horizon and marginal benefit analyses
    - Example: RE is constrained to no more than 10%
  - Not all asset classes may be permissible by some plans
    (e.g. Private Equity, Hedge Funds)

Themes for 2012 Asset Class Assumptions

- **Expected returns reflect divergence between bonds and risky assets**
  - Bond market expectations reflect historically low yields
  - Risky asset returns reflect subdued performance in 2011 and potential for upside
    - Equities, Credit, Commodities, Alternatives
- **30-year returns are lower**
  - Remain higher than 5-7 year expectations but experienced broad decrease due to lower long-term bond yields
- **Differentiation across public equity asset classes**
  - After removing premium on US Smid Cap and International Developed Equities in 2011 and realizing underperformance, we once again expect a premium for these asset classes relative to US Large Cap for 2012
- **Credit markets have higher risk adjusted returns than equities**
- **Minor enhancements to both equity and fixed income forecasting**
- **Commodities assumption change to blended GSCI and non-energy GSCI to create assumption resembling preferred implementation of Dow Jones-UBS Index**
  - Previously simply relied on longer history of GSCI Index

2012 5-7 Year Return and Volatility Forecasts

Geometric Expected Return			
Asset Class	**2011**	**2012**	**2012-2011**
Cash	2.00%	1.25%	-0.75%
Treasuries	2.00%	1.50%	-0.50%
IG Corp Credit	4.00%	4.50%	0.50%
MBS	3.50%	3.25%	-0.25%
*Core Bonds**	*3.03%*	*2.88%*	*-0.15%*
TIPS	2.25%	1.75%	-0.50%
High-Yield Bonds	6.50%	7.00%	0.50%
Global Bonds (Unhedged)	1.75%	1.25%	-0.50%
Global Bonds (Hedged)	1.92%	1.49%	-0.43%
EMD External	5.25%	5.75%	0.50%
EMD Local Currency	6.25%	6.75%	0.50%
Large Cap Equities	7.00%	7.25%	0.25%
Small/Mid Cap Equities	7.00%	7.50%	0.50%
Int'l Equities (Unhedged)	7.00%	7.75%	0.75%
Int'l Equities (Hedged)	7.25%	8.00%	0.75%
Emerging Int'l Equities	9.00%	9.75%	0.75%
Private Equity	9.50%	9.75%	0.25%
Private Debt	9.25%	9.50%	0.25%
Real Estate	6.50%	6.00%	-0.50%
Commodities	4.50%	4.75%	0.25%
Private Real Assets	N/A	8.00%	
Hedge Funds Low Vol	5.75%	5.50%	-0.25%
Hedge Funds Mod Vol	7.00%	7.25%	0.25%
Risk Parity	6.30%	6.60%	0.30%
Global Asset Allocation	4.80%	5.00%	0.20%
Securities Lending	N/A	0.25%	

Volatility			
Asset Class	**2011**	**2012**	**2012-2011**
Cash	1.50%	1.50%	
Treasuries	6.00%	6.00%	
IG Corp Credit	7.00%	7.00%	
MBS	10.00%	9.00%	-1.00%
*Core Bonds**	*7.50%*	*7.00%*	*-0.50%*
TIPS	7.50%	7.50%	
High-Yield Bonds	13.00%	12.00%	-1.00%
Global Bonds (Unhedged)	9.00%	10.00%	1.00%
Global Bonds (Hedged)	5.00%	5.50%	0.50%
EMD External	12.00%	13.00%	1.00%
EMD Local Currency	15.00%	15.00%	
Large Cap Equities	18.00%	18.00%	
Small/Mid Cap Equities	22.00%	22.00%	
Int'l Equities (Unhedged)	21.00%	21.00%	
Int'l Equities (Hedged)	19.00%	19.00%	
Emerging Int'l Equities	28.00%	27.00%	-1.00%
Private Equity	28.00%	28.00%	
Private Debt	19.00%	19.00%	
Real Estate	15.00%	15.00%	
Commodities	20.00%	18.00%	-2.00%
Private Real Assets	N/A	20.00%	
Hedge Funds Low Vol	7.00%	7.00%	
Hedge Funds Mod Vol	12.00%	12.00%	
Risk Parity	11.00%	11.00%	
Global Asset Allocation	10.00%	10.00%	
Securities Lending	N/A	0.25%	

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

2012 Correlation Matrix

	Corr. w/ LIBOR	Corr. w/ Treasuries	Corr. w/ Credit	Corr. w/ MBS	Corr. w/ TIPS	Corr. w/ High-Yield Bonds	Corr. w/ Global Bonds	Corr. w/ Global Bonds - Hedged	Corr. w/ EMD - External	Corr. w/ EMD - Local	Corr. w/ Large Cap Equities	Corr. w/ Small/Mid Cap Equities	Corr. w/ Int'l Equities	Corr. w/ Int'l Equities - Hedged	Corr. w/ Emerging Int'l Equities	Corr. w/ Private Equity	Corr. w/ Private Debt	Corr. w/ Real Estate	Corr. w/ Commodities	Corr. w/ Hedge Funds Low vol	Corr. w/ Hedge Funds Mod vol	Corr. w/ Risk Parity	Corr. w/ GAA	Corr. w/ Private Real Assets	Corr. w/ Sec Lending
Cash	0.85	0.20	0.15	0.25	0.00	-0.05	0.10	0.10	0.10	0.10	0.05	-0.05	-0.10	-0.10	-0.10	-0.10	0.00	0.40	0.10	0.40	0.10	-0.07	0.05	1.00	0.99
LIBOR	1.00	0.15	0.10	0.20	0.00	0.00	0.05	0.05	0.05	0.05	0.10	0.00	-0.10	-0.10	-0.05	-0.10	0.05	0.30	0.05	0.30	0.10	-0.11	0.06	0.85	0.85
Treasuries	0.15	1.00	0.85	0.90	0.75	0.20	0.55	0.90	0.10	0.15	0.15	0.05	0.10	0.10	0.00	0.05	-0.25	-0.05	-0.05	0.05	0.10	0.64	0.27	-0.05	0.20
Credit	0.10	0.85	1.00	0.85	0.60	0.60	0.50	0.65	0.60	0.65	0.55	0.35	0.30	0.30	0.25	0.25	0.15	-0.05	0.00	0.25	0.35	0.73	0.60	0.15	0.15
MBS	0.20	0.90	0.85	1.00	0.70	0.40	0.45	0.60	0.20	0.25	0.25	0.15	0.15	0.15	0.00	0.15	0.00	0.00	-0.05	0.10	0.20	0.57	0.35	0.05	0.25
TIPS	0.00	0.75	0.60	0.70	1.00	0.20	0.40	0.65	0.20	0.25	0.10	0.05	0.05	0.05	0.05	0.00	0.05	0.00	0.30	0.35	0.20	0.75	0.28	0.20	0.00
High-Yield Bonds	0.00	0.20	0.60	0.40	0.20	1.00	0.10	0.10	0.65	0.70	0.65	0.65	0.45	0.45	0.50	0.60	0.65	-0.10	0.00	0.55	0.60	0.46	0.72	0.30	-0.05
Global Bonds	0.05	0.55	0.50	0.45	0.40	0.10	1.00	0.60	0.00	0.05	0.10	0.00	0.40	0.40	0.05	0.00	0.00	-0.05	0.10	0.00	0.00	0.58	0.29	0.10	0.10
Global Bonds - Hedged	0.05	0.90	0.65	0.60	0.65	0.10	0.60	1.00	0.00	0.05	0.10	0.00	0.40	0.40	0.05	0.00	0.00	-0.05	0.10	0.00	0.00	0.82	0.29	0.10	0.10
EMD - External	0.05	0.10	0.60	0.20	0.20	0.65	0.00	0.00	1.00	0.95	0.60	0.55	0.60	0.60	0.75	0.25	0.55	-0.10	0.20	0.40	0.40	0.44	0.73	0.25	0.10
EMD - Local	0.05	0.15	0.65	0.25	0.25	0.70	0.05	0.05	0.95	1.00	0.60	0.55	0.60	0.60	0.75	0.25	0.55	-0.10	0.25	0.40	0.40	0.49	0.75	0.25	0.10
Large Cap Equities	0.10	0.15	0.55	0.25	0.10	0.65	0.10	0.10	0.60	0.60	1.00	0.90	0.70	0.70	0.60	0.75	0.40	0.15	0.10	0.50	0.65	0.48	0.88	0.35	0.05
Small/Mid Cap Equities	0.00	0.05	0.35	0.15	0.05	0.65	0.00	0.00	0.55	0.55	0.90	1.00	0.55	0.55	0.65	0.85	0.50	0.05	0.10	0.50	0.70	0.40	0.80	0.45	-0.05
Int'l Equities	-0.10	0.10	0.30	0.15	0.05	0.45	0.40	0.40	0.60	0.60	0.70	0.55	1.00	0.90	0.65	0.50	0.40	0.10	0.15	0.50	0.55	0.59	0.85	0.35	-0.10
Int'l Equities - Hedged	-0.10	0.10	0.30	0.15	0.05	0.45	0.40	0.40	0.60	0.60	0.70	0.55	0.90	1.00	0.65	0.50	0.40	0.10	0.15	0.50	0.55	0.61	0.82	0.35	-0.10
Emerging Int'l Equities	-0.05	0.00	0.25	0.00	0.05	0.50	0.05	0.05	0.75	0.75	0.60	0.65	0.65	0.65	1.00	0.25	0.45	-0.10	0.20	0.50	0.55	0.43	0.77	0.35	-0.10
Private Equity	-0.10	0.05	0.25	0.15	0.00	0.60	0.00	0.00	0.25	0.25	0.75	0.85	0.50	0.50	0.25	1.00	0.00	0.00	0.00	0.20	0.35	0.31	0.56	0.50	-0.10
Private Debt	0.05	-0.25	0.15	0.00	0.05	0.65	0.00	0.00	0.55	0.55	0.40	0.50	0.40	0.40	0.45	0.00	1.00	-0.20	0.10	0.35	0.60	0.27	0.53	0.40	0.00
Real Estate	0.30	-0.05	-0.05	0.00	0.00	-0.10	-0.05	-0.05	-0.10	-0.10	0.15	0.05	0.10	0.10	-0.10	0.00	-0.20	1.00	0.00	0.00	0.00	0.00	0.04	0.20	0.40
Commodities	0.05	-0.05	0.00	-0.05	0.30	0.00	0.10	0.10	0.20	0.25	0.10	0.10	0.15	0.15	0.20	0.00	0.10	0.00	1.00	0.20	0.25	0.41	0.25	0.20	0.10
Hedge Funds Low vol	0.30	0.05	0.25	0.10	0.35	0.55	0.00	0.00	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.20	0.35	0.00	0.20	1.00	0.90	0.37	0.70	0.20	0.40
Hedge Funds Mod vol	0.10	0.10	0.35	0.20	0.20	0.60	0.00	0.00	0.40	0.40	0.65	0.70	0.55	0.55	0.55	0.35	0.60	0.00	0.25	0.90	1.00	0.45	0.79	0.35	0.10
Risk Parity	-0.11	0.64	0.73	0.57	0.75	0.46	0.58	0.82	0.44	0.49	0.48	0.40	0.59	0.61	0.43	0.31	0.27	0.00	0.41	0.37	0.45	1.00	0.70	0.37	-0.07
GAA	0.06	0.27	0.60	0.35	0.28	0.72	0.29	0.29	0.73	0.75	0.88	0.80	0.85	0.82	0.77	0.56	0.53	0.04	0.25	0.70	0.79	0.70	1.00	0.41	0.06
Private Real Assets	0.85	-0.05	0.15	0.05	0.20	0.30	0.10	0.10	0.25	0.25	0.35	0.45	0.35	0.35	0.35	0.50	0.40	0.20	0.20	0.20	0.35	0.37	0.41	1.00	1.00
Sec Lending	0.85	0.20	0.15	0.25	0.00	-0.05	0.10	0.10	0.10	0.10	0.05	-0.05	-0.10	-0.10	-0.10	-0.10	0.00	0.40	0.10	0.40	0.10	-0.07	0.06	1.00	1.00

2012 30-Year Return Forecasts

Geometric Expected Return			
Asset Class	**2011**	**2012**	**2012-2011**
Cash	4.50%	3.25%	-1.25%
Treasuries	4.75%	3.50%	-1.25%
Credit	6.00%	5.00%	-1.00%
MBS	5.50%	5.25%	-0.25%
*Core Bonds**	*5.34%*	*4.50%*	*-0.84%*
TIPS	5.00%	3.75%	-1.25%
High-Yield Bonds	7.50%	6.25%	-1.25%
Global Bonds (Unhedged)	4.75%	3.25%	-1.50%
Global Bonds (Hedged)	4.75%	3.48%	-1.27%
EMD External	6.75%	6.25%	-0.50%
EMD Local Currency	8.00%	7.00%	-1.00%
Large Cap Equities	8.50%	8.00%	-0.50%
Small/Mid Cap Equities	9.00%	8.50%	-0.50%
Int'l Equities (Unhedged)	9.00%	8.25%	-0.75%
Int'l Equities (Hedged)	9.00%	8.50%	-0.50%
Emerging Int'l Equities	10.00%	9.50%	-0.50%
Private Equity	10.50%	10.00%	-0.50%
Private Debt	9.00%	8.00%	-1.00%
Real Estate	7.00%	6.00%	-1.00%
Commodities	5.50%	5.25%	-0.25%
Private Real Assets	N/A	8.50%	
Hedge Funds Low Vol	6.50%	6.25%	-0.25%
Hedge Funds Mod Vol	8.00%	8.00%	
Risk Parity	N/A	6.60%	
Global Asset Allocation	N/A	5.00%	
Securities Lending	N/A	2.00%	

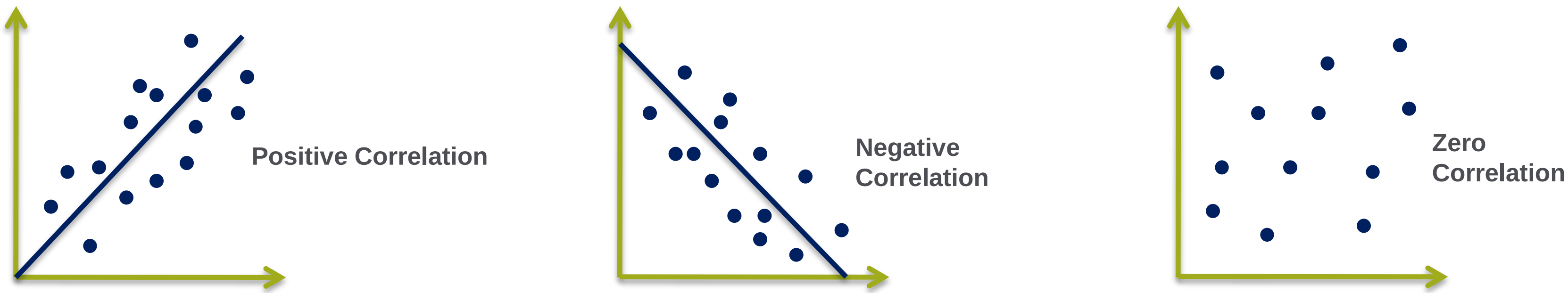
*** Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).**

Summary

- **Expected returns have generally increased for risky asset classes**
  - With even lower rates, and continued low cash forecasts over 5-7 years, all risky assets are more attractive on a risk-adjusted basis
- **Credit markets present more attractive opportunities than equity markets**
  - US and global sovereign bond expectations are less attractive after further fall in global interest rates
- **With long rates falling significantly, long-term (30 year) returns are significantly lower**
  - While lower compared to 2011, these returns will likely still support investor expected return targets
- **Structural themes and recent underperformance in emerging markets support higher returns across debt and equity markets**
- **Global economic uncertainty remains elevated**
  - High volatility currency regime expected to continue
    - Currency hedging of developed markets exposure can reduce portfolio volatility
  - A risk balanced approach can lead to improved outcomes as portfolios reduce concentrated exposure to economic growth

Glossary

- **Correlation:**
  - A measure of the degree to which two asset classes move together



- **Expected Return:**
  - The expected percentage change in an accounts market value over a defined period of time (evaluation period)
- **Standard Deviation**
  - Statistical measure of the distance a quantity is likely to lie from its average value
  - Measures an investments volatility or “risk”
- **Skew**
  - Asymmetry of the distribution. An asymmetric tail extending to the right is referred to as “positively skewed”; an asymmetric tail extending to the left is referred to as “negatively skewed”
- **Kurtosis**
  - Determines the shape of a data distribution
  - Measures whether the data is peaked or flat relative to a normal distribution
- **Sharpe Ratio**
  - 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 (such as Cash) from the rate of return for a portfolio and dividing the result by the standard deviation of the portfolio returns.
- **Sortino Ratio**
  - A ratio developed by Frank A. Sortino to differentiate between good and bad volatility
  - This differentiation of upwards and downwards volatility allows the calculation to provide a risk-adjusted measure of a fund’s performance without penalizing it for upward price changes. The calculation replaces the denominator of the Sharpe ratio with the standard deviation of “downside” returns

Skew & Kurtosis