



South Carolina Retirement System Investment Commission

Asset Allocation Review February 2013

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Executive Summary

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Executive Summary

- We conducted an asset/liability study for the RSIC using data from the actuary, GRS. The study focuses on creating a risk-efficient portfolio that maximizes potential funding status, minimizes contributions and minimizes downside risk of investment loss.
- Due to the System's current funded status, higher risk asset allocation options could be justified. We sought instead to balance the current mix to be more risk/return efficient by reducing volatility at a slightly higher level of expected return.
- The major asset allocation recommendations are illustrated below. We have grouped asset classes into larger categories to focus the discussion and ease illustration. Return-Seeking assets, or the amount outside of low-risk fixed income, is a combination of asset classes across four of the five broad categories below.

	Current	Proposed
Global Equity	38.5%	40%
Diversified Credit	20.5	19
Real Assets	6	8
Opportunistic Strategies	15	18
Conservative Fixed Income	20	15
Effective Mix: Stocks/Bonds/Alternatives	35/37/28 (43% in Alts. when Portable Alpha overlay is counted)	36/32/32 (39% in Alts. if 100% of hedge fund latitude is used)

- While practices vary across the industry, we define Alternatives as being private equity, private debt, opportunistic credit strategies, real estate, commodities, and hedge funds.

Executive Summary (cont'd)

- While the proposed mix creates a slightly higher target alternatives allocation, it does so in real estate and hedge funds – two lower volatility, and more liquid, alternatives components, while slightly reducing Private Debt. Once the Portable Alpha program is eliminated, the effective alternatives allocation will actually be lower than your current program. We are comfortable that the Fund's liquidity needs can be comfortably met by this mix over time. We have provided two "Alternatives Light" solutions for your consideration as well, but they are less risk/return efficient over time.
- We recommend several structural and risk control elements as well, including:
 - Restricting private market investments (initial lock-ups exceeding 5 years) to a target of 21% of assets within ± 3
 - Allowing hedge funds to be used in other asset classes (such as equity) but subject to a cap of 15% of the total fund assets (this includes the low beta, dedicated hedge fund component)
 - Creating a global public equity component, rather than carving up the stock market into many pieces
- It is important to note that we analyzed the current long-term target allocations as articulated in the Annual Investment Plan and did not model the portable alpha program, which adds about 15 percentage points of exposure to hedge funds on top of the target allocation. We recommend this program be phased out.
- In the table on the following pages, we summarize the current targets, recommended asset allocation, proposed rebalancing ranges, and suggested benchmarks.

Summary of Recommended Asset Allocation

Asset Class	Current Target	Proposed Target	Change
Global Equity:	38.5%	40%	+1.5%
<ul style="list-style-type: none"> • U.S. Stock (lg. + small-cap) • Non-U.S. Stock – Developed • Emerging Markets Equities • Private Equity 	14 8 8 8.5%	 31%*	+1%
Real Assets:	6%	8%	+2%
<ul style="list-style-type: none"> • Commodities • Real Estate 	3 3	3* 5	-- -- +2%
Opportunistic:	15%	18%	+3%
<ul style="list-style-type: none"> • GTAA/Risk Parity • Hedge Funds (low beta) 	10 5	10* 8*	-- -- +3%
Diversified Credit:	20.5%	19%	-1.5%
<ul style="list-style-type: none"> • Mixed Credit (HY, Loans, Structured) • Emerging Market Debt • Private Debt 	6 6 8.5	6* 6* 7*	-- -- -- -- -1.5%
Conservative Fixed Income:	20%	15%	-5%
<ul style="list-style-type: none"> ▪ Core Fixed Income (+IG Credit) ▪ Global Fixed Income (hedged) ▪ Short Duration ▪ Cash (net of overlays) 	12 1 4 3%	7% 3 3 2%	-5% +2% -1% -1%

*Asset classes in which hedge funds can be used, up to a maximum of 15% across the entire portfolio

**We recommend a secondary benchmark be used over longer periods: vintage year universe median returns

Summary of Recommended Rebalancing Ranges

Asset Class	Current Minimum	Current Maximum	Proposed Minimum	Proposed Maximum
Global Equity:			30%	45%
<ul style="list-style-type: none"> • U.S. Stock (lg. + small-cap) • Non-U.S. Stock – Developed • Emerging Markets Equities • Private Equity 	0%	25/20%	25%	37%
	0%	25%		
	0%	20%	6%	12%
	0%	15%		
Real Assets:	0%	20%		
<ul style="list-style-type: none"> • Commodities • Real Estate 	0	10%	0%	6%
	0	10%	2%	8%
Opportunistic:	0%	20%		
<ul style="list-style-type: none"> • GTAA/Risk Parity • Hedge Funds (low beta) 	0	20%	7%	13%
	0	20%	5%	11%
Diversified Credit:				
<ul style="list-style-type: none"> • Mixed Credit (HY, Loans, Structured) • Emerging Market Debt • Private Debt 	0	25%	3%	9%
	0	25%	3%	9%
	0	15%	4%	10%
Conservative Fixed Income:			10%	25%
<ul style="list-style-type: none"> ▪ Core Fixed Income (+IG Credit) ▪ Global Fixed Income (hedged) ▪ Short Duration ▪ Cash (net of overlays) 	0	50%	4%	10%
	0	25%	0%	6%
	0	100%	0%	6%
	0	100%	0%	5%

- We recommend more narrow ranges across all asset class. In practice, the portfolio has not generally tested the minimums or maximums.

Recommended Asset Class Benchmarks

Asset Class	Current Benchmark	Recommended Benchmark
Global Public Equity	Blend of underlying sub-asset class benchmarks	MSCI All-Country World Index IMI
Private Equity	80% Russell 3000 / 20% MSCI EAFE + 300 bps, on a 3-month lag	Primary Benchmark: 80% Russell 3000/20% MSCI EAFE + 300 basis points Secondary Benchmark: Vintage year weighted benchmark
High Yield Debt	Barclays Capital High Yield	BofA/Merrill Lynch High Yield Master II Constrained Index
Bank Loans	S&P/LSTA Leveraged Loan Index	S&P/LSTA Leveraged Loan Index
Emerging Market Debt	50% JP Morgan EMBI Global / 50% JP Morgan GBI-EM Global	50% JP Morgan EMBI Global Diversified (US Dollar denominated) / 50% JP Morgan GBI-EM Global Diversified (local currency denominated)
Private Debt and Credit Opportunities	Equal Blend of Barclays High Yield, S&P/LSTA Leveraged Loan and Barclays MBS Indices	Primary Benchmark: Blend of Barclays High Yield, S&P/LSTA Leveraged Loan and Barclays MBS Indices Secondary Benchmark: Blend of underlying strategy benchmarks
Broad Real Estate	NCREIF Property Index	NCREIF Open-end Diversified Core (ODCE) Index + 75 basis points
Commodities	Dow Jones-UBS Commodity Index	Dow Jones-UBS Commodity Index
Hedge Funds	HFRX Global Hedge Fund Index	HFRI Fund Weighted Composite Index
Global Tactical Asset Allocation (GTAA)	50% MSCI World / 50% S&P/Citi WGBI	50% MSCI World / 50% S&P/Citi WGBI
Core US Fixed Income	Barclays US Aggregate Bond Index	Barclays US Aggregate Bond Index
Global Fixed Income (Hedged)	Barclays Global Aggregate Bond Index	Barclays Global Aggregate Bond Index (Hedged)
Short Duration	ML US Treasuries 0-3 Year Index	Barclays 1-3 Year Government/Credit Index
Cash Equivalents	90 Day Treasury Bills	Merrill Lynch (or Citigroup) 3-Month T-Bill

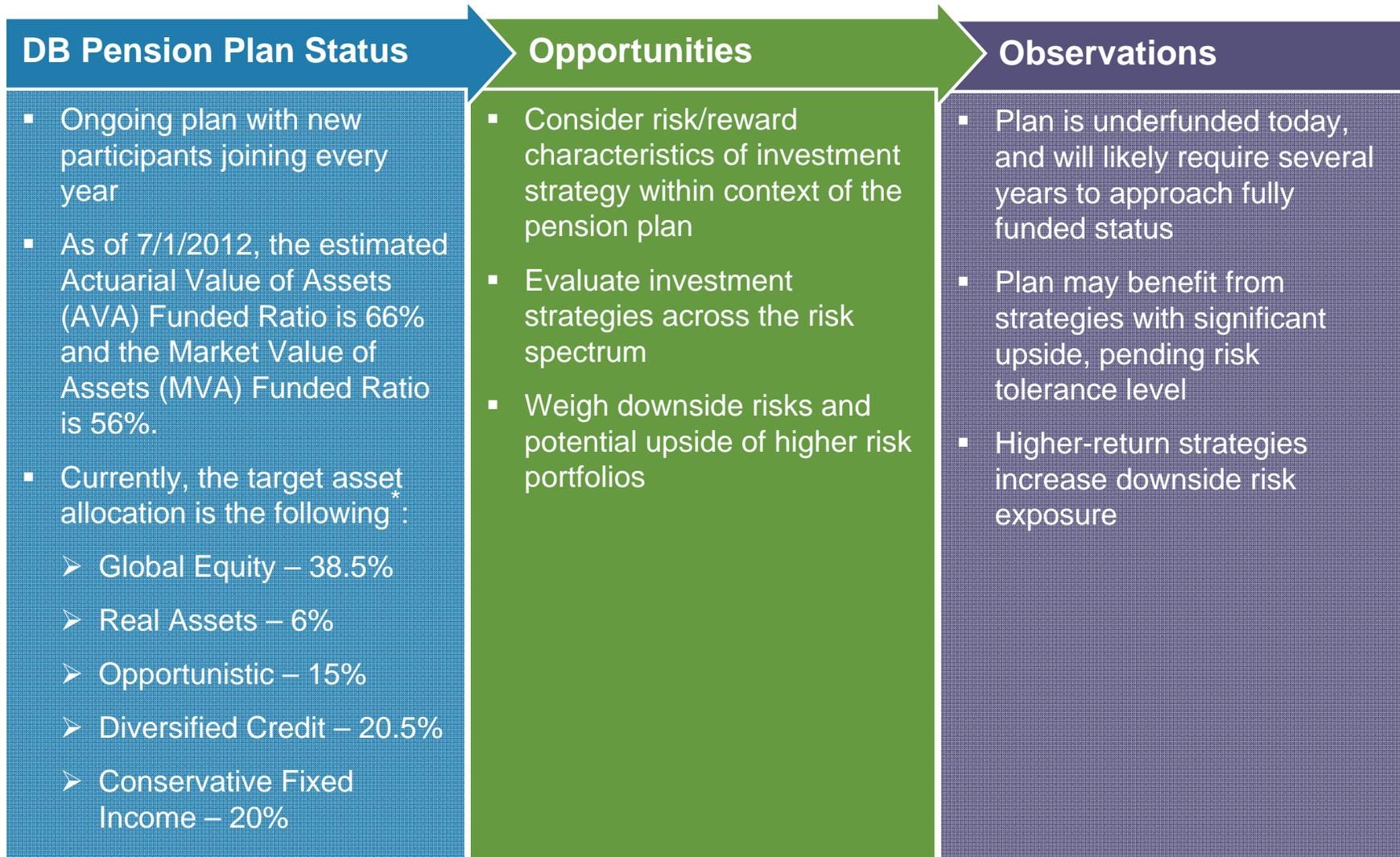
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Asset-Liability Circumstances: What Level of Return-Seeking Assets?

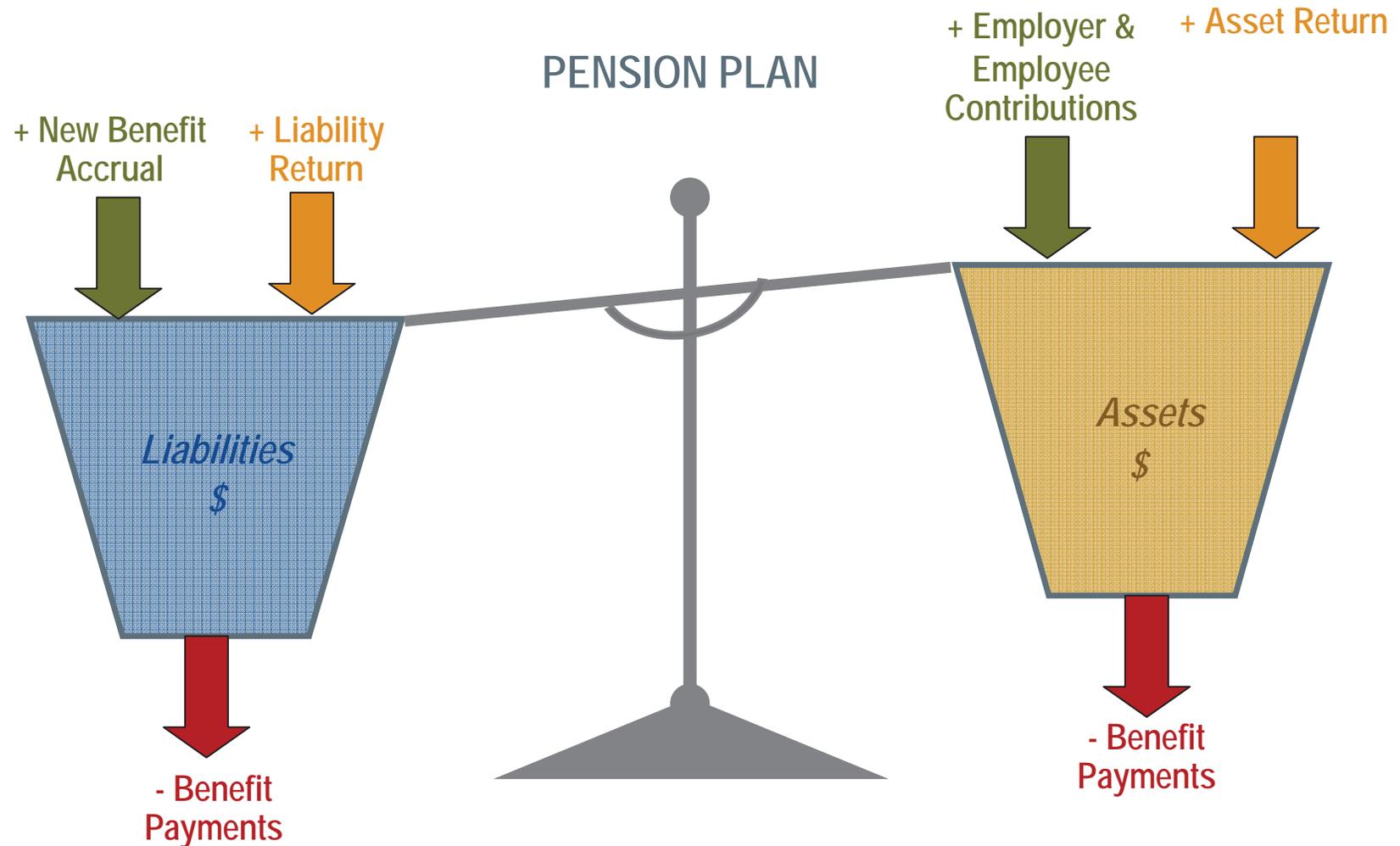
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South Carolina Retirement System (SCRS)



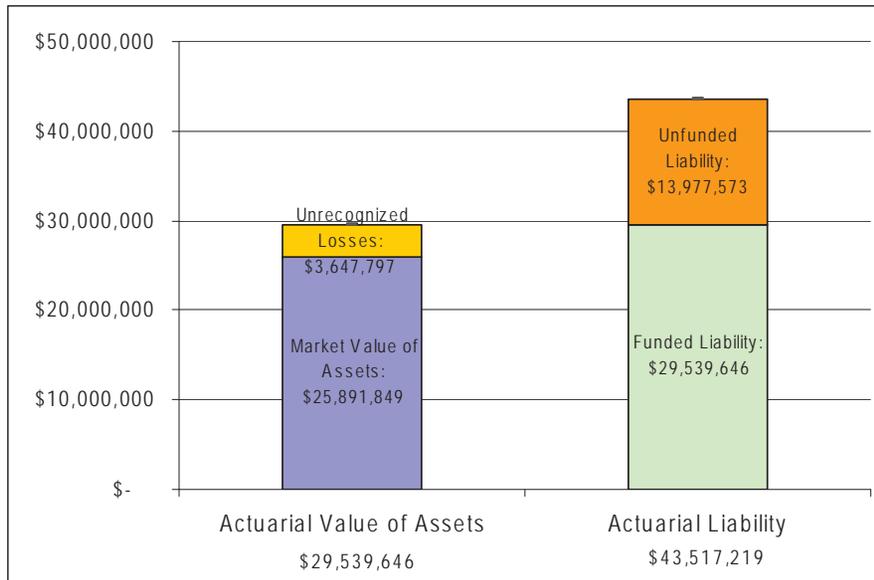
* The Appendix provides detail on this breakout.

Pension Fund: Balance of Liabilities and Assets

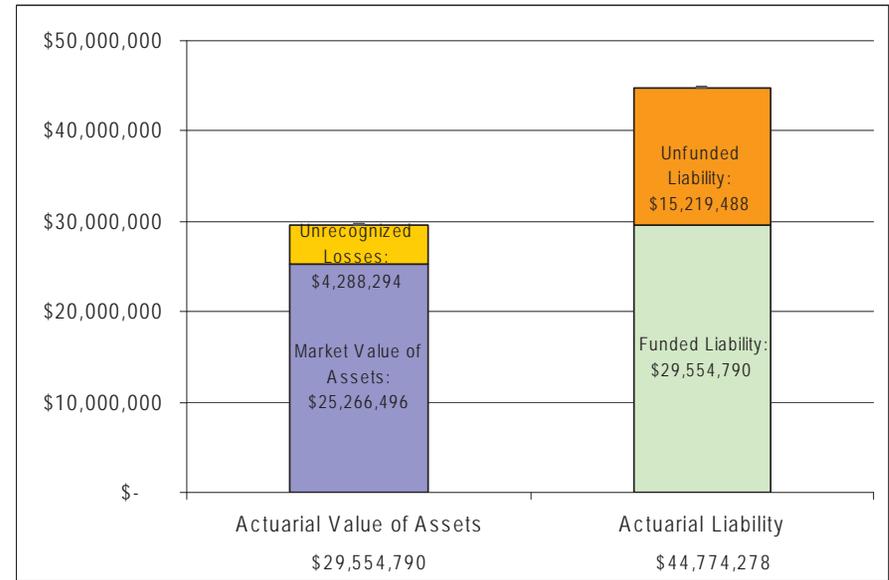


SCRS Current Funding Situation

June 30, 2011 Funding Results (\$ '000s)



June 30, 2012 Funding Results (\$ '000s)¹



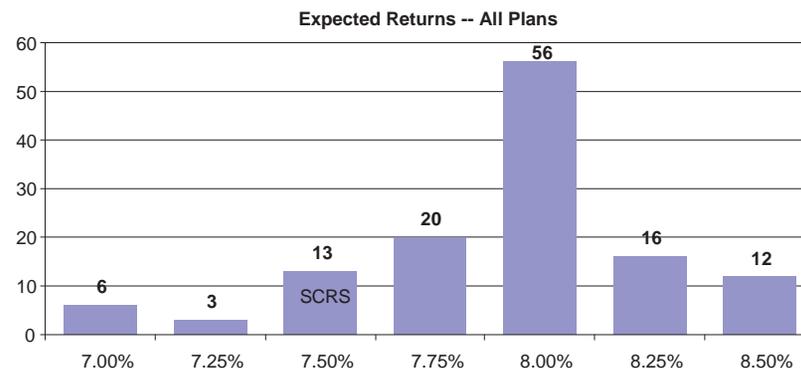
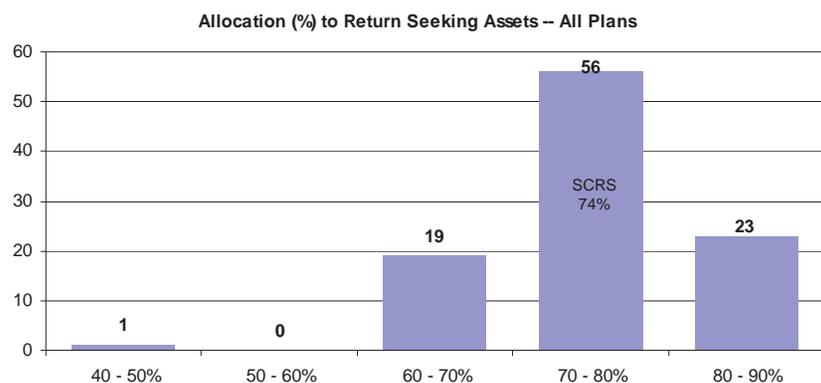
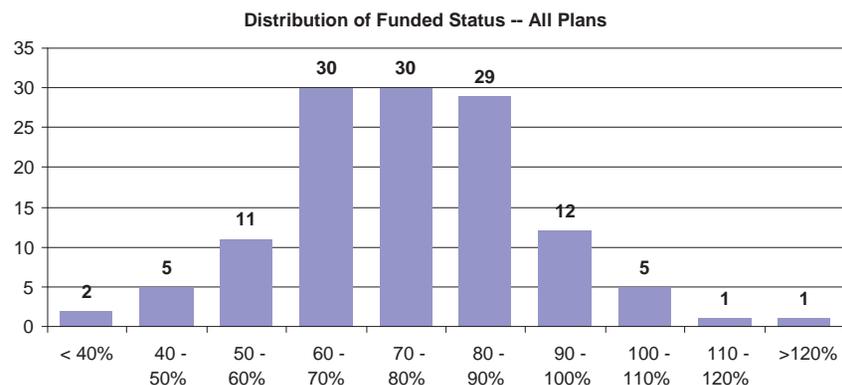
As of June 30, 2011, the plan was 59% funded on market value basis (MVA) and 68% funded on actuarial value basis (AVA)

As of June 30, 2012, we estimate the plan is 56% funded on market value basis and 66% funded on actuarial value basis

The AVA is greater than the MVA because it reflects smoothing of asset losses in recent years.

¹ The June 30, 2012 Actuarial Liability and Actuarial Value of Assets are estimated.

Pension Assumption Peer Comparison¹



- Approximately 60% of funds in this survey had higher funded status than RSIC (66% funded on AVA basis). 40% had comparable or lower
- Approximately 83% of funds used a higher return assumption than RSIC (which uses 7.5%).
- Approximately 20% of funds had a higher allocation to return-seeking assets than RSIC, 45% were similar and 15% were lower.

¹Based on Public Fund Survey (NASRA) of approximately 125 funds. November 2012 Survey Date. Survey Data is for Fiscal Year 2011 and is compiled from financial and actuarial reports.

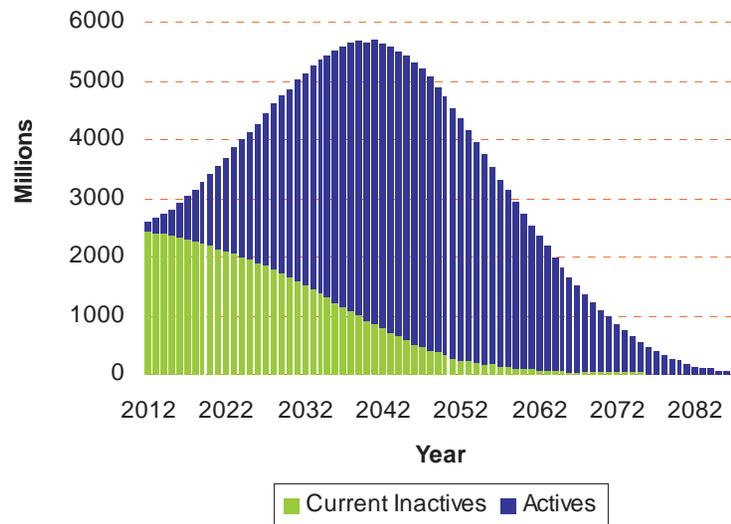
Asset-Liability Profile-Current State

June 30, 2012 Asset-Liability Snapshot			
Metric (\$ '000s)	Value	Funded Ratio (MV Assets)	Funded Ratio (AV Assets)
Market Value of Assets	\$25,256,496		
Actuarial Value of Assets ¹	\$29,554,790		
Actuarial Liability (AL)	\$44,774,278	56%	66%

¹Estimated

Target Asset Allocation Snapshot	
Asset Class	% Alloc
Global Equity	38.5%
Real Assets	6%
Opportunistic	15%
Diversified Credit	20.5%
Fixed Income	20%
Total Assets	100%

Expected Benefit Payments



Asset-Liability Growth Metrics			
Metric (\$ '000s)	Value	% of MV Assets	% of Liability
Normal Cost	\$940,935	3.7%	2.1%
Interest Cost	\$3,358,071	13.3%	7.5%
Total Liab Hurdle Rate	\$4,299,006	17.0%	9.6%
Expected Return on Assets	\$1,894,987	7.5%	4.2%
ER + EE Contributions	\$1,907,553	7.6%	4.3%
Total Expected Asset Increase	\$3,802,540	15.1%	8.5%
Hurdle Rate Shortfall	\$496,466	1.9%	1.1%
Benefit Payments	\$2,619,632	10.4%	5.9%

Risk Management Toolkit

Tools		Risks Managed
Investment Tools	Return-Seeking (R-S) Assets	• Equity and alternatives: build diversified return-seeking portfolio to reduce reliance on any single risk factor
	Risk-Reducing Assets	• Safety assets designed to protect portfolio value in times of market stress
Plan Design Tools	Plan Status	• Scope: closing and freezing a plan reduces the future size of risk
	Lump Sums	• Cost and time horizon: lump sums may increase long-term cost of plan; reduce number of participants (and longevity risk)
Funding Tools	Pre-funding	• Escape velocity: severely under-funded plans need capital to achieve critical mass
	Funding Policy	• Volatility: funding pattern established to fit sponsor
Assumptions and Methods	Smoothing Methods	• Volatility: smoothing methods can mitigate market value volatility at higher risk asset allocations
	Assumption Selection	• Volatility: assumptions used can manage timing of plan cost

- All tools must be considered in achieving fully funded status over time – relying solely on one element is difficult
- For the purposes of this discussion, we have focused on investment tools.

SCRS Asset Allocations Studied

Capital Market Expectations – 4th Quarter 2012 (10 and 30 year outlook)

Asset Class	Current Target Policy (80% R-S)	Alternative 1: Proposed Solution (85% R-S)	Alternative 2: Same Risk Higher Return (91% R-S)	Alternative 3: Capped Private Market Investments (85% R-S) ⁶	Alternative 4: No Alternative Investments (60% R-S)
Global Equity ¹	38%	40%	32%	42%	60%
Real Assets ²	6%	8%	9%	6%	0%
Opportunistic ³	15%	18%	27%	15%	0%
Diversified Credit ⁴	21%	19%	23%	22%	0%
Fixed Income ⁵	20%	15%	9%	15%	40%
Total	100%	100%	100%	100%	100%
10 Year Expected Return	7.00%	7.14%	7.57%	7.06%	6.15%
10 Year Expected Risk	12.52%	11.54%	12.52%	12.81%	12.98%
10 Year Sharpe Ratio	0.456	0.506	0.501	0.450	0.374
10 Year Expected Inflation	2.30%	2.30%	2.30%	2.30%	2.30%
30 Year Expected Return⁶	7.55%	7.68%	8.04%	7.53%	6.79%
30 Year Expected Risk	11.93%	11.04%	11.97%	12.17%	12.19%
30 Year Sharpe Ratio	0.415	0.460	0.454	0.405	0.344
30 Year Expected Inflation	2.30%	2.30%	2.30%	2.30%	2.30%

¹ Global Equity is comprised of Global Public Equity and Private Equity

² Real Assets is comprised of Real Estate and Commodities

³ Opportunistic is comprised of Hedge Funds and Global Asset Allocation (GAA)

⁴ Diversified Credit is comprised of High Yield Bonds, Bank Loans, Emerging Market Debt, and Private Debt/Opportunistic Credit

⁵ Fixed Income is comprised of Core Fixed Income, International Bonds, Intermediate Credit, Short Credit, Short Gov't Bonds, and Cash

⁶ Private Market Investments (Private Equity, Private Debt, and Real Estate) and Hedge Funds are capped at 20% of the total asset allocation.

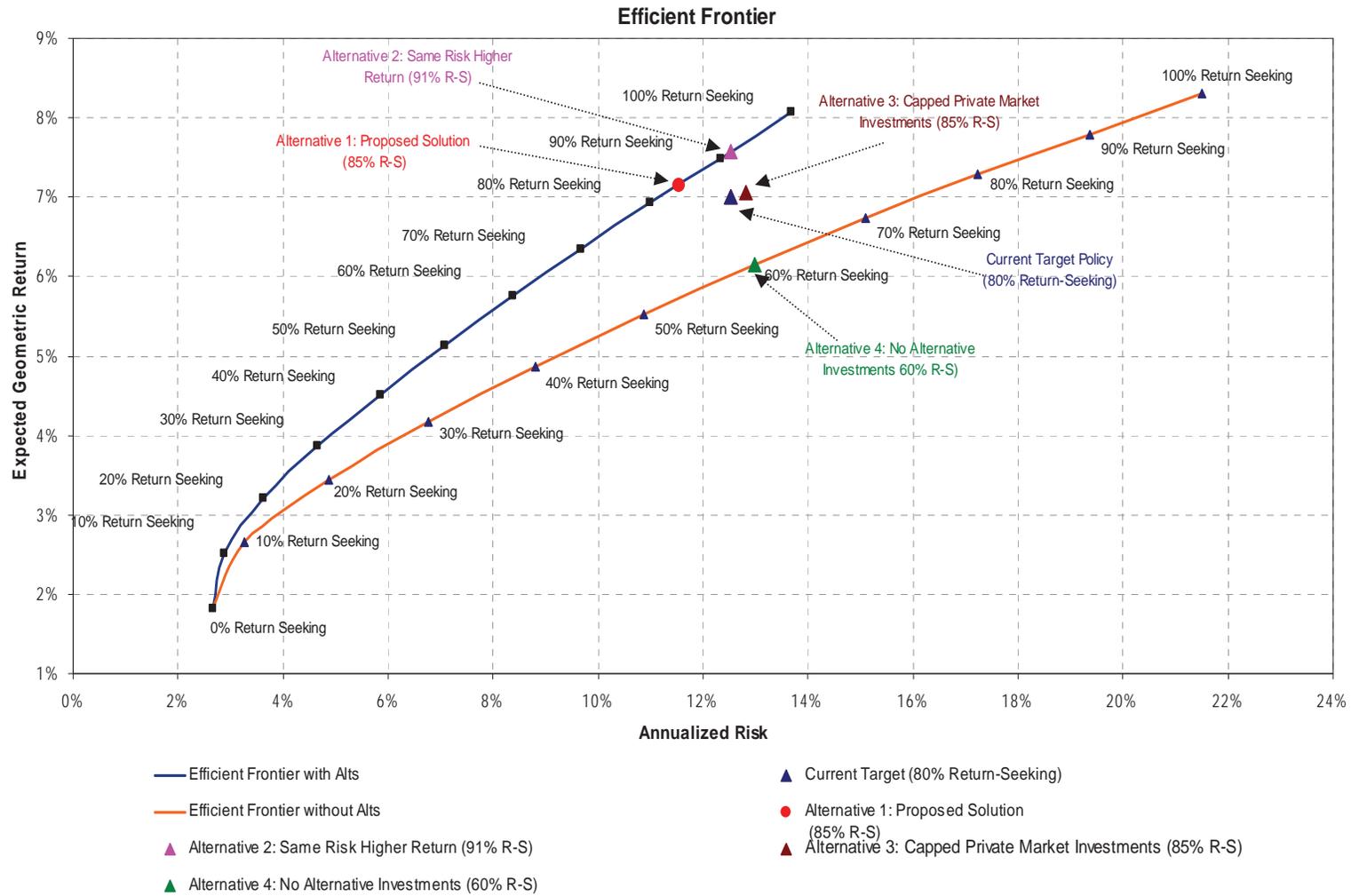
Asset Allocations Studied

	Target Policy	Alternative 1: Proposed Solution (85% R-S)	Alternative 2: Same Risk Higher Return (91% R-S)	Alternative 3: Capped Private Market Investments (85% R-S)	Alternative 4: No Alternative Investments (60% R-S)
Global Equity					
Large Cap U.S. Equity	0.0%	0.0%	0.0%	0.0%	0.0%
Small Cap U.S. Equity	0.0%	0.0%	0.0%	0.0%	0.0%
Global Public Equity	30.0%	31.0%	21.8%	36.0%	60.0%
International (Non-U.S.) Equity (Developed)	0.0%	0.0%	0.0%	0.0%	0.0%
Emerging Markets Equity	0.0%	0.0%	0.0%	0.0%	0.0%
Private Equity	8.5%	9.0%	10.3%	5.9%	0.0%
<i>Total Global Equity</i>	<i>38.5%</i>	<i>40.0%</i>	<i>32.1%</i>	<i>41.9%</i>	<i>60.0%</i>
Real Assets					
Real Estate (Broad Market)	3.0%	5.0%	5.4%	3.2%	0.0%
Commodities	3.0%	3.0%	3.3%	3.0%	0.0%
<i>Total Real Assets</i>	<i>6.0%</i>	<i>8.0%</i>	<i>8.7%</i>	<i>6.2%</i>	<i>0.0%</i>
Opportunistic					
Hedge Funds Universe (Median Manager)	5.0%	8.0%	16.3%	5.0%	0.0%
Global Asset Allocation (GAA) ¹	10.0%	10.0%	10.9%	10.0%	0.0%
<i>Total Opportunistic</i>	<i>15.0%</i>	<i>18.0%</i>	<i>27.2%</i>	<i>15.0%</i>	<i>0.0%</i>
Diversified Credit					
High Yield Bonds	3.0%	2.0%	3.3%	3.0%	0.0%
Bank Loans	3.0%	4.0%	3.3%	5.0%	0.0%
Emerging Market Bonds (Sov., USD)	3.0%	0.0%	0.0%	0.0%	0.0%
Emerging Market Bonds (Sov., Local)	3.0%	6.0%	6.5%	8.0%	0.0%
Private Debt/Opportunistic Credit ²	8.5%	7.0%	10.3%	5.9%	0.0%
<i>Total Diversified Credit</i>	<i>20.5%</i>	<i>19.0%</i>	<i>23.4%</i>	<i>21.9%</i>	<i>0.0%</i>
Total Return-Seeking Assets	80.0%	85.0%	91.4%	85.0%	60.0%
Fixed Income					
Core U.S. Fixed Income (Market Duration)	10.0%	7.0%	3.1%	6.0%	27.4%
Global Fixed Income	1.0%	3.0%	0.5%	4.0%	0.0%
Short Duration Bonds - Gov't	2.0%	1.5%	1.5%	1.5%	1.5%
Short Duration Bonds - Credit	2.0%	1.5%	1.5%	1.5%	1.5%
Intermediate Corporate Bonds	2.0%	0.0%	0.0%	0.0%	0.0%
International Developed Bonds (0% Hedged)	0.0%	0.0%	0.0%	0.0%	0.0%
International Developed Bonds (100% Hedged)	0.0%	0.0%	0.0%	0.0%	7.6%
Cash Equivalents	3.0%	2.0%	2.0%	2.0%	2.0%
Total Risk-Reducing Assets	20.0%	15.0%	8.6%	15.0%	40.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
10 Year Expected Geometric Return	7.00%	7.14%	7.57%	7.06%	6.15%
10 Year Expected Risk	12.52%	11.54%	12.52%	12.81%	12.98%
10 Year Sharpe Ratio	0.456	0.506	0.501	0.450	0.374
10 Year Expected Inflation	2.30%	2.30%	2.30%	2.30%	2.30%
30 Year Expected Geometric Return	7.55%	7.68%	8.04%	7.53%	6.79%
30 Year Expected Risk	11.93%	11.04%	11.97%	12.17%	12.19%
30 Year Sharpe Ratio	0.415	0.460	0.454	0.405	0.344
30 Year Expected Inflation	2.30%	2.30%	2.30%	2.30%	2.30%

¹ GAA allocation is modeled as 50% Global Equity and 50% Global Fixed Income

² Private Debt/Opportunistic Credit is modeled as Private Equity

Candidate Investment Portfolios (10 Year CMAs)



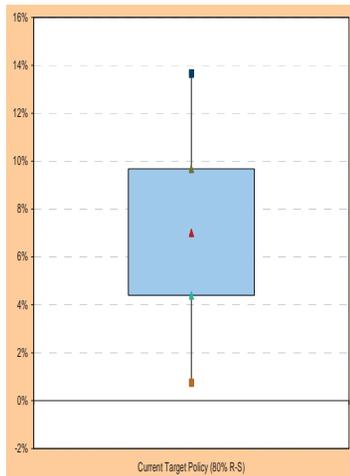
Candidate Investment Portfolios (10 Year CMAs)

			Return-Seeking				Risk-Reducing
	Expected Nominal Return	Expected Risk	Global Equity	Real Assets	Opportunistic	Diversified Credit	Fixed Income
Current Portfolio (80% R-S)	7.0%	12.5%	38%	6%	15%	21%	20%
Efficient Portfolio with Alts (80% R-S)	6.9%	11.0%	29%	8%	24%	20%	20%
Alternative 1: Proposed Solution (85% R-S)	7.1%	11.5%	40%	8%	18%	19%	15%
Alternative 2: Same Risk Higher Return (91% R-S)	7.6%	12.5%	32%	9%	27%	23%	9%
Alternative 3: Capped Private Market Investments (85% R-S)	7.1%	12.8%	42%	6%	15%	22%	15%
Alternative 4: No Alternative Investments (60% R-S)	6.2%	13.0%	60%	0%	0%	0%	40%
Efficient Frontier without Alts							
0% Return-Seeking Assets	1.8%	2.7%	0%	0%	0%	0%	100%
10% Return-Seeking Assets	2.7%	3.3%	10%	0%	0%	0%	90%
20% Return-Seeking Assets	3.4%	4.9%	20%	0%	0%	0%	80%
30% Return-Seeking Assets	4.2%	6.8%	30%	0%	0%	0%	70%
40% Return-Seeking Assets	4.9%	8.8%	40%	0%	0%	0%	60%
50% Return-Seeking Assets	5.5%	10.9%	50%	0%	0%	0%	50%
60% Return-Seeking Assets	6.2%	13.0%	60%	0%	0%	0%	40%
70% Return-Seeking Assets	6.7%	15.1%	70%	0%	0%	0%	30%
80% Return-Seeking Assets	7.3%	17.2%	80%	0%	0%	0%	20%
90% Return-Seeking Assets	7.8%	19.4%	90%	0%	0%	0%	10%
100% Return-Seeking Assets	8.3%	21.5%	100%	0%	0%	0%	0%
Efficient Frontier with Alts							
0% Return-Seeking Assets	1.8%	2.7%	0%	0%	0%	0%	100%
10% Return-Seeking Assets	2.5%	2.9%	4%	1%	3%	3%	90%
20% Return-Seeking Assets	3.2%	3.6%	7%	2%	6%	5%	80%
30% Return-Seeking Assets	3.9%	4.7%	11%	3%	9%	8%	70%
40% Return-Seeking Assets	4.5%	5.8%	14%	4%	12%	10%	60%
50% Return-Seeking Assets	5.1%	7.1%	18%	5%	15%	13%	50%
60% Return-Seeking Assets	5.7%	8.4%	21%	6%	18%	15%	40%
70% Return-Seeking Assets	6.3%	9.7%	25%	7%	21%	18%	30%
80% Return-Seeking Assets	6.9%	11.0%	29%	8%	24%	20%	20%
90% Return-Seeking Assets	7.5%	12.3%	32%	9%	27%	23%	10%
100% Return-Seeking Assets	8.1%	13.7%	36%	10%	30%	25%	0%

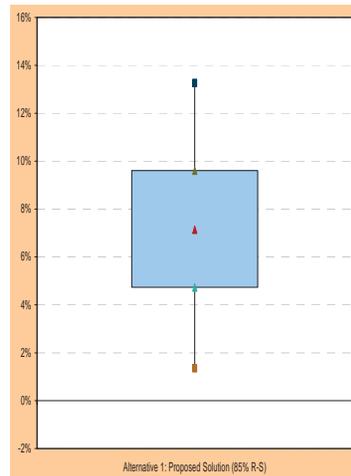
SCRS Asset Allocations Studied

Capital Market Expectations – 4th Quarter 2012 (10 year outlook)

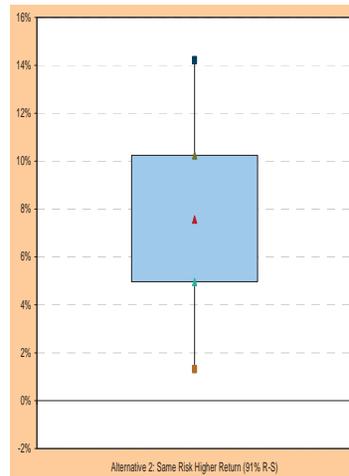
Current Target Policy (80%R-S)



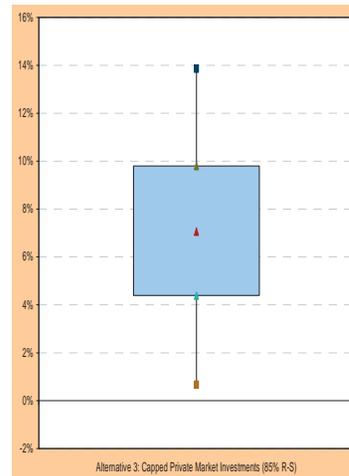
Alternative 1: Proposed Solution (85%R-S)



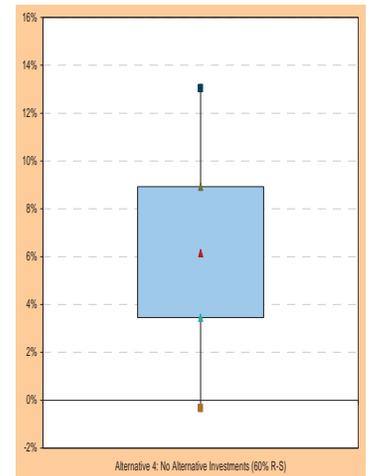
Alternative 2: Same Risk Higher Return (91%R-S)



Alternative 3: Capped Private Market Investments (85%R-S)



Alternative 4: No Alternative Investments (60%R-S)



Time Horizon	10 Years				
	95 th	75 th	50 th	25 th	5 th
Target Allocation	13.6%	9.7%	7.0%	4.4%	0.7%

Time Horizon	10 Years				
	95 th	75 th	50 th	25 th	5 th
Alt 1	13.3%	9.6%	7.1%	4.7%	1.4%

Time Horizon	10 Years				
	95 th	75 th	50 th	25 th	5 th
Alt 2	14.2%	10.2%	7.6%	5.0%	1.3%

Time Horizon	10 Years				
	95 th	75 th	50 th	25 th	5 th
Alt 3	13.9%	9.8%	7.1%	4.4%	0.7%

Time Horizon	10 Years				
	95 th	75 th	50 th	25 th	5 th
Alt 4	13.0%	8.9%	6.2%	3.4%	-0.3%

SCRS Asset Allocations Studied

Capital Market Expectations – 4th Quarter 2012 (30 year outlook)

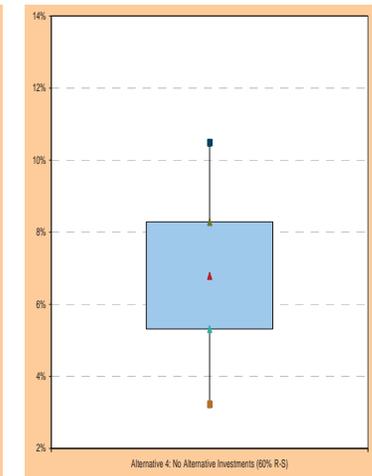
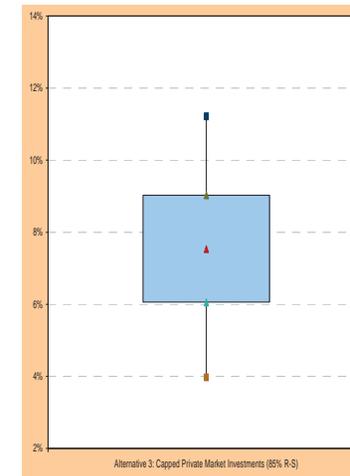
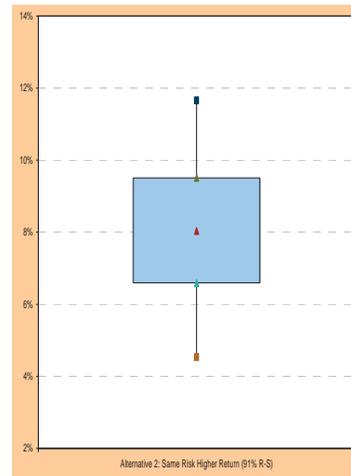
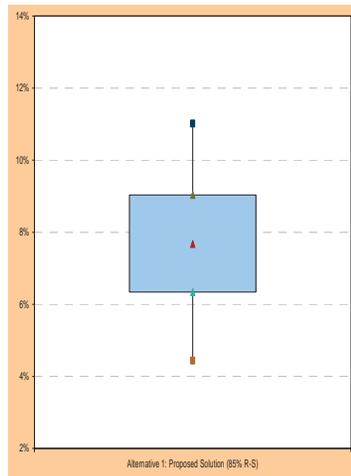
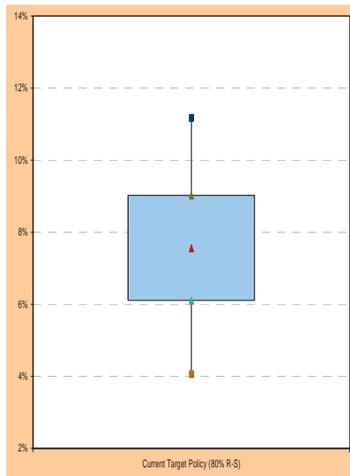
Current Target Policy (80%R-S)

Alternative 1: Proposed Solution (85%R-S)

Alternative 2: Same Risk Higher Return (91%R-S)

Alternative 3: Capped Private Market Investments (85%R-S)

Alternative 4: No Alternative Investments (60%R-S)



Time Horizon	30 Years				
	95 th	75 th	50 th	25 th	5 th
Target Allocation	11.2%	9.0%	7.6%	6.1%	4.1%

Time Horizon	30 Years				
	95 th	75 th	50 th	25 th	5 th
Alt 1	11.0%	9.0%	7.7%	6.3%	4.4%

Time Horizon	30 Years				
	95 th	75 th	50 th	25 th	5 th
Alt 2	11.7%	9.5%	8.0%	6.6%	4.5%

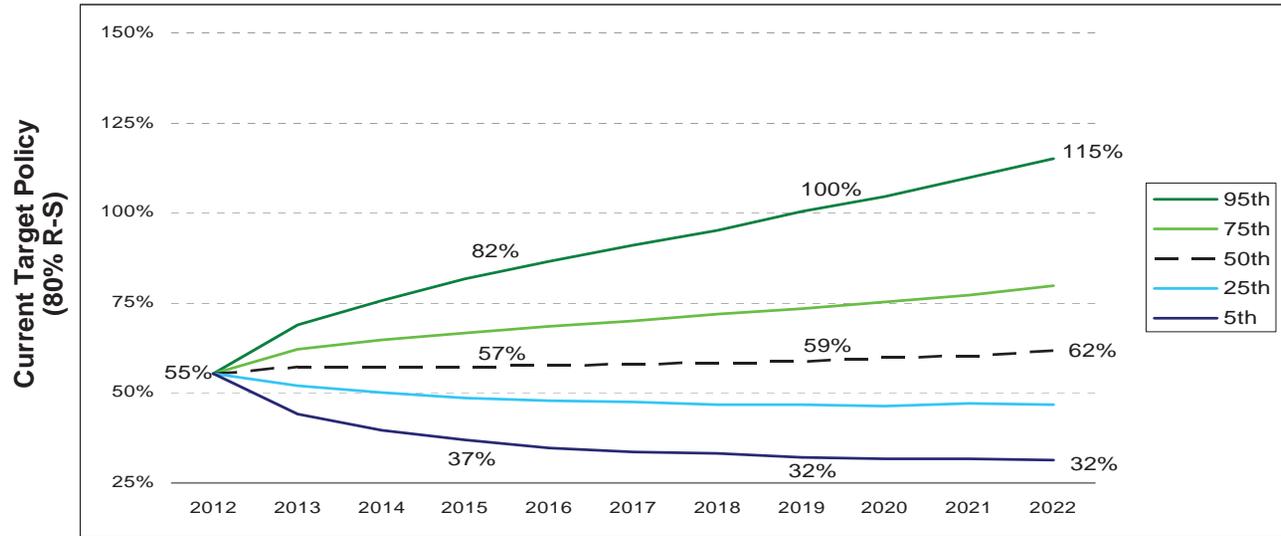
Time Horizon	30 Years				
	95 th	75 th	50 th	25 th	5 th
Alt 3	11.2%	9.0%	7.5%	6.1%	4.0%

Time Horizon	30 Years				
	95 th	75 th	50 th	25 th	5 th
Alt 4	10.5%	8.3%	6.8%	5.3%	3.2%

Asset-Liability Projection Analysis

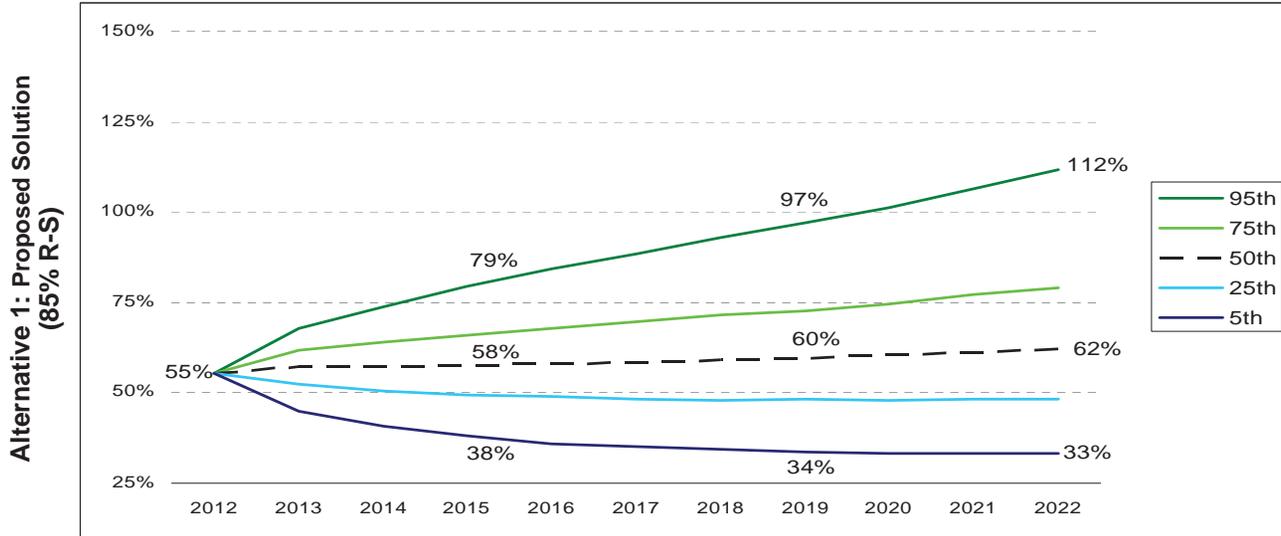
- In the following sections, we show the results of a stochastic or “Monte Carlo” asset-liability simulation with 5,000 future economic scenarios
- Asset class assumptions (expected returns, standard deviations and correlations) are incorporated in the economic model and are reflected in the returns generated for each scenario
- Our model produced 10-year projections for each of the following portfolios:
 - Current Target Allocation (80% Return-Seeking)
 - Alternative 1: Proposed Solution (85% Return-Seeking)
 - Alternative 2: Same Risk Higher Return (91% Return-Seeking)
 - Alternative 3: Capped Private Market Investments (85% Return-Seeking)
 - Alternative 4: No Alternative Investments (60% Return-Seeking)
- Results were modeled under a Annual Recommended Contribution (ARC) policy in which plan year contributions are equal to normal cost plus the 30 year amortization of the unfunded actuarial liability.
- We analyzed the following key financial measures of the plan:
 - MVA Funded Ratio (Market Value of Assets/Actuarial Liability)
 - AVA Funded Ratio (Actuarial Value of Assets/Actuarial Liability)
 - Employer + Employee Contribution Rate
 - Liquidity Needs (Net Outflow/Market Value of Assets)
 - Economic Scenario Analysis
 - Economic Cost

Projected Funded Ratio (MVA Basis); Current Target Policy (80% R-S) vs. Alternative 1: Proposed Solution (85% R-S)¹



Current Target Policy (80% R-S)

- The 50th percentile outcome (62% funded in 2022) represents the central expectation after 10 years
- The 95th percentile outcome (115% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (32% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

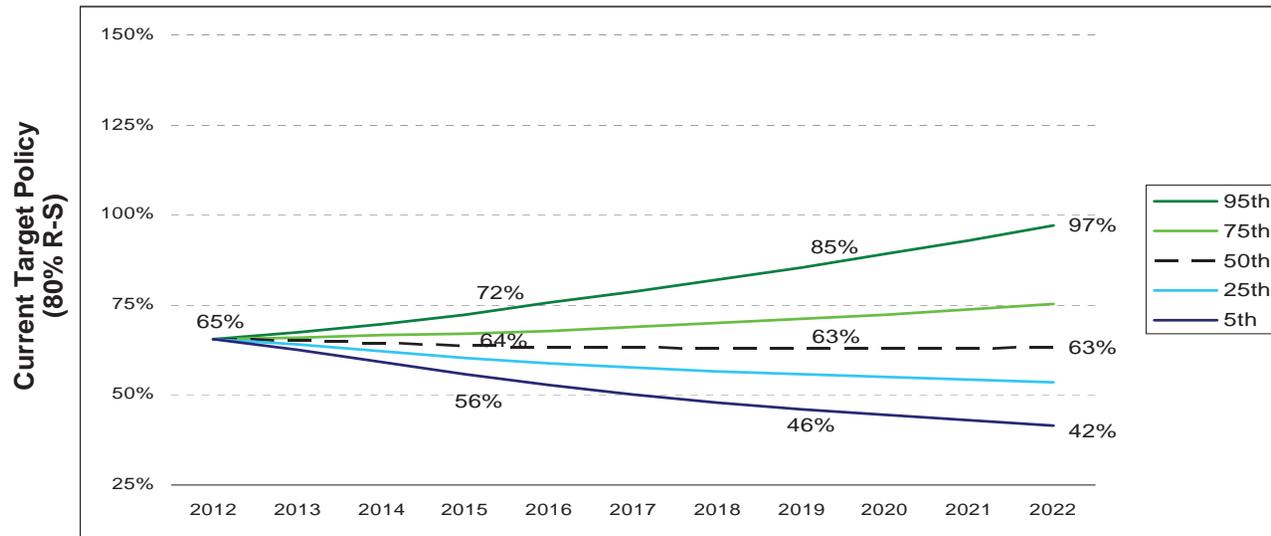


Alternative 1: Proposed Solution (85% R-S)

- The 50th percentile outcome (62% funded in 2022) represents the central expectation after 10 years
- The 95th percentile outcome (112% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (33% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

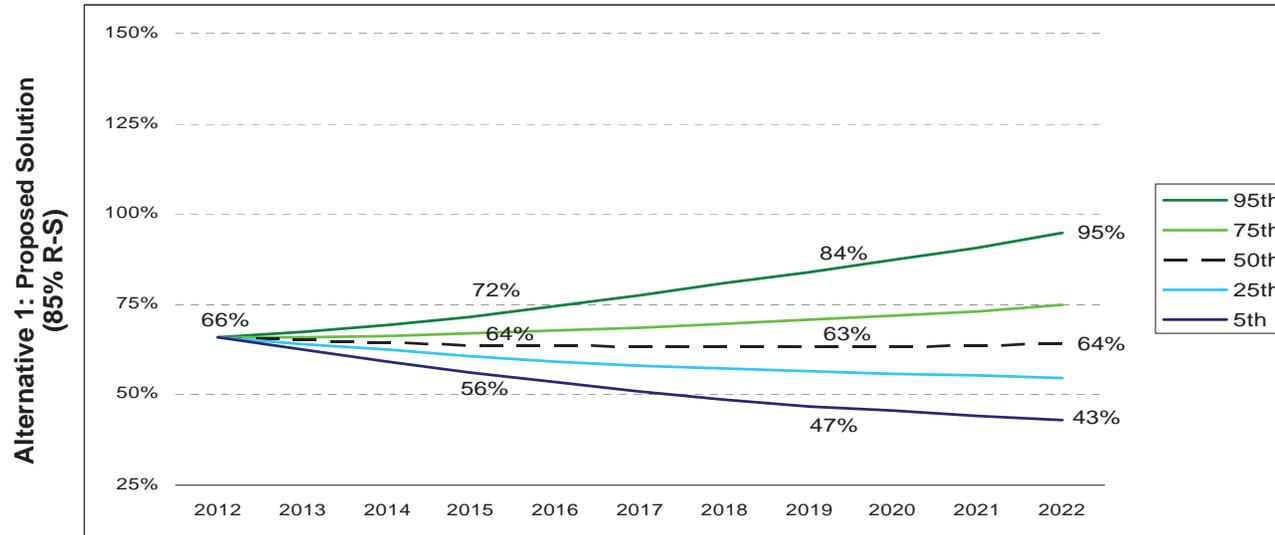
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

Projected Funded Ratio (AVA Basis); Current Target Policy (80% R-S) vs. Alternative 1: Proposed Solution (85% R-S)¹



Current Target Policy (80% R-S)

- The 50th percentile outcome (63% funded in 2022) represents the central expectation after 10 years
- The 95th percentile outcome (97% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (42% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

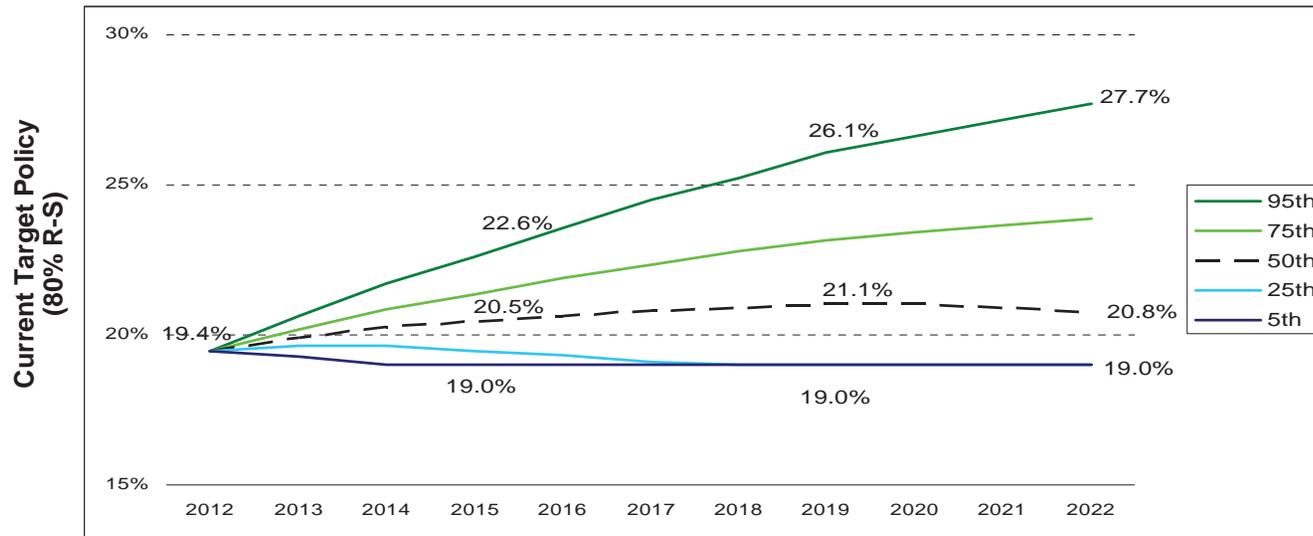


Alternative 1: Proposed Solution (85% R-S)

- The 50th percentile outcome (64% funded in 2022) represents the central expectation after 10 years
- The 95th percentile outcome (95% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (43% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

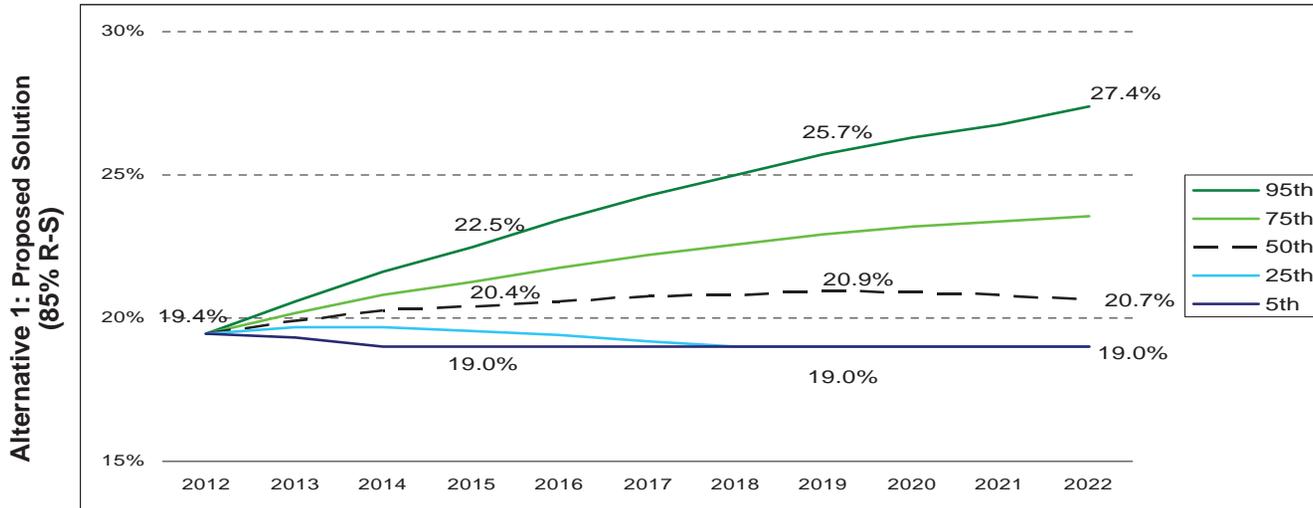
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

(ER + EE) Contribution Rate; Current Target Policy (80% R-S) vs. Alternative 1: Proposed Solution (85% R-S)¹



Current Target Policy (80% R-S)

- The 50th percentile outcome (20.8% funded in 2022) represents the central expectation after 10 years
- The 95th percentile outcome (27.7% contribution in 2022) represents potentially high contributions or very pessimistic results after 10 years
- The 5th percentile outcome (19.0% contribution in 2022) represents potentially low contributions or very optimistic results after 10 years

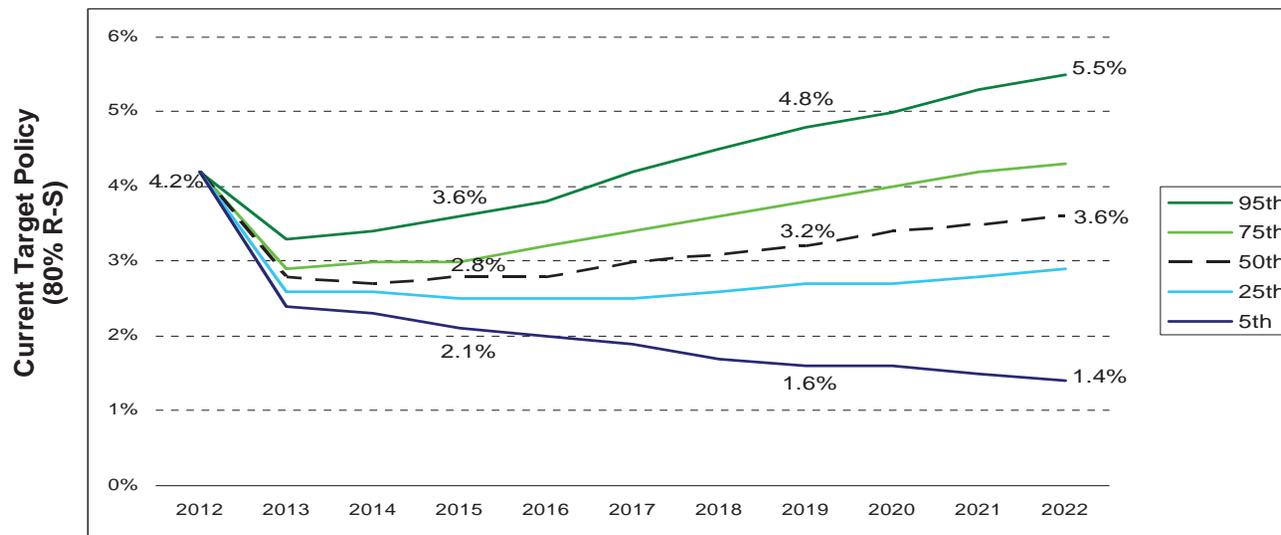


Alternative 1: Proposed Solution (85% R-S)

- The 50th percentile outcome (20.7% funded in 2022) represents the central expectation after 10 years
- The 95th percentile outcome (27.4% contribution in 2022) represents potentially high contributions or very pessimistic results after 10 years
- The 5th percentile outcome (19.0% contribution in 2022) represents potentially low contributions or very optimistic results after 10 years

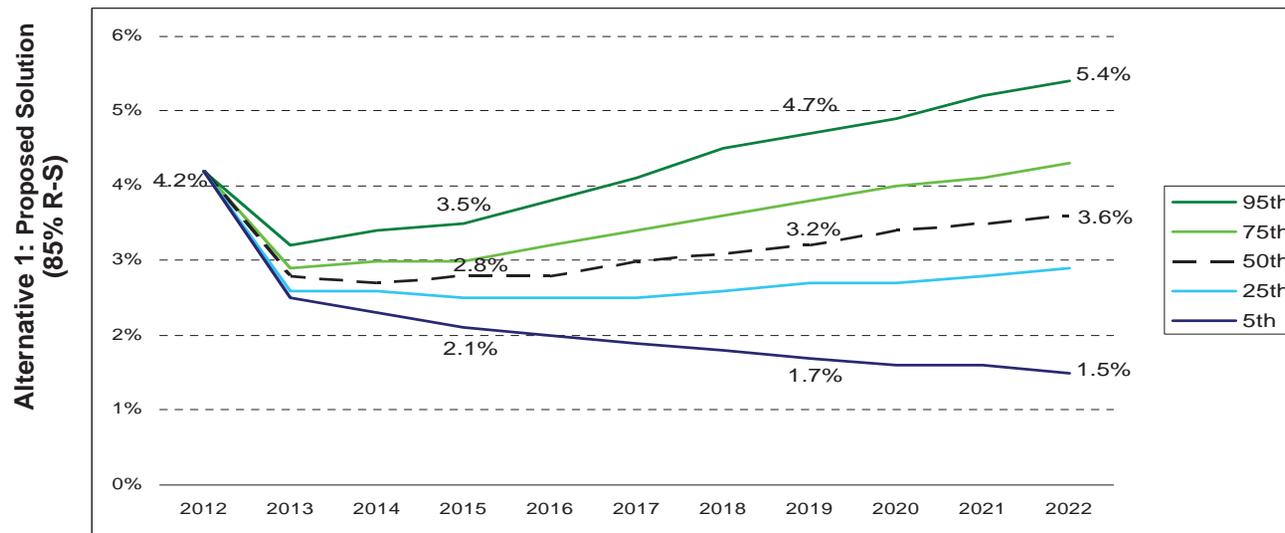
¹ Reflects an estimated funding floor of 19% of Covered Payroll. Under current statute, the employer and employee contribution rates can not decrease unless the Plan becomes 90% funded.

Liquidity Needs: Net Outflow/MV of Assets; Current Target Policy (80% R-S) vs. Alternative 1: Proposed Solution (85% R-S)



Current Target Policy (80% R-S)

- The net outflow represents the excess of benefit payments over cash contributions. It is expected that the benefit payments will exceed cash contributions each year over the next 10 years.
- The 95th percentile outcome (5.5% net outflows in 2022) represents potentially high net outflows or very pessimistic results after 10 years
- The 5th percentile outcome (1.4% net outflows in 2022) represents potentially low net outflows or very optimistic results after 10 years

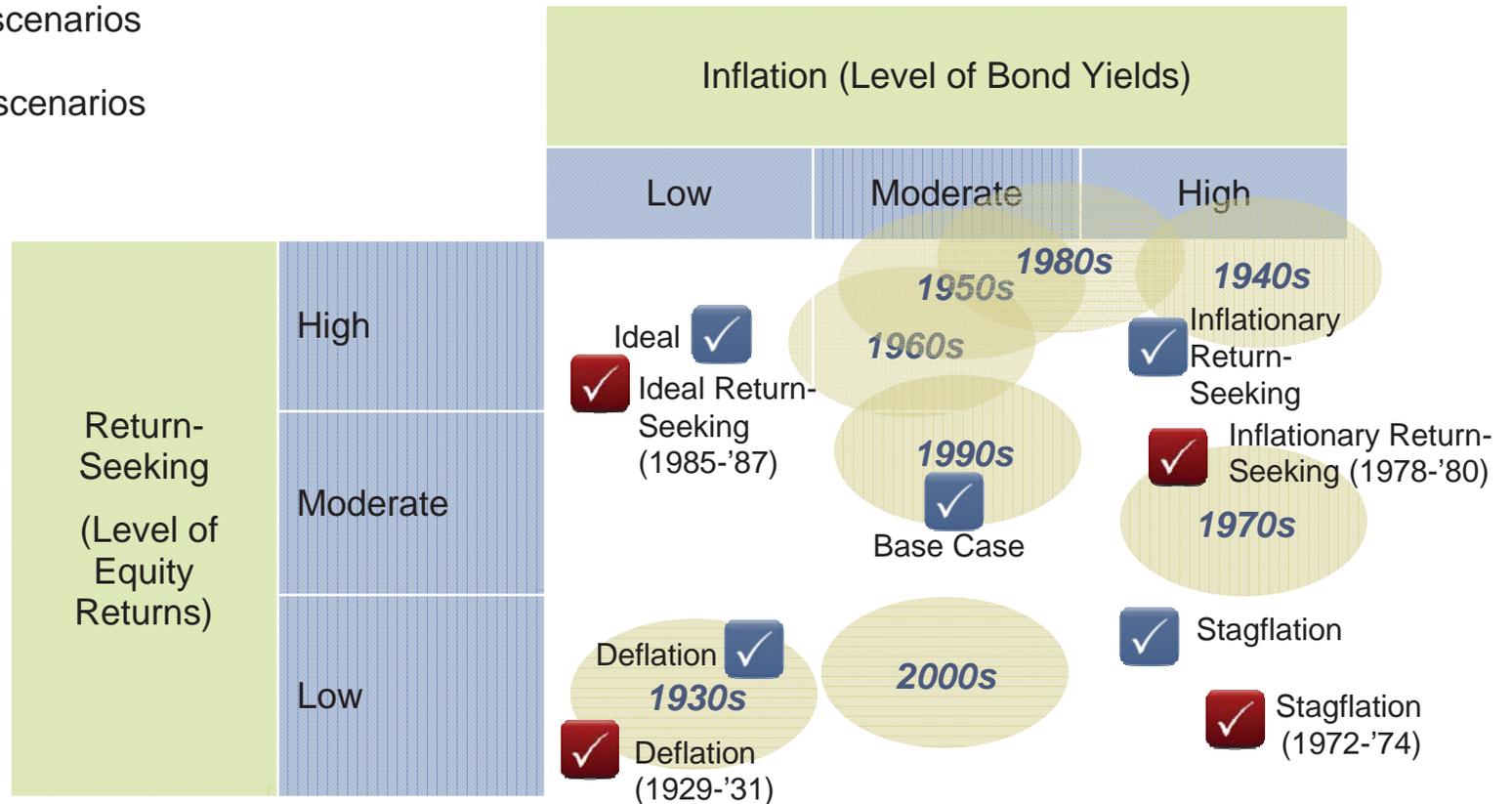


Alternative 1: Proposed Solution (85% R-S)

- The 95th percentile outcome (5.4% net outflows in 2022) represents potentially high net outflows or very pessimistic results after 10 years
- The 5th percentile outcome (1.5% net outflows in 2022) represents potentially low net outflows or very optimistic results after 10 years

Scenario Framework

- Standard scenarios
- Historical scenarios



- Five economic scenarios were modeled in this report.
- The economic scenarios vary by the average level of growth and inflation over the forecast period.
- The chart below provides historical context for the five scenarios.
- Simulations reflecting these characteristics were drawn from the total of all simulations.
- Level of Inflation was based on the average yield on 10yr Treasuries.
- Level of Growth was based on the average return on U.S. Equity.
- Simulations were then grouped into scenarios based on the deciles of inflation and growth: 1st through 3rd deciles were considered “Low”, 4th through 7th considered “Moderate”, and 8th through 10th considered “High”.

Scenario Probabilities¹ (10 Year Outlook)

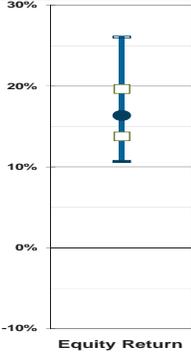
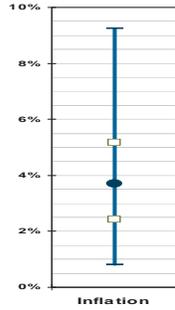
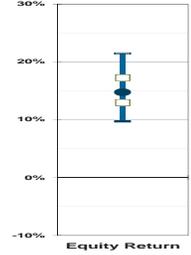
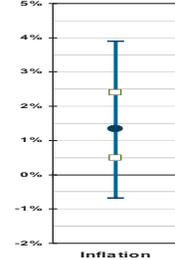
		Inflation (Level of Bond Yields)		
		Low	Moderate	High
Return-Seeking (Level of Equity Returns)	High	10%	10%	10%
	Moderate	15%	15%	10%
	Low	5%	15%	10%

¹ Approximate probabilities based on HEK 2012 Q4 Capital Market Assumptions

Scenario Analysis - 10 Years

Economic Environment		Equity Returns	Inflation	Contribution Rate (2022)	AVA Funded Ratio (2022)
Moderate Growth Moderate Inflation	<p>Central Case - World events unfold in a fashion consistent with our Global Capital Market Assumptions.</p> <p>Real Equity Return: +6.4%</p> <p>Inflation: +1.8%</p>			<p>Expected: 19.2%</p> <p>Range: 11.3% to 25.2%</p>	<p>Expected: 70%</p> <p>Range: 49% to 96%</p>
Low Growth High Inflation	<p>Fears Over High Inflation (Stagflation) - Inflation expectations take off as monetary stimulus feeds through to much higher commodity prices.</p> <p>Real Equity Return: -1.1%</p> <p>Inflation: +3.25%</p>			<p>Expected: 25.7%</p> <p>Range: 21.2% to 31.8%</p>	<p>Expected: 45%</p> <p>Range: 26% to 61%</p>
Low Growth Low Inflation	<p>Double Dip Recession (Deflation) - The global economy slips back into recession .</p> <p>Real Equity Return: -0.5%</p> <p>Inflation: +1.3%</p>			<p>Expected: 27.4%</p> <p>Range: 21.9% to 32.9%</p>	<p>Expected: 44%</p> <p>Range: 27% to 61%</p>

Scenario Analysis -10 Years (cont'd)

Economic Environment		Equity Returns	Inflation	Contribution Rate (2022)	Funded Ratio (2022)
<p>High Growth High Inflation</p>	<p>Inflation driven Return-Seeking (Inflationary Return-Seeking) – Economy grows more than expected mainly due to inflationary forces.</p> <p>Real Equity Return: +12%</p> <p>Inflation: +3.7%</p>			<p>Expected: 8.4%</p> <p>Range: 0% to 17.7%</p>	<p>Expected: 106%</p> <p>Range: 68% to 195%</p>
<p>High Growth Low Inflation</p>	<p>Blue Skies (Ideal Return-Seeking) - Pronounced cyclical upswing with world Return-Seeking above and even substantially above long term trend while inflation expectations remain contained.</p> <p>Real Equity Return: +13%</p> <p>Inflation: +1.3%</p>			<p>Expected: 6.4%</p> <p>Range: 0% to 17.1%</p>	<p>Expected: 112%</p> <p>Range: 76% to 188%</p>

Historical Scenario Analysis



Economic Environment

Portfolio Return (3 years)

Inflation (3 years)

Contribution Rate (2017)

Funded Ratio (2017)

Moderate Growth Moderate Inflation	<p>Central Case – Assume portfolio return is 7.50% and inflation is 2.75% for next 5 years.</p> <p><i>In the other scenarios below, the historical return and inflation are used for the first 3 years and the subsequent 2 years assume 7.50% asset return and 2.75% inflation</i></p>	7.50%	2.75%	20.6%	63%
Low Growth High Inflation (1972-'74)	<p>Fears Over High Inflation (Stagflation) – Combination of oil crisis and negative real growth were the prevailing conditions in the early 70's.</p>	-4.3%	8.1%	22.3%	53%
Low Growth Low Inflation (1929-'31)	<p>Depression (Deflation) – The 1930's were characterized by the downward spiral of both prices and economic growth.</p>	-17.3%	-5.2%	26.9%	48%
High Growth High Inflation (1978-'80)	<p>Inflation driven growth (Inflationary Growth) – The late 70's to the early 80's experienced continued high inflation and the economy started its recovery.</p>	15.9%	11.6%	18.0%	67%
High Growth Low Inflation (1985-'87)	<p>Blue Skies (Ideal Growth) – The mid to late 80's were the "Nirvana" of economic growth – where strong double digit returns were experienced with low to moderate inflation.</p>	28.1%	3.1%	13.6%	88%

Long-Term Economic Cost Of Plan

Long-term economic cost =

PV of cash contributions
plus
PV of funding (surplus)/shortfall

Excludes surplus in excess of 115% of Actuarial liability, and includes twice the shortfall below 50% of Actuarial liability, on a market value basis¹

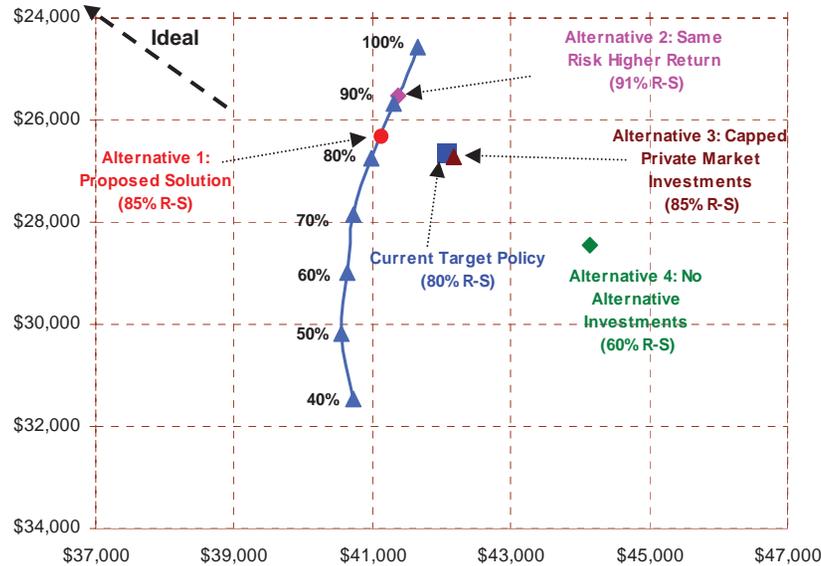
- Discounted present value of cash contributions is the main component of true long-term economic cost, but it does not reflect the plan’s funded status at the end of the forecast period (i.e. funded shortfall or surplus)
 - Surplus assets are valuable since they will lower future contributions
 - Unfunded liabilities are costs that will be recognized over future years
- Currently, the unfunded liability is about \$19.5 billion, on a market value basis, and annual normal cost is about \$941 million.

¹ 115% of Actuarial liability incorporates past service liability plus the present value of future normal costs. 50% of Actuarial liability is approximately 5 years of expected benefit payments.

Economic Cost (\$millions)

Cost/Risk Analysis

50th Percentile Expected



95th Percentile Risk

100% Return-Seeking	\$24,555.0	\$41,643.4
Alternative 2: Same Risk Higher Return (91% R-S)	\$25,514.7	\$41,369.4
90% Return-Seeking	\$25,671.3	\$41,296.6
80% Return-Seeking	\$26,758.6	\$40,986.7
70% Return-Seeking	\$27,839.8	\$40,733.3
60% Return-Seeking	\$28,992.0	\$40,635.6
50% Return-Seeking	\$30,192.6	\$40,558.0
40% Return-Seeking	\$31,451.2	\$40,728.0
Current Target Policy (80% R-S)	\$26,621.5	\$42,075.7
Alternative 1: Proposed Solution (85% R-S)	\$26,318.9	\$41,124.0
Alternative 3: Capped Private Market Investments (85% R-S)	\$26,714.0	\$42,183.6
Alternative 4: No Alternative Investments (60% R-S)	\$28,458.6	\$44,149.1

Economic Cost	
Cost	Risk
\$24,555.0	\$41,643.4
\$25,514.7	\$41,369.4
\$25,671.3	\$41,296.6
\$26,758.6	\$40,986.7
\$27,839.8	\$40,733.3
\$28,992.0	\$40,635.6
\$30,192.6	\$40,558.0
\$31,451.2	\$40,728.0
\$26,621.5	\$42,075.7
\$26,318.9	\$41,124.0
\$26,714.0	\$42,183.6
\$28,458.6	\$44,149.1

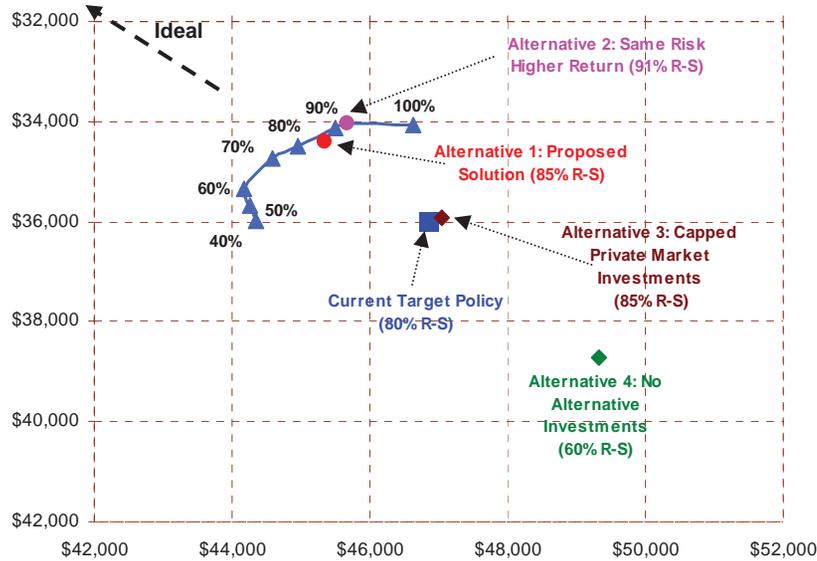
Observations

- Alternatives 1 and 2 portfolio strategies appear more efficient than the Current Target portfolio in economic terms
- By moving to the Alternative 1 portfolio, the long term economic cost is expected to decrease by \$302.6M during expected economic outcomes and by \$951.7M during worst outcomes.

Economic Cost (\$millions)

Cost/Risk Analysis (Stagflation Scenarios)

50th Percentile Expected



95th Percentile Risk

100% Return-Seeking		
Alternative 2: Same Risk Higher Return (91% R-S)		
90% Return-Seeking		
80% Return-Seeking		
70% Return-Seeking		
60% Return-Seeking		
50% Return-Seeking		
40% Return-Seeking		
Current Target Policy (80% R-S)		
Alternative 1: Proposed Solution (85% R-S)		
Alternative 3: Capped Private Market Investments (85% R-S)		
Alternative 4: No Alternative Investments (60% R-S)		

Economic Cost	
Cost	Risk
\$34,064.4	\$46,634.5
\$34,045.6	\$45,670.6
\$34,116.6	\$45,500.2
\$34,504.7	\$44,966.0
\$34,730.7	\$44,576.5
\$35,342.9	\$44,167.8
\$35,686.0	\$44,262.3
\$35,974.8	\$44,339.0
\$35,982.1	\$46,849.3
\$34,405.0	\$45,347.2
\$35,918.5	\$47,043.7
\$38,730.5	\$49,324.1

Observations

- In a stagflation environment, the long term economic costs are higher due to the unfavorable market returns.
- Higher risk portfolios do not reward investors in stagflation environments.
- By moving to the Alternative 1 portfolio, the long term economic cost is expected to decrease by \$1,577.1M during expected economic outcomes and by \$1,502.1M during worst outcomes.

Present Value of Contributions (\$millions)

Cost/Risk Analysis

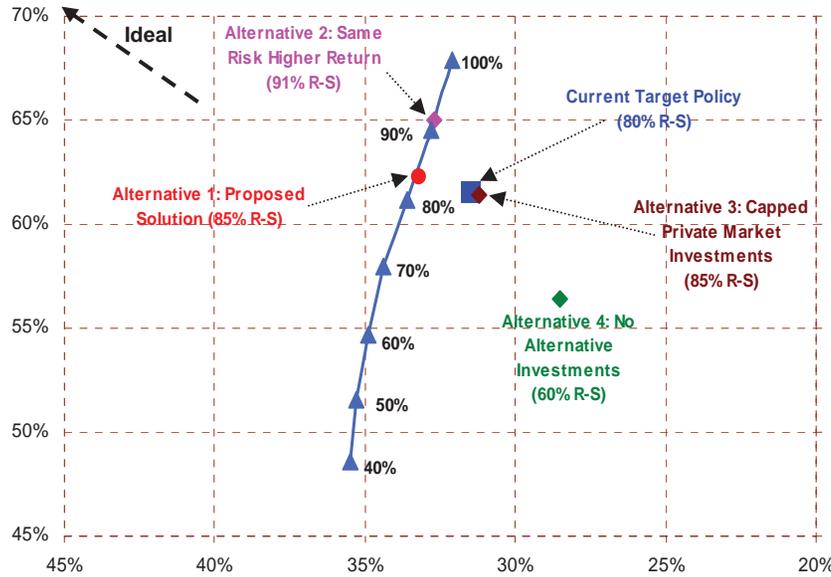


Observations

- Alternative 2 portfolio strategy appears more efficient than the Current Target portfolio in contribution terms
- By moving to the Alternative 1 portfolio, the long term contributions is expected to decrease by \$43.3M during expected economic outcomes and by \$93.8M during worst outcomes.

MVA Funded Ratio Risk/Reward Analysis

50th Percentile Expected



5th Percentile Risk

- 100% Return-Seeking
- Alternative 2: Same Risk Higher Return (91% R-S)
- 90% Return-Seeking
- 80% Return-Seeking
- 70% Return-Seeking
- 60% Return-Seeking
- 50% Return-Seeking
- 40% Return-Seeking
- Current Target Policy (80% R-S)
- Alternative 1: Proposed Solution (85% R-S)
- Alternative 3: Capped Private Market Investments (85% R-S)
- Alternative 4: No Alternative Investments (60% R-S)

MVA Funded Ratio	
Cost	Risk
68%	32%
65%	33%
65%	33%
61%	34%
58%	34%
55%	35%
52%	35%
49%	36%
62%	32%
62%	33%
61%	31%
56%	29%

Observations

- Alternatives 1 and 2 appear to have higher MVA funded ratios in both expected and worst outcomes
- Low funded ratios may be supported by higher contributions

Observations

- Alternative 1 provides a higher level of expected return at a lower level of risk compared to the Current Target.
- Differences in projected funded status during the projected 10 year period are minor among the recommended alternatives:
 - Current Target Policy (80% R-S) MVA funded ratio is expected to increase from 55% to 62% over the next 10 years
 - Alternative 1: Proposed Solution (85% R-S) MVA funded ratio is expected to increase from 55% to 62% over the next 10 years
- Investing in a basic portfolio (Alternative 4) with no alternative investments and a 60/40 stock/bond split results in a funded ratio that goes from 55% to 56%.
- During the 30-year period, illustrated in the appendix, both the Current and Alternative 1 allocations get the System towards full funding (93% for 50th percentile of Current; 94% for 50th percentile of recommended both based on actuarial value of assets).



Asset Allocation Recommendations

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Current vs. Proposed Asset Allocation Target

Asset Class	Current Target	Proposed Target	Change from Current Target
Global Equity:	38.5%	40%	+1.5%
• U.S. Stock (lg. + small-cap)	14	31%*	+1%
• Non-U.S. Stock – Developed	8		
• Emerging Markets Equities	8		
• Private Equity	8.5		
Real Assets:	6%	8%	+2%
• Commodities	3	3*	-- --
• Real Estate	3	5	+2%
Opportunistic:	15%	18%	+3%
• GTAA/Risk Parity	10	10*	-- --
• Hedge Funds (low beta)	5	8*	+3%
Diversified Credit:	20.5%	19%	-1.5%
• Mixed Credit (HY, Loans, Structured)	6	6*	-- --
• Emerging Market Debt	6	6*	-- --
• Private Debt	8.5	7*	-1.5%
Conservative Fixed Income:	20%	15%	-5%
▪ Core Fixed Income (+IG Credit)	12	7%	-5%
▪ Global Fixed Income (hedge)	1	3	+2%
▪ Short Duration	4	3	-1%
▪ Cash (net of overlays)	3	2	-1%

*Asset classes in which hedge funds can be used, up to a maximum of 15% across the entire portfolio

Key Differences Between Current and Proposed Asset Allocation

Global Equities

- Slight increase in overall liquid equity target (30% to 31%)
- Removal of explicit targets to large/small cap, U.S./non-U.S. and emerging/developed. Overall benchmark is broadly diversified – staff has latitude to create program to reflect that
- Removed emerging markets overweight in policy, but allow for it tactically

Real Assets

- Increase in weighting to reflect higher real estate target of 5% (from 3%)

Opportunistic

- Increase in hedge fund allocation from 5% to 8%
- Intention of dedicated hedge fund component is low beta exposure and diversification
- Remove any beta overlay on hedge fund component (cease portable alpha strategy)
- Allow use of hedge funds in long-only components up to cap of 15% of total assets (including dedicated Hedge Fund component)

Diversified Credit

- Combine Private Debt and Opportunistic components
- Allow Emerging Market Debt latitude on currency denomination of debt (mix of dollar and local debt)
- Structured credit (CLOs, ABS) included in new category, Mixed Credit, along with high yield and bank loans

Conservative Fixed Income

- Increase Global Fixed Income (hedged) allocation from 1% to 3%
- Split cash and short duration allocations, and reduce cash target to 2%

Are Alternatives Still That?

- One likely area of discussion in your current asset allocation is the allocation to alternatives.
- For sake of discussion, we will define alternatives as securities with one or more of the following:
1) limited liquidity, 2) very high trading turnover, or 3) material use of derivatives. In your portfolio it would include:

Private equity
Hedge Funds
Commodities

Private debt and Opportunistic credit
Real Estate

- Currently this is 28% of your assets (excluding portable alpha). Including hedge fund exposure through portable alpha raises that to 43%.
- We are recommending it change to a target of 32% with the latitude to go as high as 39% if hedge funds are fully utilized to the plan-wide limit of 15%.
- What we would not include in that definition would be:
 - Global stocks
 - Core Fixed income
 - Global bonds
 - High yield, bank loans and other credit
 - Emerging markets debt
 - GTAA managers
- Among large public funds, the allocations to the major alternatives components continues to grow aggressively. According to a NASRA survey, alternative allocations for large public plans now average 20.5% (including real estate) while 10 years ago it would have been roughly 8%.

Source: <http://www.publicfundsurvey.org/publicfundsurvey/summaryoffindings.html>

Qualities for Success with Alternative Investing

- Long-term commitment to asset class
- Access to top-tier managers
- Appropriate staffing/external support/processes:
 - Manager due diligence
 - Ongoing monitoring
 - Term/legal negotiation
 - Operational due diligence
- Ability/willingness to move with market opportunities (explicitly or through manager discretion)
- Sufficient liquidity

Using Hedge Funds in Traditional Asset Classes

The vast majority of securities utilized by hedge funds are traditional stocks and bonds. What is different is the way in which they are utilized:

- Focus on alpha, not beta
- Extensive use of short, as well as long positions
- Comfort with derivatives and leverage

Certainly other types of securities are used by hedge fund managers, but at their basic essence they are broad latitude active managers within the liquid stock and bond markets.

An Alternate Approach:

- Recognize the common market exposure elements in those hedge fund strategies that persistently exhibit beta by placing them in the asset class in which that beta resides (example: long/short equity hedge funds go into global equity component).
- Create a modest dedicated allocation for those strategies with multiple betas or no market betas.
- Set limitations across the Total Fund to ensure hedge fund strategies do not represent an unacceptably high percentage of assets.

Proposal

- Adopt an 8% allocation to Hedge Funds with a low beta structure.
- Allow up to an additional 7% of the Total Fund to be invested in hedge funds in the equity, real return, credit opportunities, and GTAA categories. Their use would be at the discretion of Staff and based on their relative attractiveness against long-only strategies.
- Set a Total Fund limit to hedge fund strategies at 15%.

Does This Change Our Risk Profile?

Factors Decreasing Risk:

- Removal of overlays that could cause Fund's effective exposure to be > 100%
- Lower expected standard deviation of returns (based on HEK assumptions)
- Removal of explicit overweight to emerging markets – a very volatile asset class
- Allowance to hedge or not hedge emerging markets debt reduces currency risk
- Slight improvement in the Fund's liquidity profile
- Much tighter rebalancing ranges

Factors Increasing Risk:

- Less dedicated cash allocation means more attention to liquidity needs – Staff has latitude to hold more and overlay with futures
- Latitude for staff to vary U.S./non-U.S. equity exposure creates potential “timing” risks

Bottom Line: While the proposed portfolio does increase the allocation to alternatives compared to the current target, they are predominantly diversifying, low beta exposures that serve to reduce volatility at a similar level of expected returns. Volatility and downside risk are lower. When factoring our recommendation to remove the portable alpha program, the proposed solution represents a significant reduction in alternative exposure.

Peer Comparisons

We do not recommend asset allocation decisions based upon peer practices

- Objectives and circumstances differ among funds
- Differences in risk tolerance, beliefs in active management, resources, etc.

However, it is often useful to understand how your plan's asset allocation is similar to, or differs from, those of your peers

- On the following slide, we compare the System's recommended asset allocation targets to peers

Recommended Asset Allocation vs. Peers

Asset Class	South Carolina – Proposed	RV Kuhns Public > \$20 Billion Universe	Q3 2012 BoNY/Mellon Universe (Median Asset Allocation) – Public Funds Greater than \$1 Billion	Q3 2012 BoNY/Mellon Universe (Median Asset Allocation) – E&Fs Greater than \$1 Billion
Global Public Equity	36%	46%	43%	24%
Global Fixed Income	27%	2	32	14
Alternatives*	32%	28	23	58
Cash Equivalents / Other	5%	1	2	4
Total	100.0%	100.0%	100.0%	100.0%

- Large public plans, as well as endowments and foundations, tend to have larger allocations to alternative investments. While RSIC’s alternatives allocation is higher than peer averages, it is not meaningfully different. What is different is its current use of credit strategies rather than traditional equity.

* Alternatives category generally includes real estate, private equity, hedge funds, commodities

Liquidity/Beta Matrix

		Liquidity	
		High	Low
Market Sensitivity (Beta)	High	Primarily Growth Assets Market Participation Upside Return Potential Premium Cashability ----- <i>Market Risk</i> <i>Cashability Loss</i>	Primarily Long-Term Assets Appropriate Return to capture Illiquidity Premium Skill-Based ----- <i>Market/Vehicle Risk</i> <i>Locked-In Assets</i>
	Low	Primarily Risk-Reducing Assets Satisfy Immediate Cash Needs Downside Protection ----- <i>Lower Expected Returns</i> <i>Limited Upside Potential</i>	Primarily Diversifying Assets Market Defense Long-Term Diversification Potential ----- <i>Locked-In Assets</i>

A portfolio's assets actually lie along a wide spectrum of liquidity levels and time horizons. However, over a given horizon, a simple "liquidity/beta matrix" might classify assets as being:

- Cash-like with lower returns and less beta-sensitivity
- Beta-sensitive but potentially liquid through their "cashability" (publicly listed equities, for example)
- Illiquid but beta sensitive
- Illiquid and beta insensitive

For this purposes, market sensitivity (beta) is defined relative to equities

In the matrix above, positive features are listed first, while the negative aspects are cited below in italics

Liquidity/Beta Matrix – Proposed Solution

		Liquidity		
		High	Medium	Low
Market Sensitivity (Beta)	High	Global Public Equity [31%]	Global Tactical Asset Allocation (GTAA) High Yield Hedge Funds (High beta) [16%]	Private Equity Broad Real Estate [13.5%]
	Medium	Commodities Core Fixed Income Global Bonds (Hedged) [13%]	Emerging Market Debt Bank Loans [10%]	Private Debt/Opportunistic Credit [7.5%]
	Low	Short Duration Cash [5%]	Hedge Funds (Low beta) [4%]	

- While the allocation to the most liquid and least sensitive asset class (cash and short-term bonds), is very low, the proposed portfolio still retains a decent allocation to highly liquid assets (49%).
 - As illustrated earlier, our median expected net outflow is expected to rise from 2.8% to 3.6%.
 - Only 21% of assets would be in the least liquid private market investments.
1. In Mixed Credit category, 2% target to High Yield, 4% target to Bank Loans, and tactical ability to invest in structured credit.
 2. Hedge Funds Recommended Allocation split equally between low beta (part of hedge fund) and high beta (part of equity/fixed income) categories.



Benchmark and Rebalancing Recommendations

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Purpose of Benchmarks

- The purpose of benchmarks is to provide for the comparison of actual fund returns relative to appropriate policy returns and
 - To determine successes and failures and identify the decisions that led to them
 - Common types of benchmarks used
 - Absolute
 - Manager universe
 - Broad market
 - Peer universe
 - Style-specific
 - Factor-model-based
 - Returns-based
 - Custom security-based
- } Appropriate for most marketable securities

Properties of a Valid Benchmark

- The CFA Institute identified several criteria to describe an appropriate benchmark for measuring performance:
 - Specified in advance
 - Appropriate
 - Measurable
 - Unambiguous
 - Reflective of current investment options
 - Owned
 - Investable
- Hewitt EnnisKnupp advocates using the broadest possible representation of the opportunity set at the asset class level
- Individual manager benchmarks should be reflective of the manager's investment style and opportunity set

Recommended Asset Class Benchmarks

Asset Class	Current Benchmark	Recommended Benchmark
Global Public Equity	Blend of underlying sub-asset class benchmarks	MSCI All-Country World Index IMI
Private Equity	80% Russell 3000 / 20% MSCI EAFE + 300 bps, on a 3-month lag	Primary Benchmark: 80% Russell 3000/20% MSCI EAFE + 300 basis points Secondary Benchmark: Vintage year weighted benchmark
High Yield Debt	Barclays Capital High Yield	BofA/Merrill Lynch High Yield Master II Constrained Index
Bank Loans	S&P/LSTA Leveraged Loan Index	S&P/LSTA Leveraged Loan Index
Emerging Market Debt	50% JP Morgan EMBI Global / 50% JP Morgan GBI-EM Global	50% JP Morgan EMBI Global Diversified (US Dollar denominated) / 50% JP Morgan GBI-EM Global Diversified (local currency denominated)
Private Debt and Credit Opportunities	Equal Blend of Barclays High Yield, S&P/LSTA Leveraged Loan and Barclays MBS Indices	Primary Benchmark: Blend of Barclays High Yield, S&P/LSTA Leveraged Loan and Barclays MBS Indices Secondary Benchmark: Blend of underlying strategy benchmarks
Broad Real Estate	NCREIF	NCREIF Open-end Diversified Core (ODCE) Index + 75 basis points
Commodities	Dow Jones-UBS Commodity Index	Dow Jones-UBS Commodity Index
Hedge Funds	HFRX Global Hedge Fund Index	HFRI Fund Weighted Composite Index
Global Tactical Asset Allocation (GTAA)	50% MSCI World / 50% S&P/Citi WGBI	50% MSCI World / 50% S&P/Citi WGBI
Core US Fixed Income	Barclays US Aggregate Bond Index	Barclays US Aggregate Bond Index
Global Fixed Income (Hedged)	Barclays Global Aggregate Bond Index	Barclays Global Aggregate Bond Index (Hedged)
Short Duration	ML US Treasuries 0-3 Year Index	Barclays 1-3 Year Government/Credit Index
Cash Equivalents	90 Day Treasury Bills	Merrill Lynch (or Citigroup) 3-Month T-Bill

Recommended Asset Class Benchmarks (cont'd)

Asset Class	Description	Reasons for Change
Global Public Equity	MSCI All-Country World Index IMI represents both domestic and international equities which includes developed and emerging market large, mid and small caps.	Broad benchmark that covers 99% of the investable global equity market
Private Equity	Primary: Public Equity Market + Liquidity Premium current benchmark may be acceptable. 300bps liquidity premium is reasonable Secondary: Thomson Venture Economics Vintage Year measures performance based on a universe of funds aggregated by vintage year	No change necessary. Unbiased measure that reflects true market conditions (unsmoothed & not appraisal based) Private equity performance tends to be highly correlated to vintage year. Comparing funds to vintage year benchmarks may be more meaningful when considering the “j-curve effect”
High Yield Debt	BofA/Merrill Lynch High Yield Master II Constrained Index is a broad measure of high yield issues. Each issue is capped at 2% of the index. Minimum one year maturity and \$100 million par value outstanding.	Broader measure than Barclays. The constrained version of the index caps each issue at 2%. This prevents “fallen angels” from skewing the index which is more representative of how high yield is managed.
Broad Real Estate	NCREIF ODCE Index consists of a market weighted composite of up to 30 open-ended comingled real estate funds that follow a core diversified strategy. May contain up to 20% non-operating properties and up to 40% leverage.	Better representative of a broad real estate program with up to 20% in non-operating properties and leverage. NCREIF only has operating properties and no leverage. 75 basis point premium reflects expectation for higher returns
Hedge Funds	HFRX Global Hedge Fund Index designed to represent the broad hedge fund universe. Includes funds on an asset weighted basis	HFRX excludes all hedge funds currently closed to new monies, whereas HFRI includes these Funds. It is also equal weighted.
Global Fixed Income (Hedged)	Barclays Global Aggregate Bond Index (Hedged) is the broadest measure of global bonds, with all local currency exposure hedged back to USD. To qualify for inclusion, all foreign bond exposure must be fully hedgeable.	The hedged version of the index is needed to reflect the fully hedged currency positions of the recommended allocation.

Rebalancing

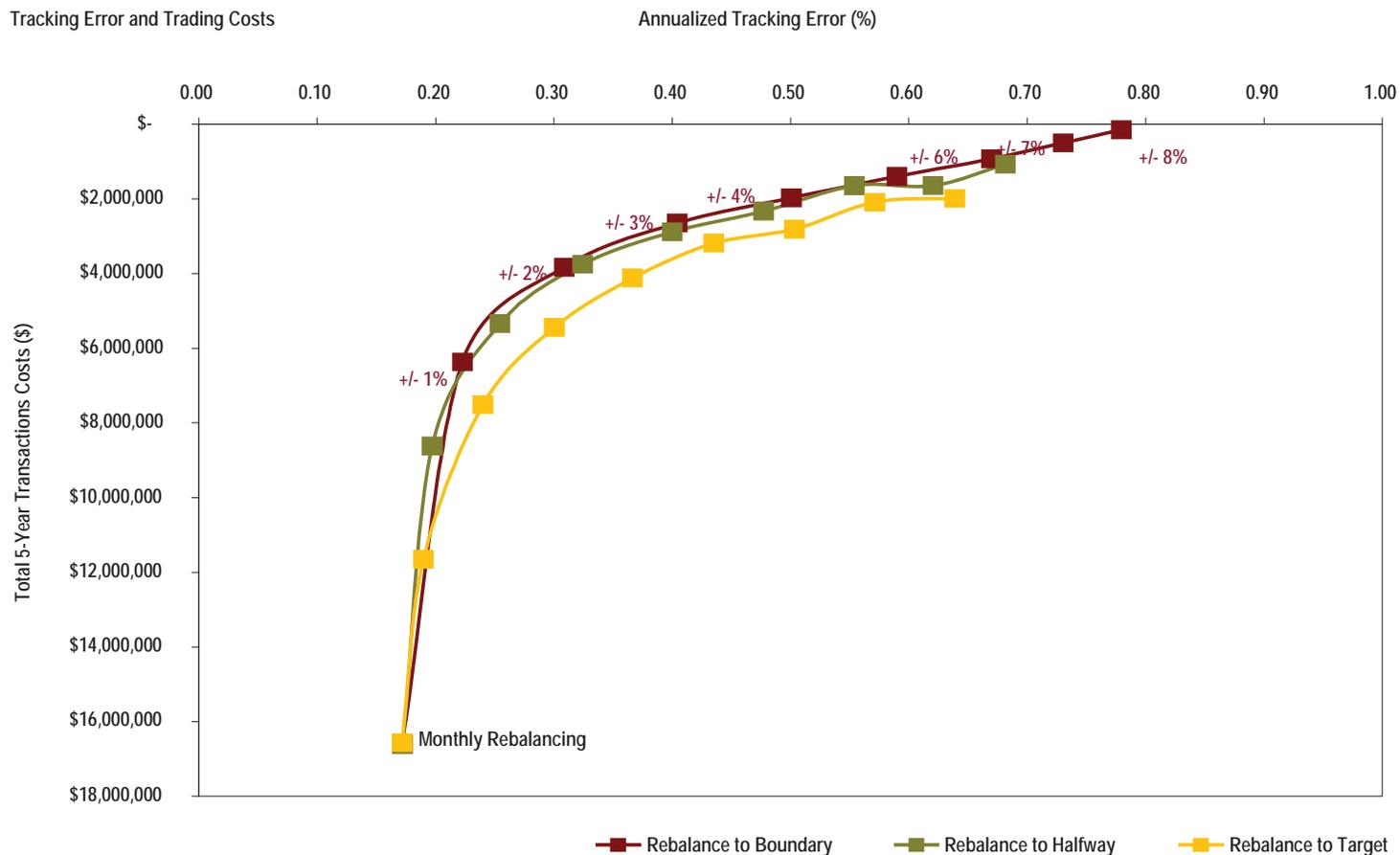
- Rebalancing is an important risk control mechanism
 - Ensures that the Fund's actual asset allocation and risk posture remains in conformance with the Commission's stated target asset allocation
- Given that the primary goal of a rebalancing program is to control risk, Hewitt EnnisKnupp recommends rebalancing whenever an asset class deviates materially from its target, as opposed to rebalancing on a calendar (monthly or quarterly) basis
 - We recommend establishing ranges for each asset class and rebalancing whenever an asset class falls outside the range
 - We generally favor more narrow ranges
 - We are comfortable with some tactical asset shifts within allowable ranges
- The goal of a good rebalancing program is to strike a balance between tracking error risk and transaction costs
 - Allowing a portfolio to drift meaningfully away from its target asset allocation will result in higher tracking error (relative to the target asset allocation)
 - Rebalancing frequently or conducting large rebalancing moves can result in higher transaction costs

Evaluating the Trade-Off between Tracking Error and Transaction Cost

- Conducted Monte Carlo simulations to analyze the trade-off between tracking error and transaction costs
 - Based on a simple two asset class model: equities (risky assets) and bonds (non-risky assets)
 - Sample Model analysis based on Fund market value (\$4.8 bn) and approved mix between return-seeking / risky and non-risky / risk-mitigating assets (78/22)
 - One-way transaction costs: 37 bps for equities and 25 bps for bonds
 - Simulation based on 10,000 simulations of monthly returns over 5 years based on HEK capital market assumptions
- Evaluate trade-off between tracking error and transaction costs
 - Assume rebalancing occurs between the two asset classes when allocation falls outside of pre-defined, fixed bands
 - Model different rebalancing bands / ranges around asset class target (for instance, +/- 3 percentage points around asset class target)
 - Assess rebalancing under three scenarios:
 - Rebalancing to target asset allocation
 - Rebalancing to boundary (or end-point of range)
 - Rebalancing to mid-point (or half way) between target and boundary

Rebalancing Results: Tracking Error vs. Transaction Cost

- The chart below shows the trade-off between transaction costs (vertical axis) and tracking error (horizontal axis):



Rebalancing Recommendations

- We generally recommend:
 - Establishing a range of +/- 3 percentage points around liquid and smaller asset classes (for very large asset classes, such as global equity, consider a range of +/-6)
 - Rebalancing transactions should be initiated when asset class weights falls outside the range to bring actual weights within the approved range
 - Monitor allocations on a regular basis and utilize ongoing cash flows, physical trades between asset classes, or synthetic transactions to rebalance the portfolio
- In times of market stress, such as during the credit crisis, it is conceivable that actual allocation to an asset class may fall outside of rebalancing range
 - Transaction costs in such environment may be prohibitive
 - Given that illiquid asset classes may not be fairly valued, asset class deviations may be misstated
 - In such instances, we recommend that deviations be reported to the Commission with a subjective assessment of circumstances and a recommended course of action (for instance, use of a synthetic rebalancing strategy)
- To control risk while allowing Staff to exercise some tactical latitude, we have proposed asymmetric ranges for two key asset classes – Global Equity (target 40%, range: 30% to 45%) and Conservative Fixed Income (target: 15%,range; 10% to 25%)

Recommended Rebalancing Ranges

Asset Class	Strategic Asset Allocation	Rebalancing Ranges
Total Global Equity	40%	30-45%
Global Public Equity	31	25 – 37%
Private Equity	9	6 – 12%
Mixed Credit	6	3 – 9%
Emerging Market Debt	6	3 – 9%
Private Debt	7	4 – 10%
Broad Real Estate	5	2 – 8%
Commodities	3	0 – 6%
Hedge Fund*	8	5 – 11%
Global Tactical Asset Allocation (GTAA)	10	7 – 13%
Total Conservative Fixed Income	15%	10-25%
Core US Fixed Income	7	4 – 10%
Global Fixed Income (Hedged)	3	0 – 6%
Short Term	3	0 – 6%
Cash Equivalents	2	0 – 5%

*As a dedicated allocation, we recommend an 8% target to hedge funds. Across the entire fund we propose a 15% cap.

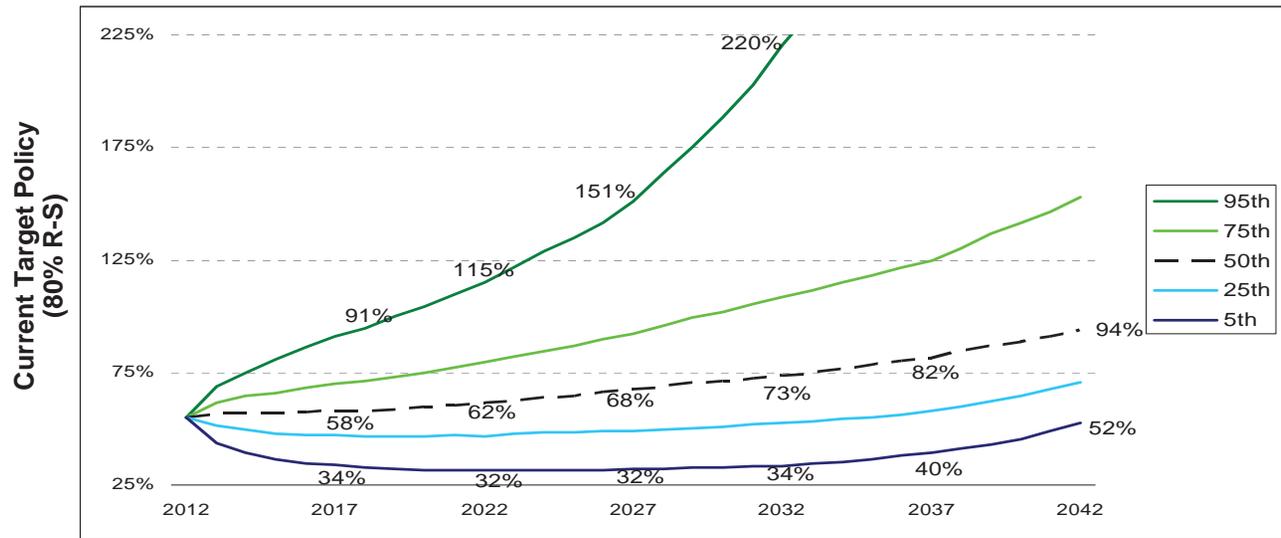
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Appendix:
30 Year Projection: Current vs. Alternative 1
Current Target vs. Alternative 2 and Alternative 4

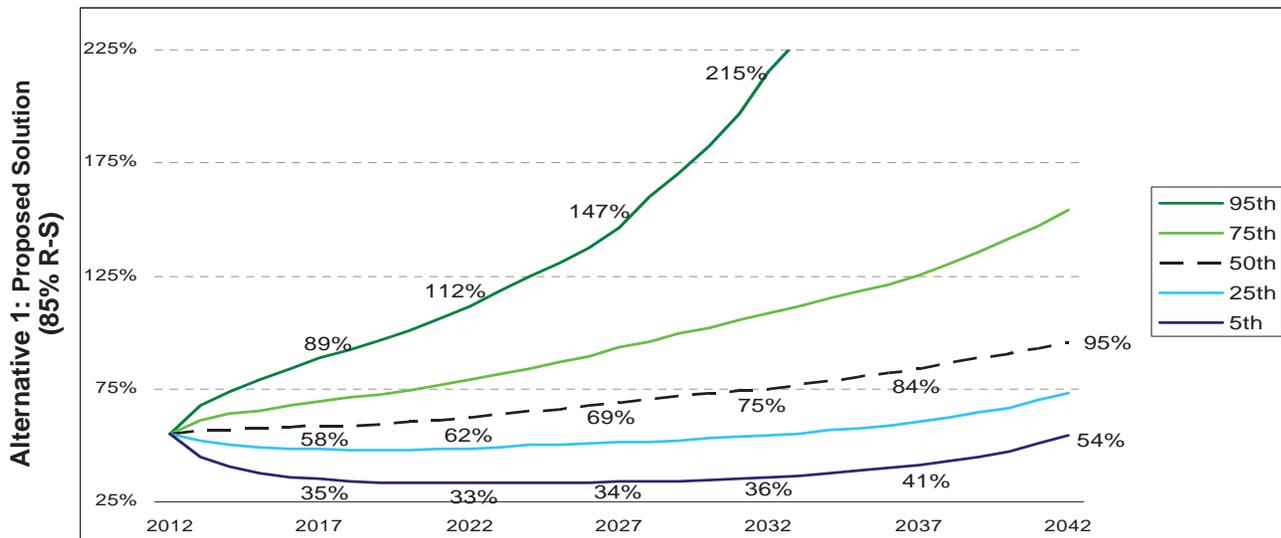
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Projected Funded Ratio (MVA Basis); Current Target Policy (80% R-S) vs. Alternative 1: Proposed Solution (85% R-S)¹



Current Target Policy (80% R-S)

- The 50th percentile outcome (94% funded in 2042) represents the central expectation after 10 years
- The 95th percentile outcome (524% funded in 2042) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (52% funded in 2042) represents potentially low funded ratios or very pessimistic results after 10 years

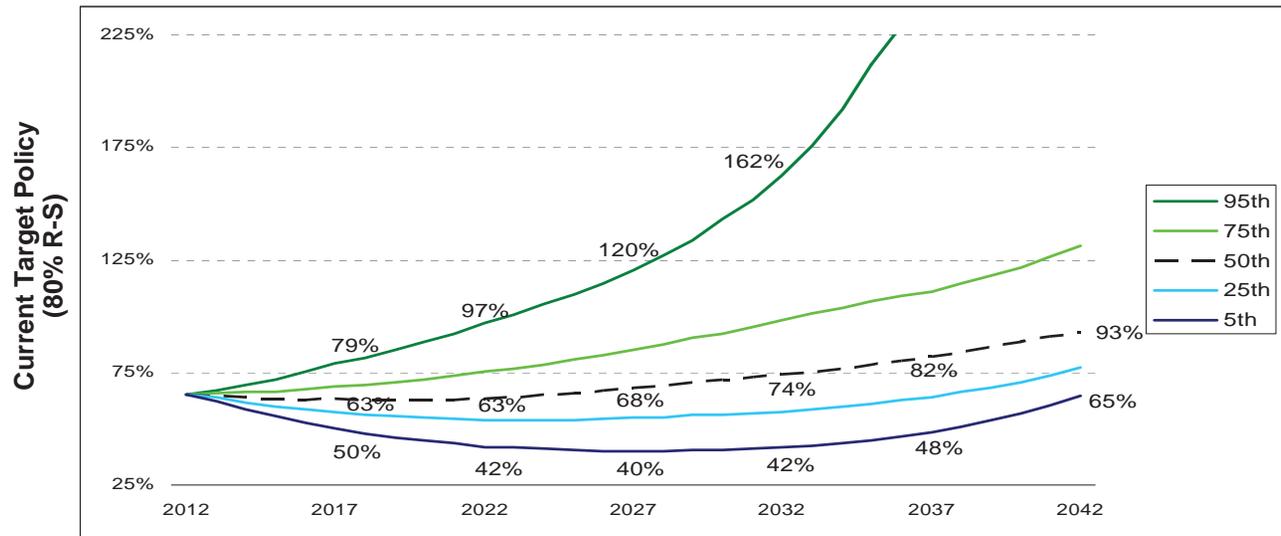


Alternative 1: Proposed Solution (85% R-S)

- The 50th percentile outcome (95% funded in 2042) represents the central expectation after 10 years
- The 95th percentile outcome (510% funded in 2042) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (54% funded in 2042) represents potentially low funded ratios or very pessimistic results after 10 years

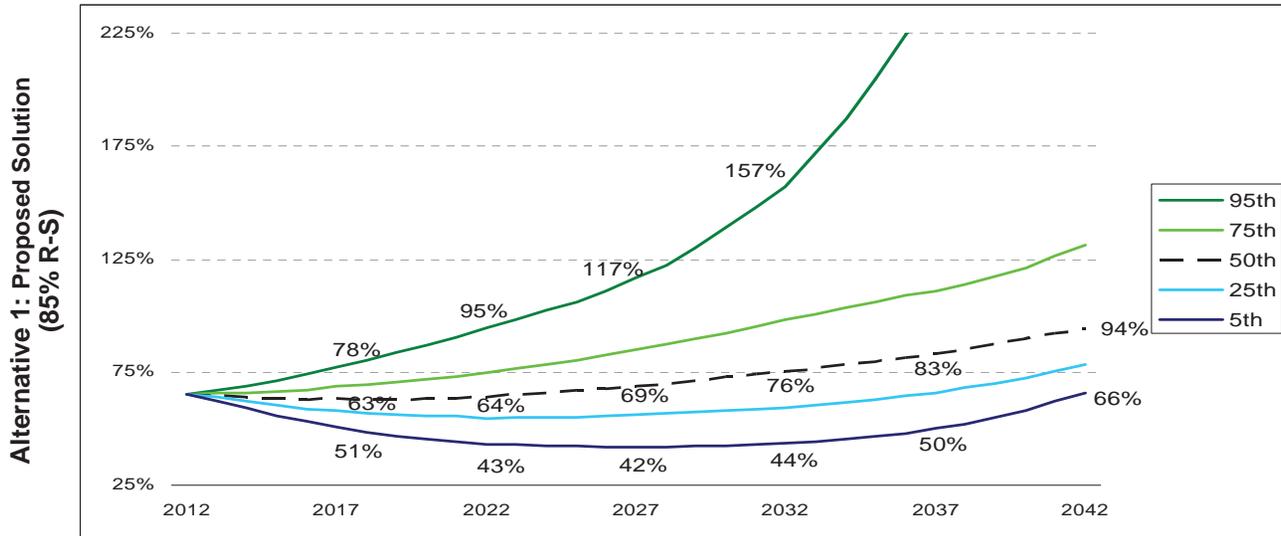
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

Projected Funded Ratio (AVA Basis); Current Target Policy (80% R-S) vs. Alternative 1: Proposed Solution (85% R-S)¹



Current Target Policy (80% R-S)

- The 50th percentile outcome (93% funded in 2042) represents the central expectation after 10 years
- The 95th percentile outcome (400% funded in 2042) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (65% funded in 2042) represents potentially low funded ratios or very pessimistic results after 10 years

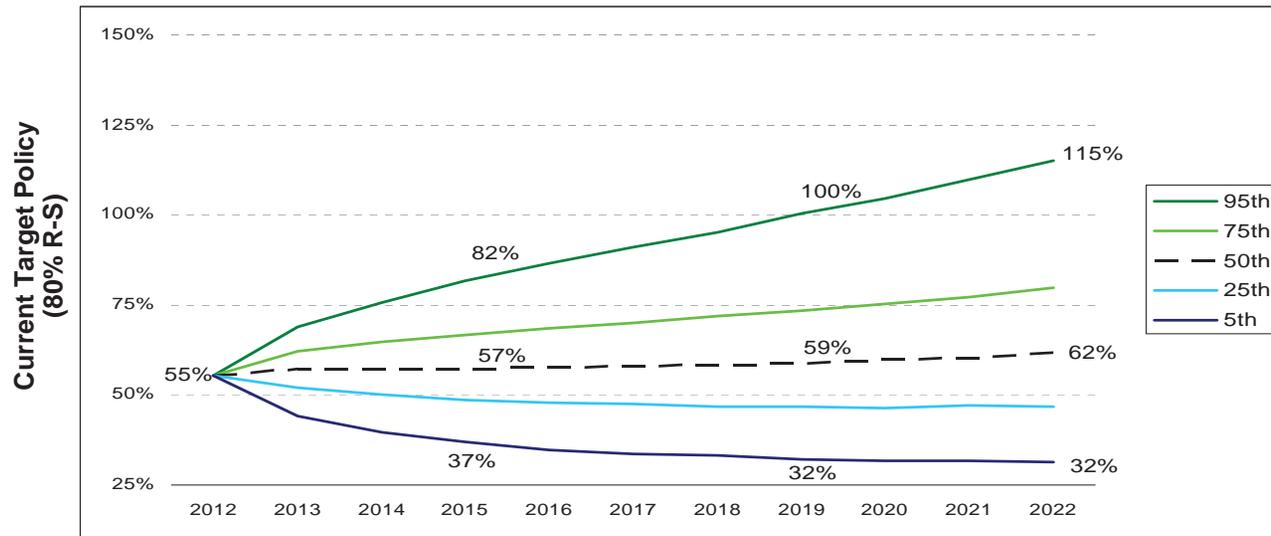


Alternative 1: Proposed Solution (85% R-S)

- The 50th percentile outcome (176% funded in 2042) represents the central expectation after 10 years
- The 95th percentile outcome (390% funded in 2042) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (65% funded in 2042) represents potentially low funded ratios or very pessimistic results after 10 years

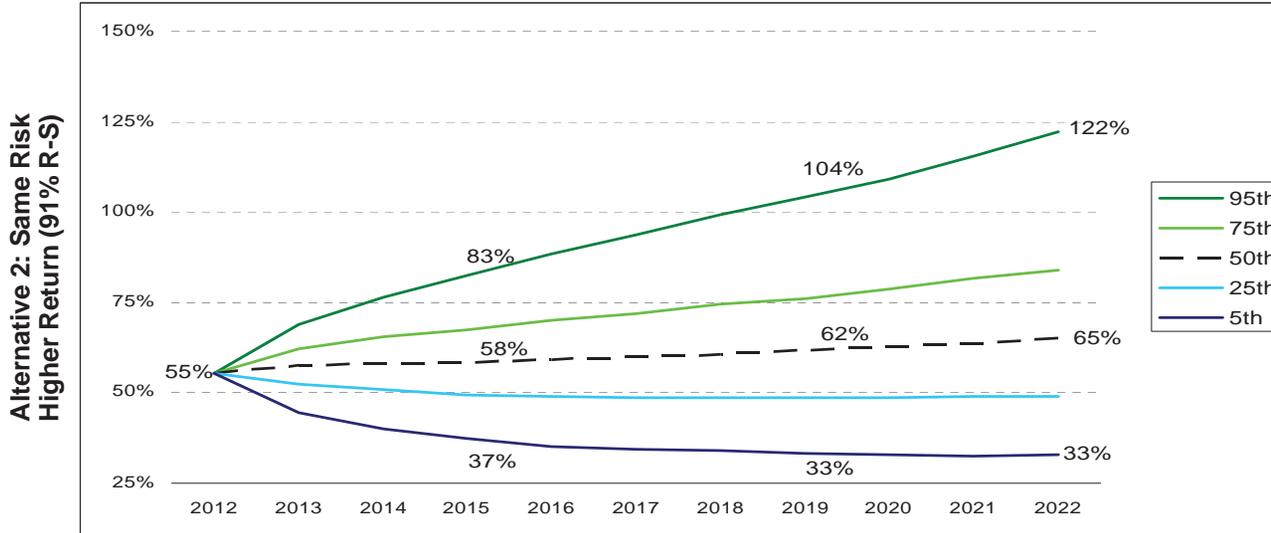
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

Projected Funded Ratio (MVA Basis); Current Target Policy (80% R-S) vs. Alternative 2: Same Risk Higher Return (91% R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (115% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (32% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

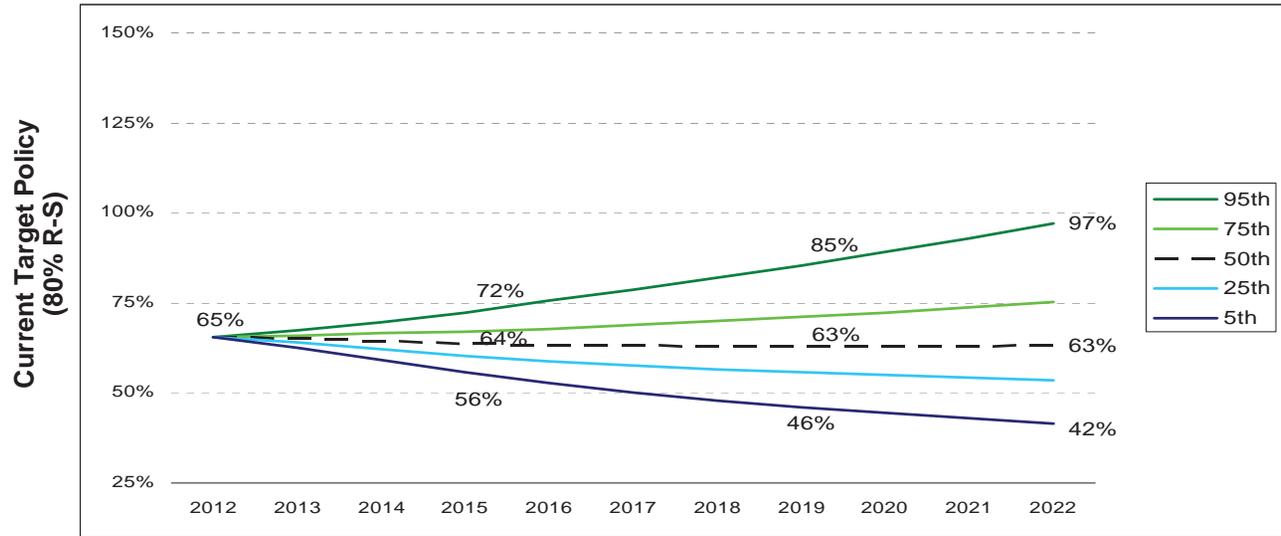


Alternative 2: Same Risk Higher Return (91% R-S)

- The 95th percentile outcome (122% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (33% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

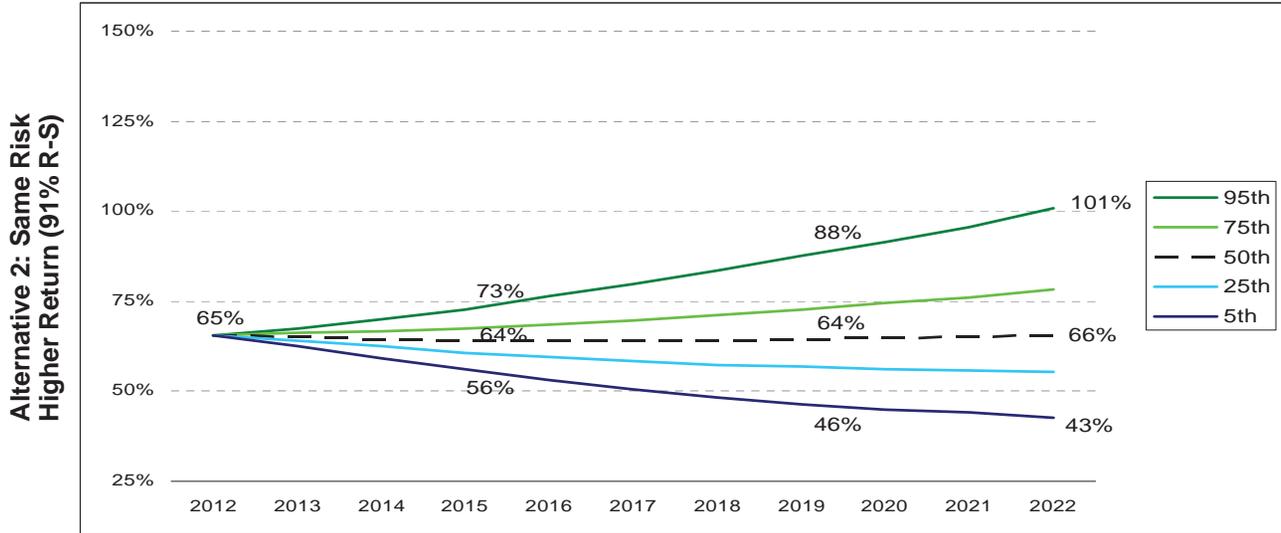
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

Projected Funded Ratio (AVA Basis); Current Target Policy (80% R-S) vs. Alternative 2: Same Risk Higher Return (91% R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (97% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (42% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

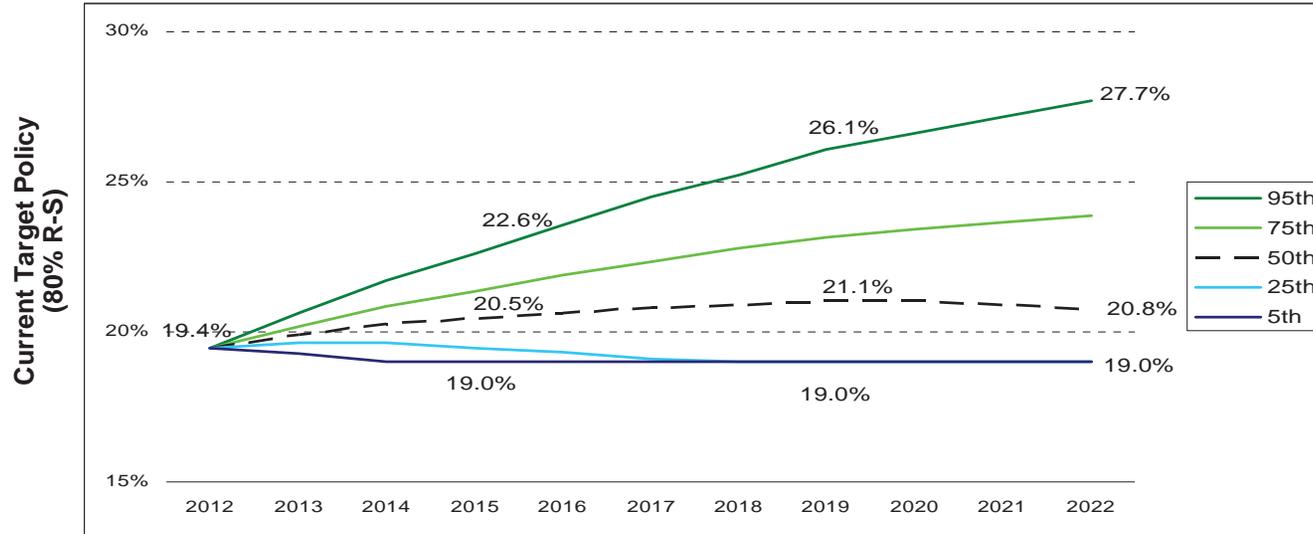


Alternative 2: Same Risk Higher Return (91% R-S)

- The 95th percentile outcome (101% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (43% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

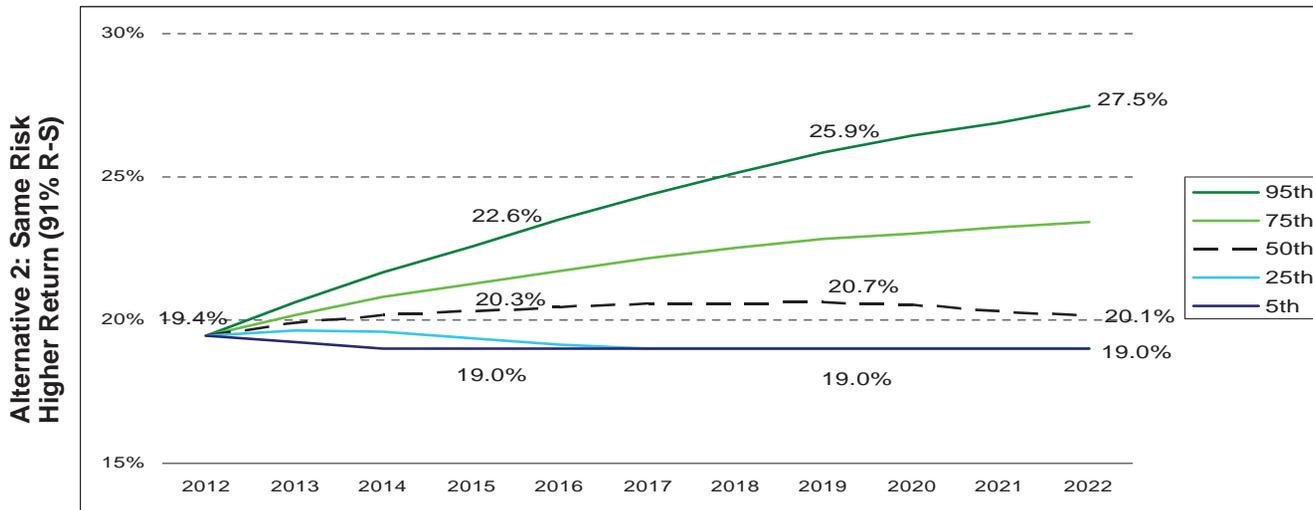
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

(ER + EE) Contribution Rate; Current Target Policy (80% R-S) vs. Alternative 2: Same Risk Higher Return (91% R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (27.7% contribution in 2022) represents potentially high contributions or very pessimistic results after 10 years
- The 5th percentile outcome (19.0% contribution in 2022) represents potentially low contributions or very optimistic results after 10 years

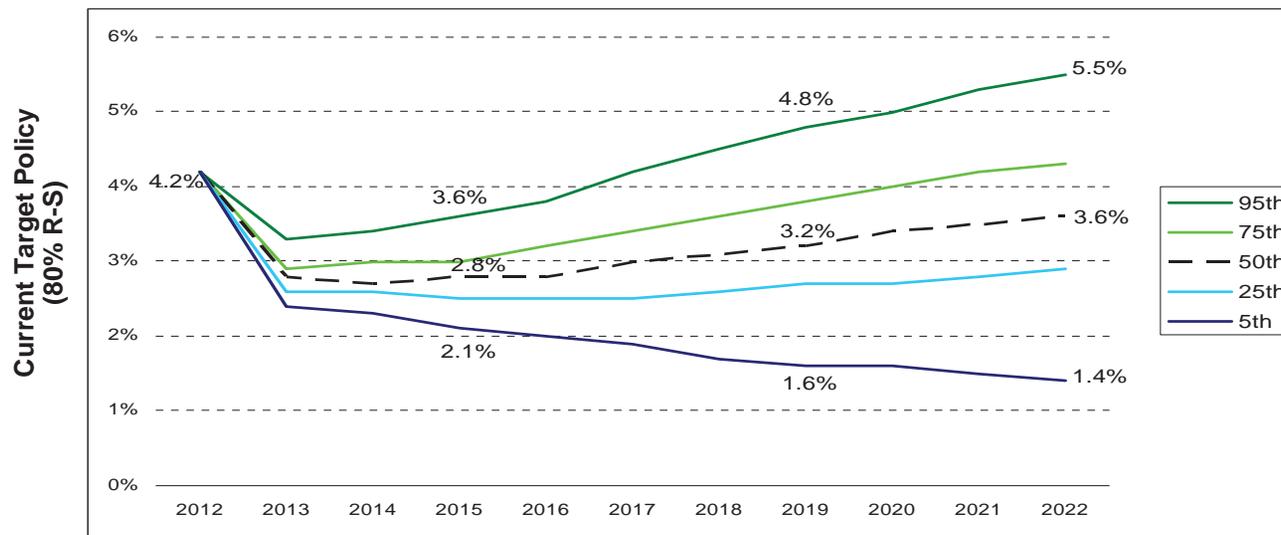


Alternative 2: Same Risk Higher Return (91% R-S)

- The 95th percentile outcome (27.5% contribution in 2022) represents potentially high contributions or very pessimistic results after 10 years
- The 5th percentile outcome (19.0% contribution in 2022) represents potentially low contributions or very optimistic results after 10 years

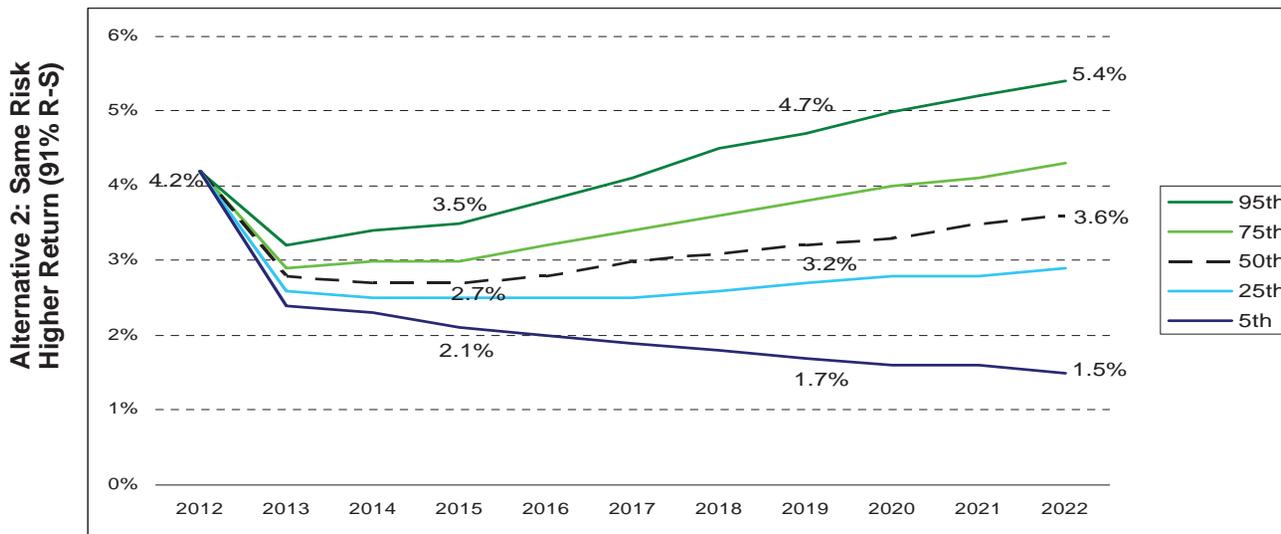
¹ Reflects an estimated funding floor of 19% of Covered Payroll. Under current statute, the employer and employee contribution rates can not decrease unless the Plan becomes 90% funded.

Liquidity Needs: Net Outflow/MV of Assets; Current Target Policy (80% R-S) vs. Alternative 2: Same Risk Higher Return (91% R-S)



Current Target Policy (80% R-S)

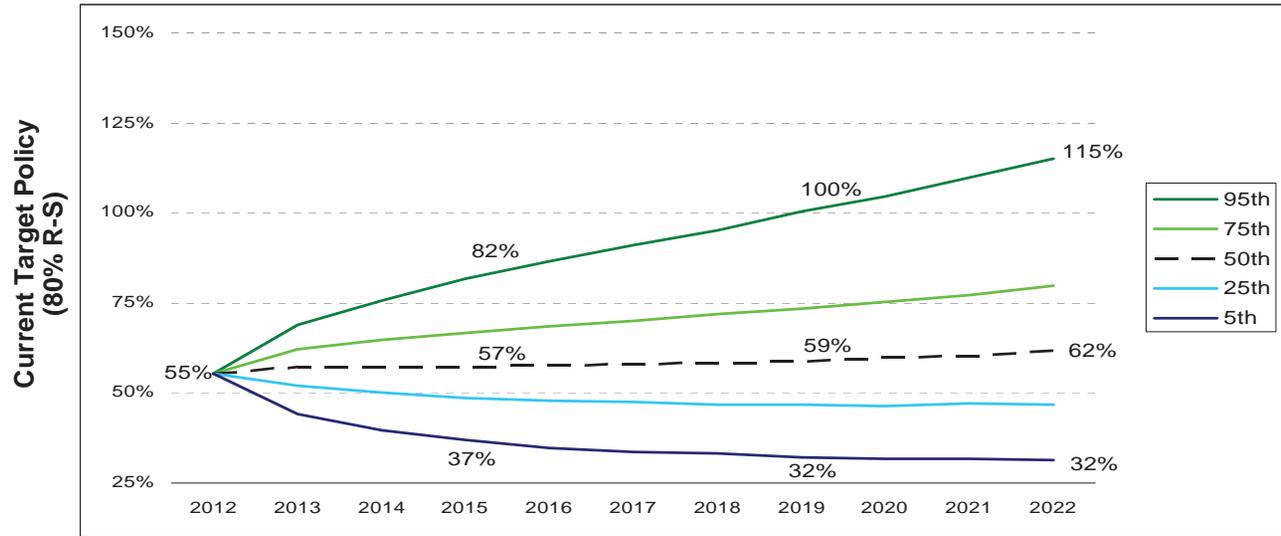
- The 95th percentile outcome (5.5% net outflows in 2022) represents potentially high net outflows or very pessimistic results after 10 years
- The 5th percentile outcome (1.4% net outflows in 2022) represents potentially low net outflows or very optimistic results after 10 years



Alternative 2: Same Risk Higher Return (91% R-S)

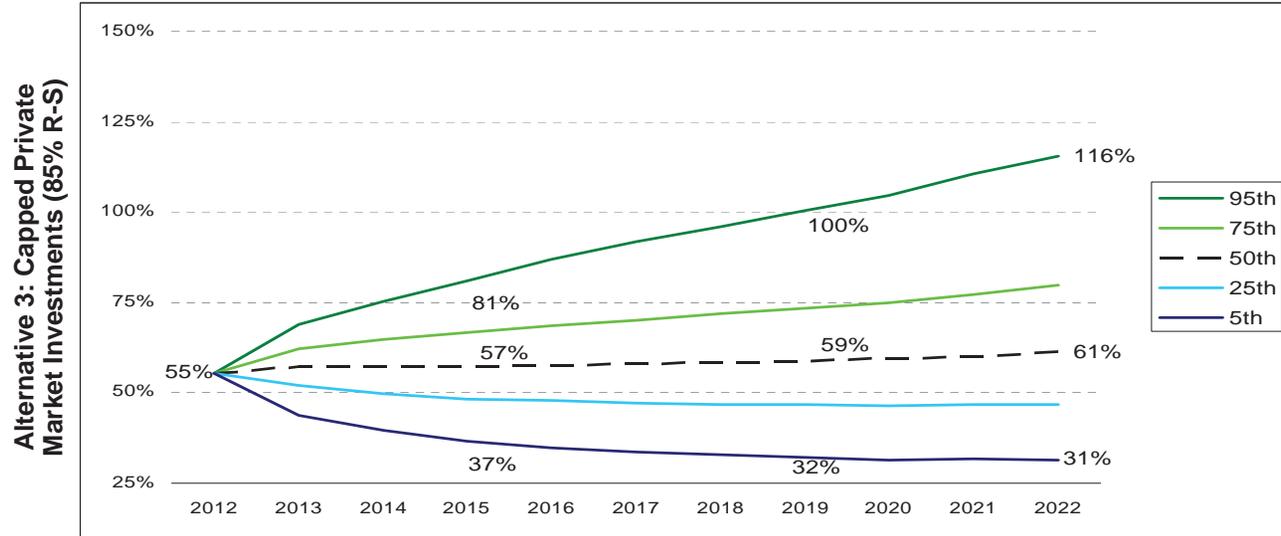
- The 95th percentile outcome (5.4% net outflows in 2022) represents potentially high net outflows or very pessimistic results after 10 years
- The 5th percentile outcome (1.5% net outflows in 2022) represents potentially low net outflows or very optimistic results after 10 years

Projected Funded Ratio (MVA Basis); Current Target Policy (80% R-S) vs. Alternative 3: Capped Private Market Investments (85% R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (115% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (32% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

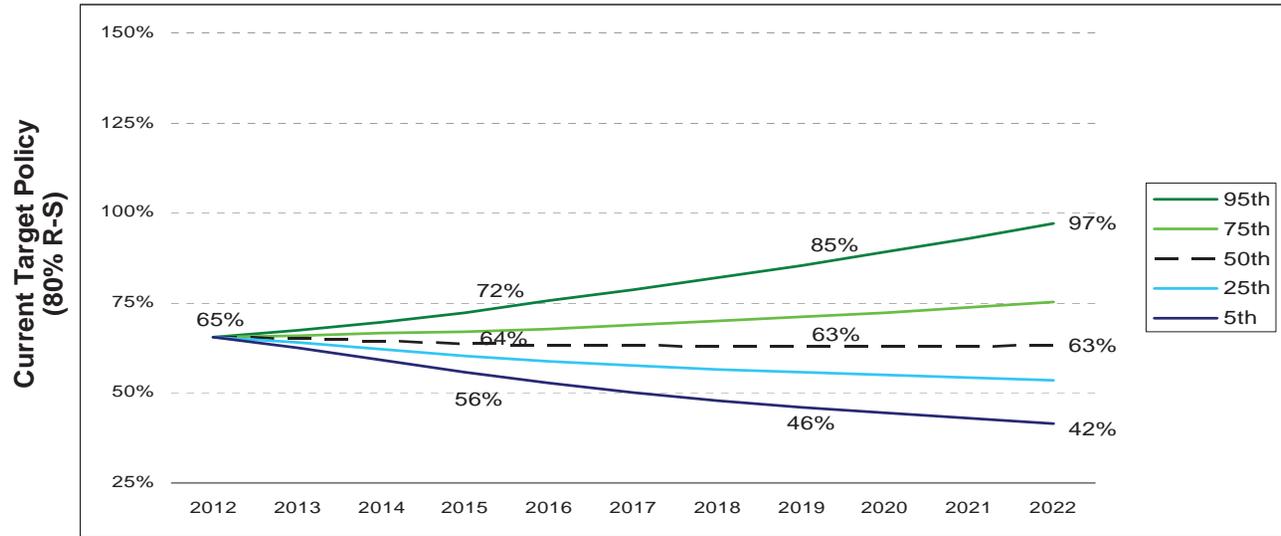


Alternative 3: Capped Private Market Investments (85% R-S)

- The 95th percentile outcome (116% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (31% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

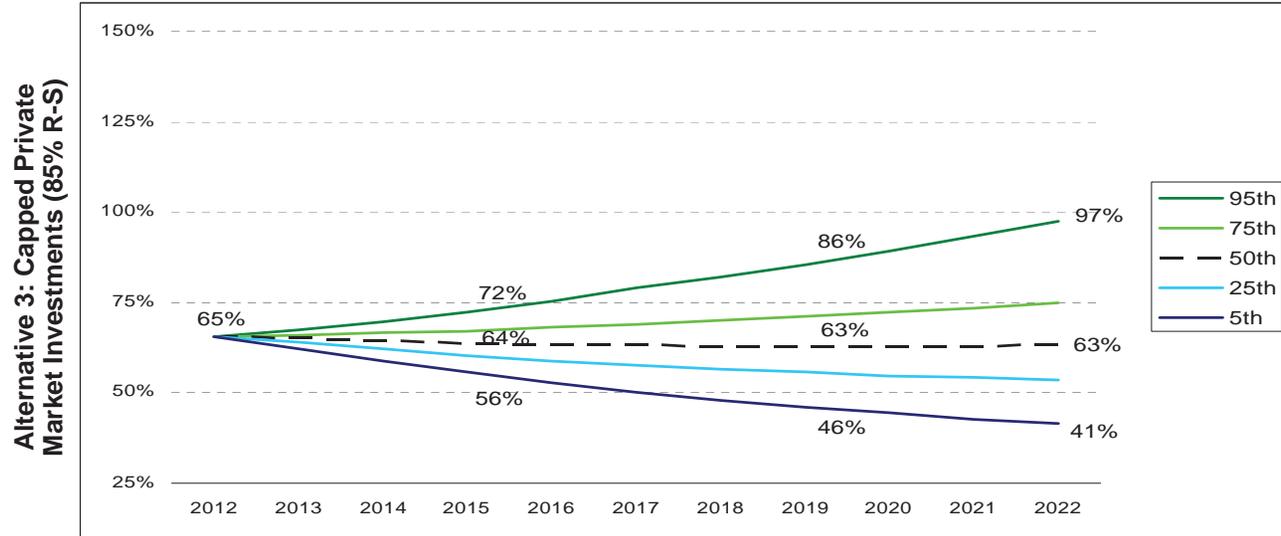
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

Projected Funded Ratio (AVA Basis); Current Target Policy (80% R-S) vs. Alternative 3: Capped Private Market Investments (85% R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (97% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (42% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

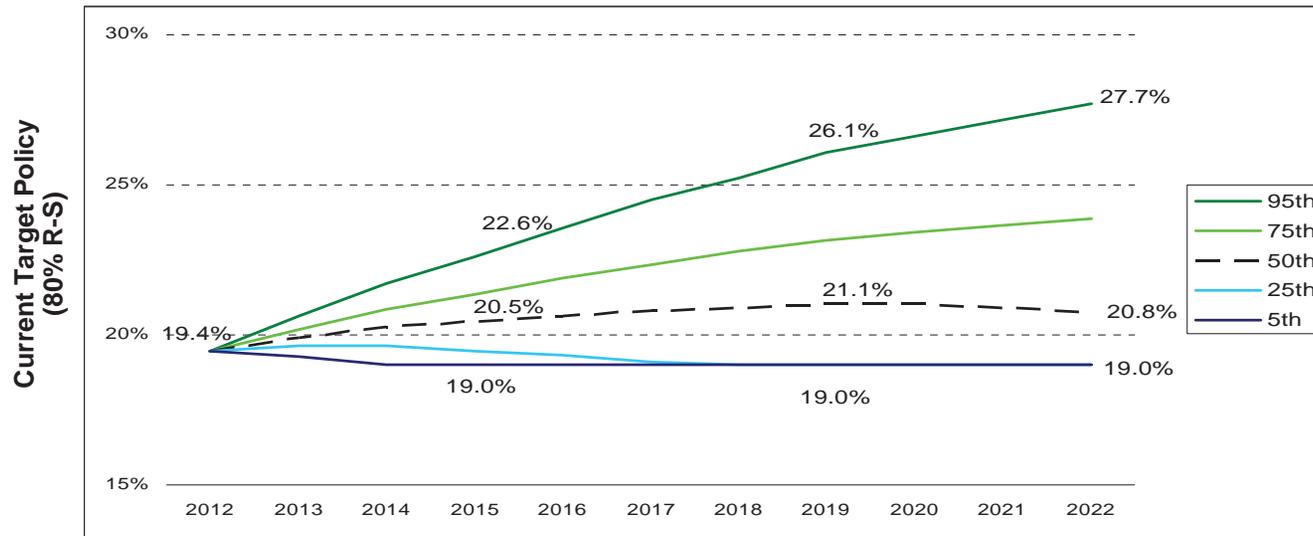


Alternative 3: Capped Private Market Investments (85% R-S)

- The 95th percentile outcome (97% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (41% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

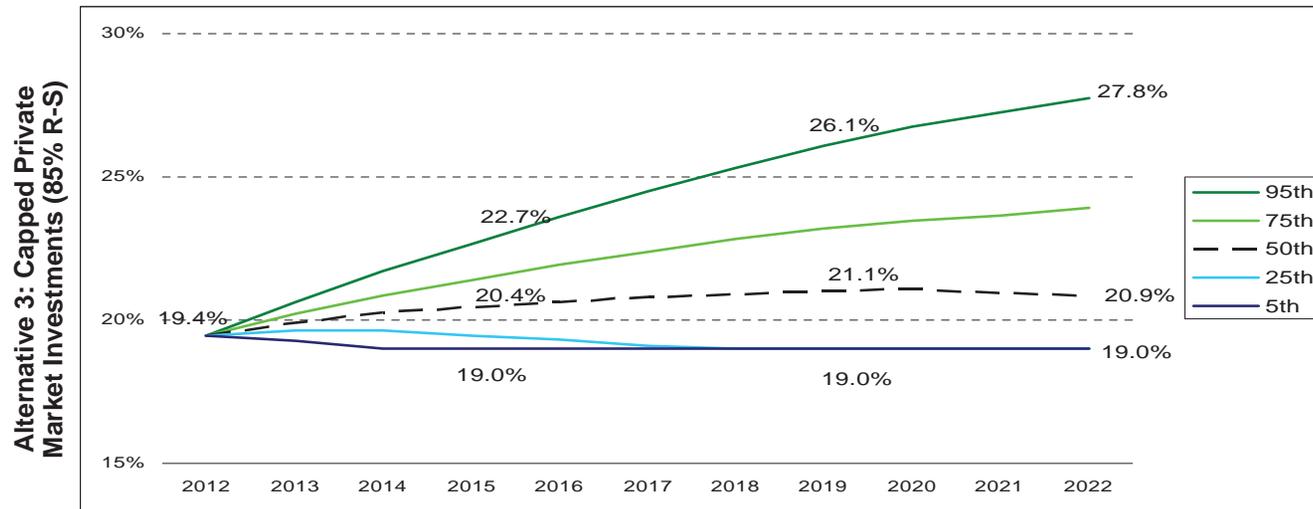
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

(ER + EE) Contribution Rate; Current Target Policy (80% R-S) vs. Alternative 3: Capped Private Market Investments (85% R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (27.7% contribution in 2022) represents potentially high contributions or very pessimistic results after 10 years
- The 5th percentile outcome (19.0% contribution in 2022) represents potentially low contributions or very optimistic results after 10 years

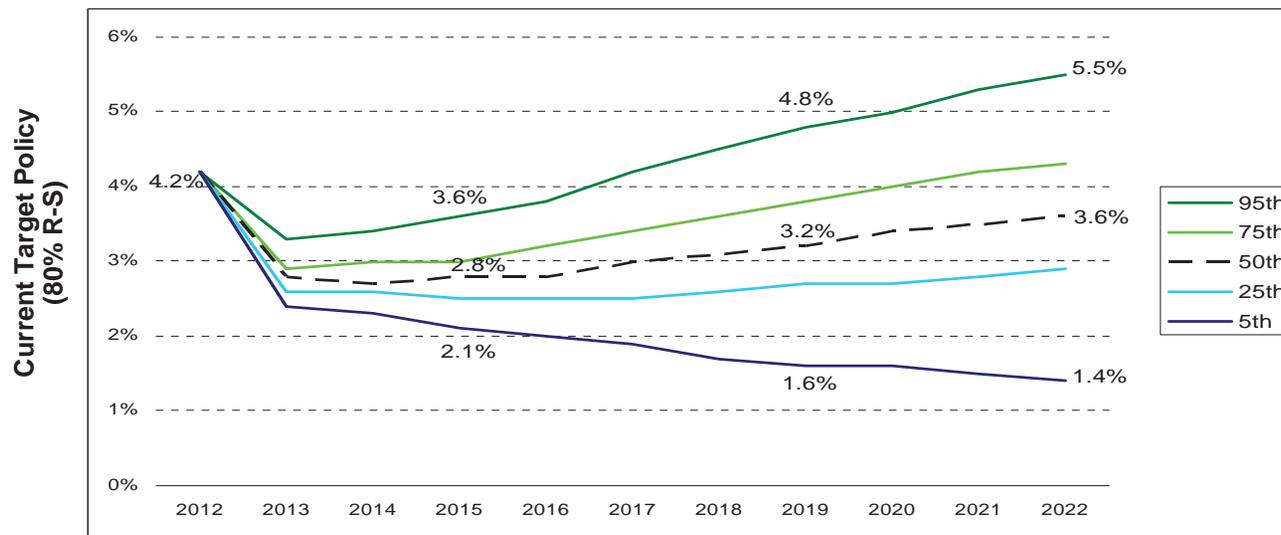


Alternative 3: Capped Private Market Investments (85% R-S)

- The 95th percentile outcome (27.8% contribution in 2022) represents potentially high contributions or very pessimistic results after 10 years
- The 5th percentile outcome (19.0% contribution in 2022) represents potentially low contributions or very optimistic results after 10 years

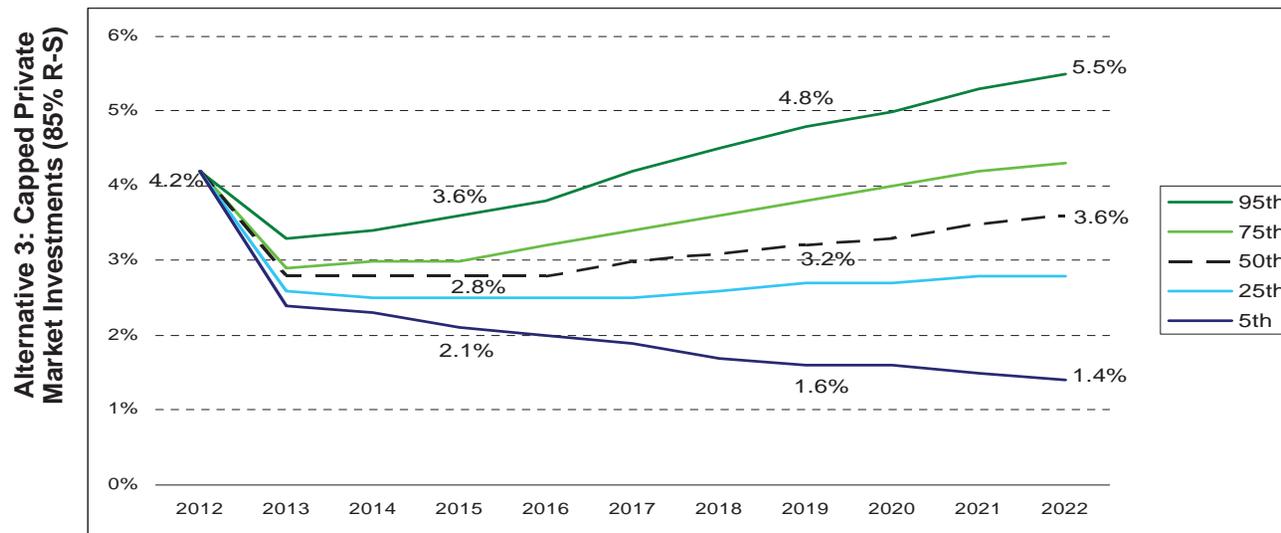
¹ Reflects an estimated funding floor of 19% of Covered Payroll. Under current statute, the employer and employee contribution rates can not decrease unless the Plan becomes 90% funded.

Liquidity Needs: Net Outflow/MV of Assets; Current Target Policy (80% R-S) vs. Alternative 3: Capped Private Market Investments (85% R-S)¹



Current Target Policy (80% R-S)

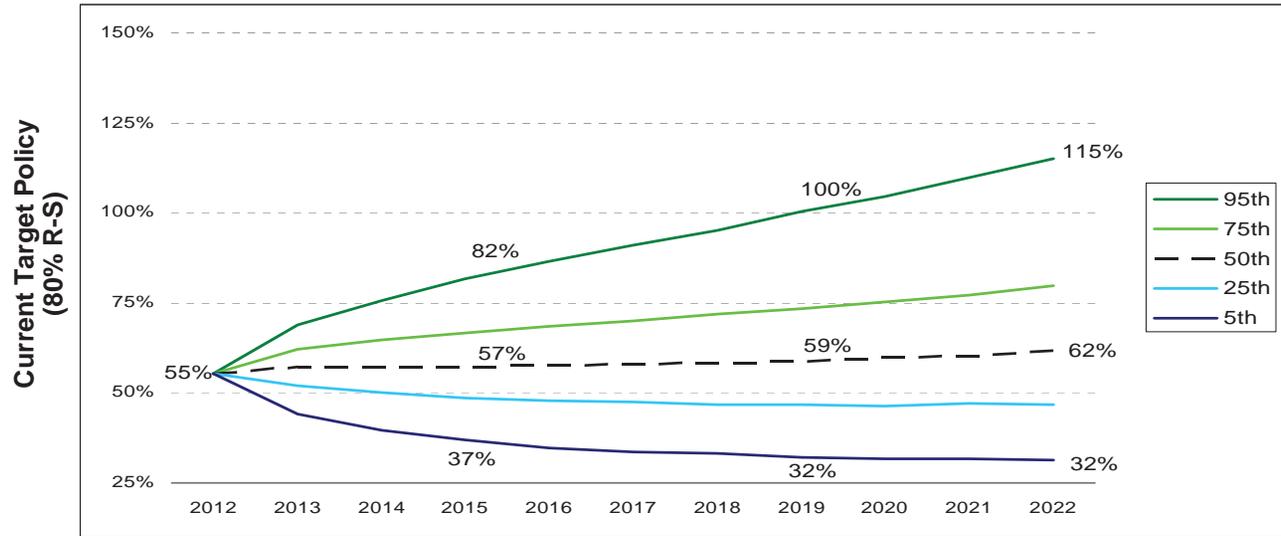
- The net outflow represents the excess of benefit payments over cash contributions. It is expected that the benefit payments will exceed cash contributions each year over the next 10 years.
- The 95th percentile outcome (5.5% net outflows in 2022) represents potentially high net outflows or very pessimistic results after 10 years
- The 5th percentile outcome (1.4% net outflows in 2022) represents potentially low net outflows or very optimistic results after 10 years



Alternative 3: Capped Private Market Investments (85% R-S)

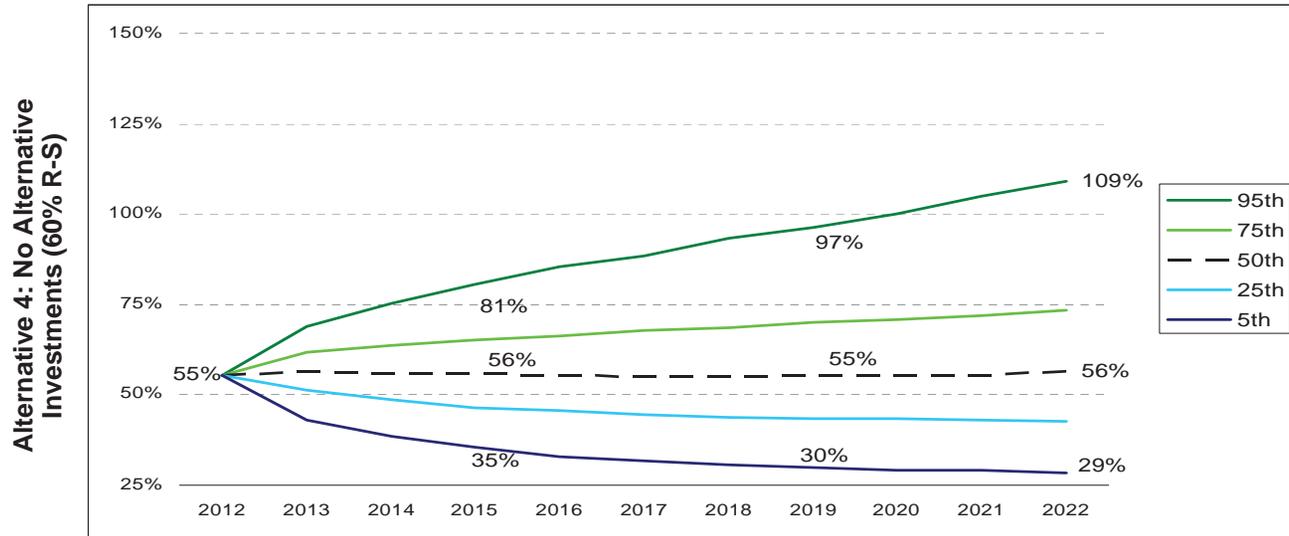
- The 95th percentile outcome (5.5% net outflows in 2022) represents potentially high net outflows or very pessimistic results after 10 years
- The 5th percentile outcome (1.4% net outflows in 2022) represents potentially low net outflows or very optimistic results after 10 years

Projected Funded Ratio (MVA Basis); Current Target Policy (80%R-S) vs. Alternative 4: No Alternative Investments (60%R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (115% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (32% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

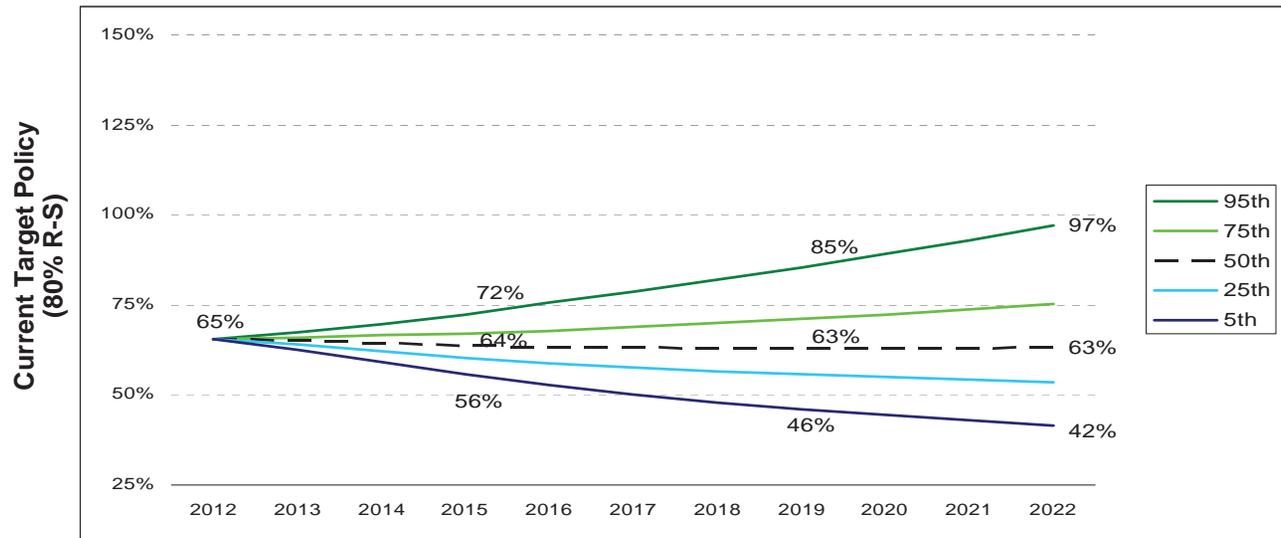


Alternative 4: No Alternative Investments (60% R-S)

- The 95th percentile outcome (109% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (29% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

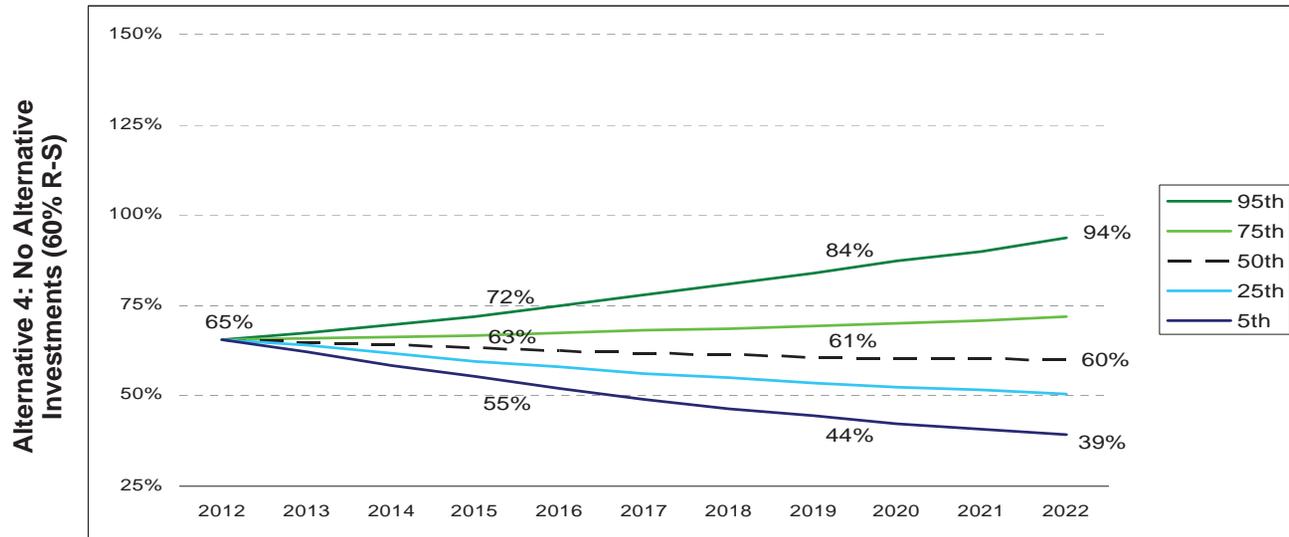
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

Projected Funded Ratio (AVA Basis); Current Target Policy (80%R-S) vs. Alternative 4: No Alternative Investments (60%R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (97% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (42% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

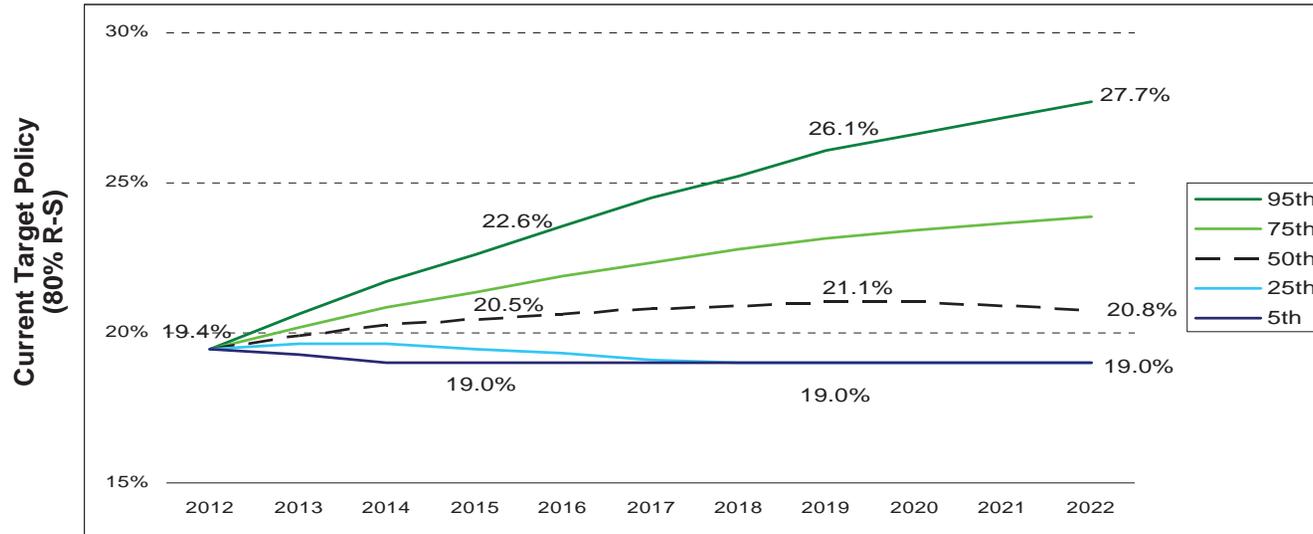


Alternative 4: No Alternative Investments (60% R-S)

- The 95th percentile outcome (94% funded in 2022) represents potentially high funded ratios or very optimistic results after 10 years
- The 5th percentile outcome (39% funded in 2022) represents potentially low funded ratios or very pessimistic results after 10 years

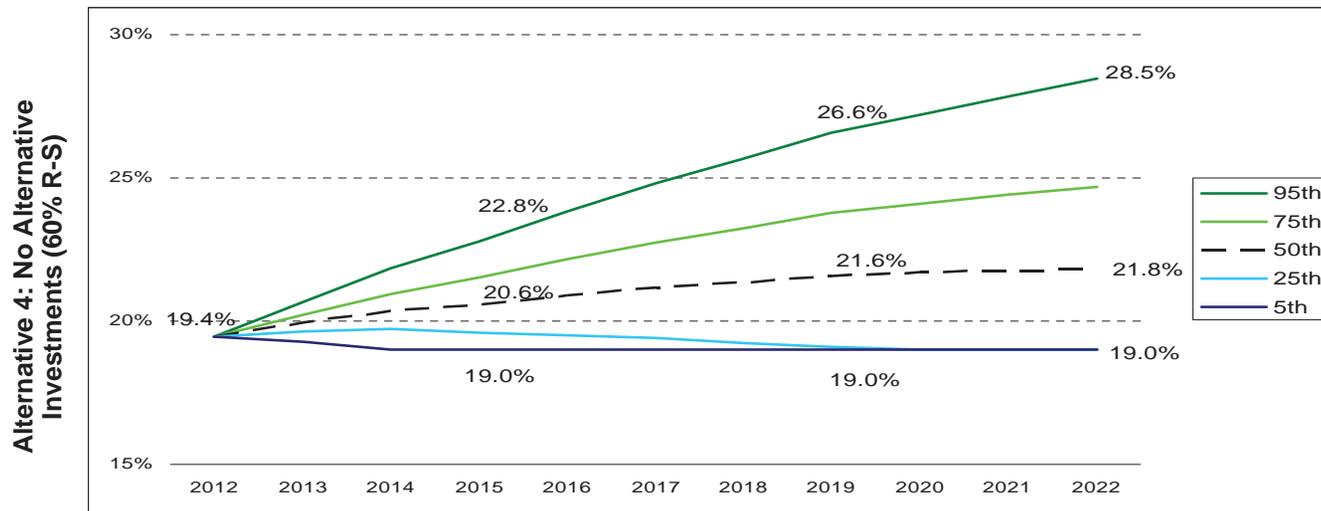
¹ 95th percentile results do not reflect the contribution floor amount of approximately 19% of payroll, so the 95th percentile (upside) funded ratios are likely understated.

(ER + EE) Contribution Rate; Current Target Policy (80%R-S) vs. Alternative 4: No Alternative Investments (60%R-S)¹



Current Target Policy (80% R-S)

- The 95th percentile outcome (27.7% contribution in 2022) represents potentially high contributions or very pessimistic results after 10 years
- The 5th percentile outcome (19.0% contribution in 2022) represents potentially low contributions or very optimistic results after 10 years

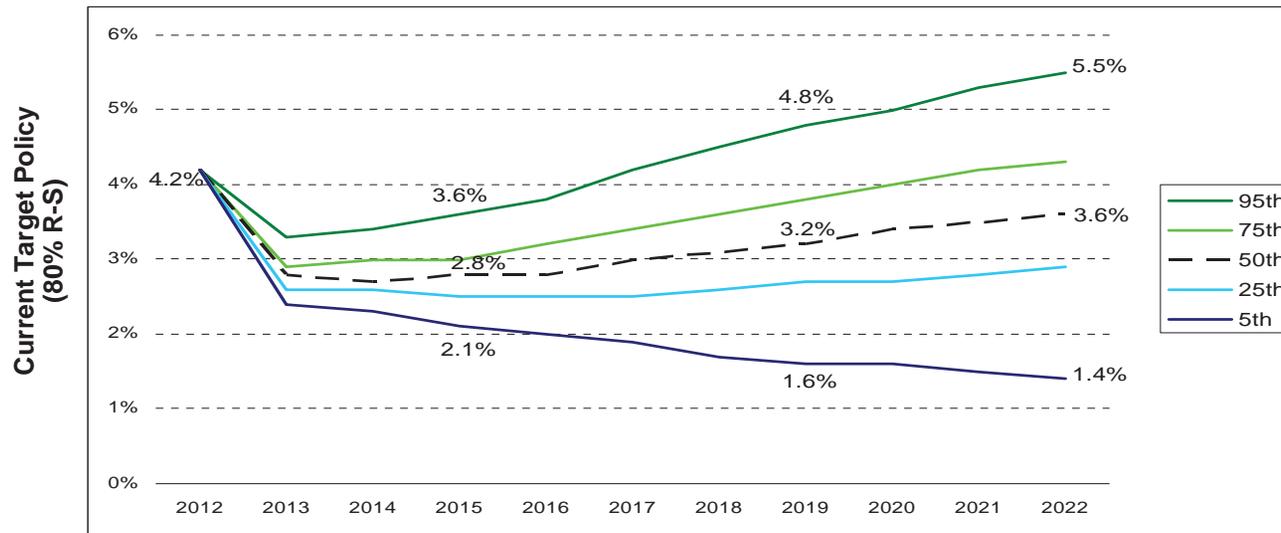


Alternative 4: No Alternative Investments (60% R-S)

- The 95th percentile outcome (28.5% contribution in 2022) represents potentially high contributions or very pessimistic results after 10 years
- The 5th percentile outcome (19.0% contribution in 2022) represents potentially low contributions or very optimistic results after 10 years

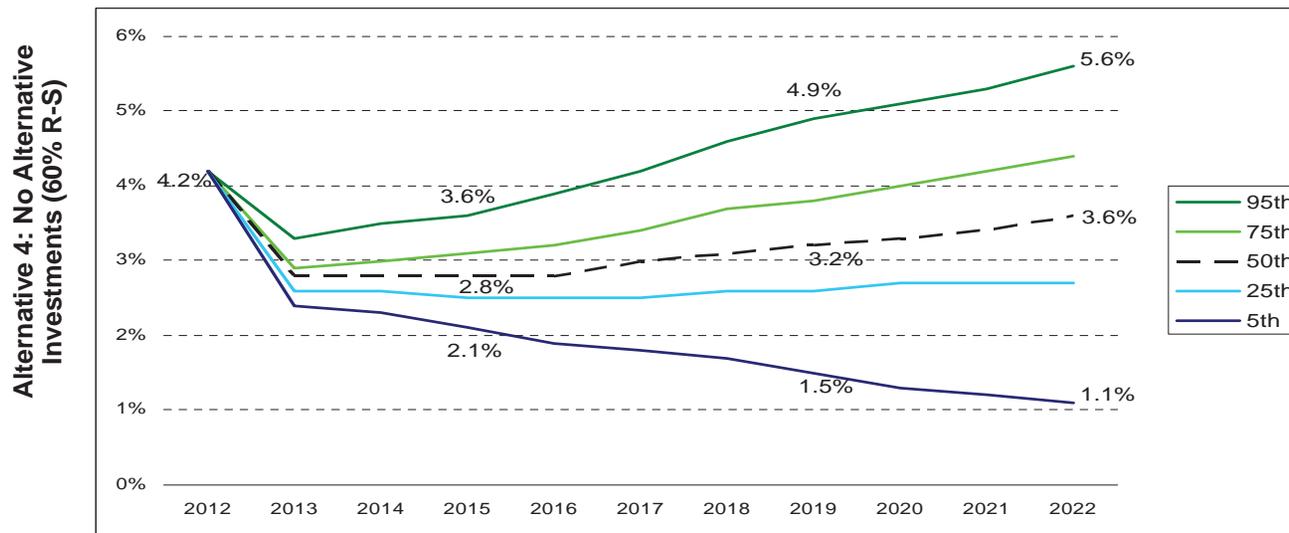
¹ Reflects an estimated funding floor of 19% of Covered Payroll. Under current statute, the employer and employee contribution rates can not decrease unless the Plan becomes 90% funded.

Liquidity Needs: Net Outflow/MV of Assets; Current Target Policy (80%R-S) vs. Alternative 4: No Alternative Investments (60%R-S)



Current Target Policy (80% R-S)

- The net outflow represents the excess of benefit payments over cash contributions. It is expected that the benefit payments will exceed cash contributions each year over the next 10 years.
- The 95th percentile outcome (5.5% net outflows in 2022) represents potentially high net outflows or very pessimistic results after 10 years
- The 5th percentile outcome (1.4% net outflows in 2022) represents potentially low net outflows or very optimistic results after 10 years



Alternative 4: No Alternative Investments (60% R-S)

- The 95th percentile outcome (5.6% net outflows in 2022) represents potentially high net outflows or very pessimistic results after 10 years
- The 5th percentile outcome (1.1% net outflows in 2022) represents potentially low net outflows or very optimistic results after 10 years



Appendix: HEK 2012 Q4 Capital Market Assumptions (10 and 30 Years)

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Aon Hewitt Long-Term Capital Market Assumptions (10 Years) – 2012 Q4

	Expected Real Return ¹	Expected Nominal Return ¹	Expected Volatility
Equity			
1 Large Cap U.S. Equity	5.1%	7.5%	21.0%
2 Small Cap U.S. Equity	5.3%	7.7%	27.0%
3 Global Equity (Developed & Emerging)	5.9%	8.3%	21.5%
4 International (Non-U.S.) Equity (Developed)	6.0%	8.4%	22.5%
5 Emerging Markets Equity	6.9%	9.4%	31.5%
Fixed Income			
6 Cash (Gov't)	-1.0%	1.3%	1.0%
7 TIPS	-0.6%	1.7%	4.5%
8 Core U.S. Fixed Income (Market Duration)	-0.4%	1.9%	3.0%
9 Long Duration Bonds – Gov't / Credit	0.7%	3.0%	9.5%
10 Long Duration Bonds – Credit	1.0%	3.3%	11.0%
11 Long Duration Bonds – Gov't	0.2%	2.5%	9.0%
12 High Yield Bonds	1.6%	3.9%	14.0%
13 Bank Loans	1.8%	4.1%	7.0%
14 Non-US Developed Bond (0% Hedged)	0.3%	2.6%	10.0%
15 Non-US Developed Bond (50% Hedged)	0.0%	2.3%	5.5%
16 Non-US Developed Bond (100% Hedged)	-0.7%	1.6%	2.5%
17 Emerging Market Bonds (Sov. USD)	1.1%	3.4%	12.0%
18 Emerging Market Bonds (Corporate USD)	1.5%	3.8%	12.0%
19 Emerging Market Bonds (Sov. Local)	3.1%	5.5%	14.0%
Alternative Investments			
20 Hedge Funds Universe (Median Manager)	2.8%	5.2%	8.0%
21 Real Estate (Broad Market)	5.0%	7.4%	16.0%
22 Core Private Real Estate	4.0%	6.4%	14.0%
23 U.S. REITs	3.9%	6.3%	22.5%
24 Commodities	1.5%	3.8%	21.5%
25 Private Equity	7.2%	9.7%	28.5%
26 Infrastructure	6.3%	8.7%	18.5%
27 U.S. Inflation	--	2.3%	1.5%

Developed the following key asset classes;

- Global Equity
- Real Assets
- Opportunistic
- Diversified Credit
- Fixed Income

They are made up of the following subclasses:

- Global Equity – Global Public Equity and Private Equity
- Real Assets – Real Estate and Commodities
- Opportunistic – Hedge Funds, Opportunistic Debt, and Global Asset Allocation (GAA)
- Diversified Credit - High Yield Bonds, Bank Loans, and Emerging Market Debt
- Conservative Fixed Income - Core US Bonds, Intermediate Credit, Short Credit, Short Gov't Credit, and International Bonds (Hedged and Un-hedged)

¹ All Expected Returns are geometric (long-term compounded; rounded to nearest decimal) and net of assumed investment management fees

Aon Hewitt Long-Term Capital Market Assumptions (10 Years) – 2012 Q4

Nominal Correlations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1 Large Cap U.S. Equity	1.00	0.92	0.95	0.81	0.63	0.08	-0.03	0.05	0.00	0.10	-0.10	0.55	0.40	-0.03	-0.02	0.00	0.45	0.41	0.48	0.45	0.39	0.37	0.68	0.27	0.61	0.34	0.07
2 Small Cap U.S. Equity		1.00	0.87	0.75	0.58	0.07	-0.03	0.04	0.00	0.09	-0.10	0.52	0.37	-0.02	-0.02	-0.01	0.42	0.38	0.44	0.41	0.36	0.34	0.63	0.24	0.57	0.32	0.06
3 Global Equity (Developed & Emerging)			1.00	0.93	0.79	0.08	-0.02	0.04	0.00	0.09	-0.10	0.57	0.38	0.17	0.14	0.00	0.49	0.44	0.53	0.45	0.39	0.38	0.65	0.34	0.58	0.32	0.08
4 International (Non-U.S.) Equity (Developed)				1.00	0.67	0.07	-0.01	0.04	0.01	0.09	-0.08	0.50	0.33	0.35	0.29	0.00	0.42	0.38	0.46	0.40	0.37	0.36	0.57	0.35	0.50	0.29	0.10
5 Emerging Markets Equity					1.00	0.05	-0.02	0.02	0.00	0.06	-0.07	0.49	0.25	0.22	0.18	0.00	0.49	0.44	0.55	0.32	0.28	0.27	0.44	0.28	0.39	0.21	0.06
6 Cash (Gov't)						1.00	0.48	0.56	0.26	0.23	0.27	0.16	0.01	0.21	0.39	0.67	0.21	0.15	0.12	0.25	0.12	0.14	0.08	0.26	0.07	0.10	0.49
7 TIPS							1.00	0.28	0.09	0.08	0.09	0.07	-0.02	0.13	0.19	0.25	0.07	0.04	0.04	0.09	0.02	0.03	-0.01	0.29	-0.02	0.02	0.56
8 Core U.S. Fixed Income (Market Duration)								1.00	0.84	0.82	0.80	0.34	-0.02	0.24	0.40	0.65	0.52	0.38	0.22	0.21	0.07	0.07	0.04	0.07	0.04	0.05	0.09
9 Long Duration Bonds – Gov't / Credit									1.00	0.97	0.96	0.29	-0.02	0.19	0.33	0.52	0.50	0.37	0.17	0.13	0.02	0.02	0.01	-0.07	0.01	0.02	-0.16
10 Long Duration Bonds – Credit										1.00	0.86	0.48	0.22	0.18	0.31	0.49	0.63	0.49	0.29	0.21	0.06	0.06	0.07	-0.05	0.08	0.05	-0.14
11 Long Duration Bonds – Gov't											1.00	0.05	-0.27	0.19	0.33	0.52	0.33	0.22	0.02	0.05	-0.03	-0.02	-0.06	-0.08	-0.07	-0.03	-0.16
12 High Yield Bonds												1.00	0.72	0.13	0.16	0.16	0.78	0.69	0.68	0.42	0.25	0.24	0.39	0.25	0.39	0.22	0.11
13 Bank Loans													1.00	-0.02	-0.02	-0.02	0.50	0.44	0.47	0.31	0.18	0.17	0.28	0.07	0.29	0.16	0.05
14 Non-US Developed Bond (0% Hedged)														1.00	0.96	0.39	0.17	0.13	0.14	0.05	0.01	0.02	-0.02	0.32	-0.01	0.00	0.17
15 Non-US Developed Bond (50% Hedged)															1.00	0.64	0.24	0.17	0.15	0.10	0.03	0.03	-0.01	0.30	0.00	0.01	0.21
16 Non-US Developed Bond (100% Hedged)																1.00	0.29	0.20	0.10	0.17	0.05	0.06	0.01	0.08	0.00	0.04	0.22
17 Emerging Market Bonds (Sov. USD)																	1.00	0.76	0.74	0.37	0.21	0.20	0.32	0.13	0.32	0.18	0.02
18 Emerging Market Bonds (Corporate USD)																		1.00	0.66	0.31	0.19	0.18	0.28	0.11	0.29	0.16	0.02
19 Emerging Market Bonds (Sov. Local)																			1.00	0.32	0.21	0.20	0.33	0.22	0.33	0.18	0.09
20 Hedge Funds Universe (Median Manager)																				1.00	0.25	0.24	0.33	0.17	0.32	0.21	0.12
21 Real Estate (Broad Market)																					1.00	0.95	0.52	0.08	0.30	0.17	0.07
22 Core Private Real Estate																						1.00	0.49	0.08	0.29	0.16	0.08
23 U.S. REITs																							1.00	0.18	0.43	0.25	0.06
24 Commodities																								1.00	0.10	0.06	0.48
25 Private Equity																									1.00	0.27	0.05
26 Infrastructure																										1.00	0.06
27 U.S. Inflation																											1.00

Explanation of US Capital Market Assumptions (10 Years) – 2012 Q4

The following capital market assumptions were developed by Aon Hewitt's Global Asset Allocation Team and represent the long-term capital market outlook (i.e., 10 years) based on data at the end of the third quarter of 2012. The assumptions were developed using a building block approach, reflecting observable inflation and interest rate information available in the fixed income markets as well as Consensus Economics forecasts. Our long-term assumptions for other asset classes are based on historical results, current market characteristics, and our professional judgment.

Inflation – Expected Level (2.3%)

Based on Consensus Economics long-term estimates and our near-term economic outlook, we expect U.S. consumer price inflation to be approximately 2.3% during the next 10 years.

Real Returns for Asset Classes

Fixed Income

- Cash (-1.0%) – Over the long run, we expect the real yield on cash and money market instruments to produce a negative real return of -1.0% in a moderate- to low-inflationary environment.
- TIPS (-0.6%) – We expect intermediate duration Treasury Inflation-Protected Securities to produce a negative real return of about -0.6%.
- Core Fixed Income (i.e., Market Duration) (-0.4%) – We expect intermediate duration Treasuries to produce a negative real return of about -0.8%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 0.4%, resulting in a long-term real return of -0.4%.

Explanation of US Capital Market Assumptions (10 Years) – 2012 Q4

- Long Duration Bonds – Government and Credit (0.7%) – We expect Treasuries with a duration comparable to the Long Government Credit Index to produce a real return of 0.2%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 0.5%, resulting in an expected real return of 0.7%.
- Long Duration Bonds – Credit (1.0%) – We expect Treasuries with a duration comparable to the Long Credit Index to produce a real return of 0.2%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 0.8%, resulting in an expected real return of 1.0%.
- Long Duration Bonds – Government (0.2%) – We expect Treasuries with a duration of ~12 years to produce a real return of 0.2% during the next 10 years.
- High Yield Bonds (1.6%) – We expect intermediate duration Treasuries to produce a negative real return of about -0.8%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 2.4%, resulting in an expected real return of 1.6%.
- Bank Loans (1.8%) – We expect LIBOR to produce a negative real return of about -0.7%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 2.5%, resulting in an expected real return of 1.8%.
- Non-US Developed Bonds: 50% Hedged (0.0%) – We forecast real returns for non-US developed market bonds to be 0.0% over a 10-year period after adjusting for a 50% currency hedge. We assume a blend of one-third investment grade corporate bonds and two-thirds government bonds. We also produce assumptions for 0% hedged and 100% hedged non-US developed bonds.

Explanation of US Capital Market Assumptions (10 Years) – 2012 Q4

- Emerging Market Bonds (Sovereign USD) (1.1%) – We forecast real returns for emerging market sovereign bonds denominated in US dollars to be 1.1% over a 10-year period.
- Emerging Market Bonds (Corporate USD) (1.5%) – We forecast real returns for emerging market corporate bonds denominated in US dollars to be 1.5% over a 10-year period.
- Emerging Market Bonds (Local) (3.1%) – We forecast real returns for emerging market sovereign bonds denominated in local currency to be 3.1% over a 10 year-period.

Equities

- Large Cap U.S. Equity (5.1%) – This assumption is based on our 10-year outlook for large cap U.S. company dividends and real earnings growth. Adjustments are made for valuations as needed.
- Small Cap U.S. Equity (5.3%) – Adding a 0.2% return premium for small cap U.S. equity over large cap U.S. equity results in an expected real return of 5.3%. This return premium is theoretically justified by the higher risk inherent in small cap U.S. equity versus large cap U.S. equity, and is also justified by historical data. The 0.2% premium reflects the fact that the increase in the relative valuation of small caps equity versus large cap equity in recent years indicates that the risk premium demanded by investors may be shrinking.
- Global Equity (Developed & Emerging Markets) (5.9%) – We employ a building block process similar to the U.S. equity model using the developed and emerging equity markets that comprise the MSCI All-Country World Index. Our roll-up model produces an expected real return of 5.9% for global equity.

Explanation of US Capital Market Assumptions (10 Years) – 2012 Q4

- International (Non-U.S.) Equity, Developed Markets (6.0%) – We employ a building block process similar to the U.S. equity model using the non-U.S. developed equity markets that comprise the MSCI EAFE Index.
- Emerging Market Stocks (6.9%) - We employ a building block process similar to the U.S. equity model using the non-U.S. emerging equity markets that comprise the MSCI Emerging Markets Index.

Alternative Asset Classes

- Hedge Funds Universe (2.8%) – The generic category “hedge funds” encompasses a wide range of strategies. Our assumption is based on diversified and conservative fund-of-funds with more exposure to non-directional strategies than directional or equity-oriented investments. Our assumption is somewhat more conservative than historical results to account for flaws inherent in hedge funds indices, including survivorship bias and self-reporting bias. We also assume the median manager is selected. A top-tier portfolio of individual managers (hedge funds buy-list) could add an additional 1.7% in return at similar volatility based on alpha, lower fees (i.e., fewer fund-of-funds fees), and better risk management.
- Real Estate (5.0%) – Our real return assumption for broad real estate market is based on a gross income of about 7%, management fees of roughly 2%, and future capital appreciation slightly below inflation during the next 10 years. We assume a portfolio of equity real estate holdings that is diversified by property type and by geographic region.

Explanation of US Capital Market Assumptions (10 Years) – 2012 Q4

- Core Real Estate (4.0%) -- Our real return assumption for core real estate is based a gross income of about 6%, management fees of roughly 2%, and future capital appreciation slightly below inflation during the next 10 years. We assume a portfolio of equity real estate holdings that is diversified by property and by geographic region.
- US REITs (3.9%) – Our real return assumption for REITs is based on income of about 3% to 4% and capital appreciation near the rate of inflation. REITs are a sub-set of U.S. small/mid cap equities.
- Commodities (1.5%) – Our commodity assumption is for a diversified portfolio of commodity futures contracts. Commodity futures returns are composed of three parts: spot price appreciation, collateral return, and roll return (positive or negative change implied by the shape of the future curve). We believe that spot prices will converge with CPI over the long run (i.e., 2.3%). Collateral is assumed to be LIBOR cash (-0.7%). Also, we believe the roll effect will be near zero, resulting in a real return of about 1.5% for commodities.
- Private Equity (7.2%) – Our private equity assumption reflects a diversified fund of funds with exposure to buyouts, venture capital, distressed debt, and mezzanine debt.
- Infrastructure (6.3%) – Our infrastructure assumption is formulated using a cash flow based approach that projects cash flows (on a diversified portfolio of assets) over a 10 year period. Income and capital growth as well as gearing levels, debt costs and terms, relevant tax and management expenses are all taken into consideration. Our approach produces an expected real return of 6.3% for infrastructure.

Explanation of US Capital Market Assumptions (10 Years) – 2012 Q4

Volatility / Correlation Assumptions

- Assumed volatilities are formulated with reference to implied volatilities priced into option contracts of various terms, as well as with regard to historical volatility levels. For asset classes which are not marked to market (for example real estate), we “de-smooth” historical returns before calculating volatilities. Importantly, we consider expected volatility trends in the future – in recent years we assumed the re-emergence of an economic cycle and a loss of confidence in central bankers would lead to an increase in volatility. Correlation assumptions are generally similar to actual historical results; however, we do make adjustments to reflect our forward-looking views as well as current market fundamentals.

Aon Hewitt Long-Term Capital Market Assumptions (30 Years) – 2012 Q4

	Expected Real Return ¹	Expected Nominal Return ¹	Expected Volatility	
Equity				<ul style="list-style-type: none"> ▪ Developed the following key asset classes; <ul style="list-style-type: none"> – Global Equity – Real Assets – Opportunistic – Diversified Credit – Fixed Income ▪ They are made up of the following subclasses: <ul style="list-style-type: none"> – Global Equity – Global Public Equity and Private Equity – Real Assets – Real Estate and Commodities – Opportunistic – Hedge Funds, Opportunistic Debt, and Global Asset Allocation (GAA) – Diversified Credit - High Yield Bonds, Bank Loans, and Emerging Market Debt – Fixed Income - Core US Bonds, Intermediate Credit, Short Credit, Short Gov't Credit, and International Bonds (Hedged and Un-hedged)
1 Large Cap U.S. Equity	5.1%	7.5%	19.0%	
2 Small Cap U.S. Equity	5.5%	7.9%	25.0%	
3 Global Equity	6.1%	8.5%	20.0%	
4 International Developed Equity	6.1%	8.5%	21.0%	
5 Emerging Markets Equity	7.6%	10.1%	30.0%	
Fixed Income				
6 Cash (Gov't)	0.3%	2.6%	2.0%	
7 TIPS	0.6%	2.9%	5.0%	
8 Core Fixed Income (Market Duration)	1.0%	3.3%	5.0%	
9 Long Duration Bonds– Gov't / Credit	1.4%	3.7%	13.0%	
10 Long Duration Bonds– Credit	1.8%	4.1%	14.5%	
11 Long Duration Bonds– Gov't	0.9%	3.2%	13.0%	
12 High Yield Bonds	2.5%	4.9%	14.5%	
13 Bank Loans	2.5%	4.9%	7.5%	
14 Non-US Developed Bonds (0% Hedged)	1.8%	4.1%	11.5%	
15 Non-US Developed Bonds (50% Hedged)	1.3%	3.6%	7.0%	
16 Non-US Developed Bonds (100% Hedged)	0.7%	3.0%	4.5%	
17 Emerging Market Bonds (Sovereign USD)	2.2%	4.6%	13.0%	
18 Emerging Market Bonds (Corporate USD)	2.7%	5.1%	12.5%	
19 Emerging Market Bonds (Sovereign Local)	3.1%	5.5%	14.5%	
Alternative Investments				
20 Hedge Funds Universe	3.7%	6.1%	8.5%	
21 Real Estate (Broad Market)	5.0%	7.4%	14.5%	
22 Real Estate (Core)	4.0%	6.4%	12.5%	
23 U.S. REITs	3.9%	6.3%	21.5%	
24 Commodities	3.0%	5.4%	21.5%	
25 Private Equity	7.2%	9.7%	27.0%	
26 Infrastructure	6.3%	8.7%	17.0%	
27 U.S. Inflation	--	2.3%	2.0%	

¹ All Expected Returns are geometric (long-term compounded; rounded to nearest decimal) and net of assumed investment management fees

Aon Hewitt Long-Term Capital Market Assumptions (30 Years) – 2012 Q4

Nominal Correlations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
1 Large Cap U.S. Equity	1.00	0.92	0.95	0.81	0.63	0.08	-0.03	0.05	0.00	0.10	-0.10	0.55	0.40	-0.03	-0.02	0.00	0.45	0.41	0.48	0.45	0.39	0.37	0.68	0.27	0.61	0.34	0.07	
2 Small Cap U.S. Equity		1.00	0.87	0.75	0.58	0.07	-0.03	0.04	0.00	0.09	-0.10	0.52	0.37	-0.02	-0.02	-0.01	0.42	0.38	0.44	0.41	0.36	0.34	0.63	0.24	0.57	0.32	0.06	
3 Global Equity			1.00	0.93	0.79	0.08	-0.02	0.04	0.00	0.09	-0.10	0.57	0.38	0.17	0.14	0.00	0.49	0.44	0.53	0.45	0.39	0.38	0.65	0.34	0.58	0.32	0.08	
4 International Developed Equity				1.00	0.67	0.07	-0.01	0.04	0.01	0.09	-0.08	0.50	0.33	0.35	0.29	0.00	0.42	0.38	0.46	0.40	0.37	0.36	0.57	0.35	0.50	0.29	0.10	
5 Emerging Markets Equity					1.00	0.05	-0.02	0.02	0.00	0.06	-0.07	0.49	0.25	0.22	0.18	0.00	0.49	0.44	0.55	0.32	0.28	0.27	0.44	0.28	0.39	0.21	0.06	
6 Cash (Gov't)						1.00	0.48	0.56	0.26	0.23	0.27	0.16	0.01	0.21	0.39	0.67	0.21	0.15	0.12	0.25	0.12	0.14	0.08	0.26	0.07	0.10	0.49	
7 TIPS							1.00	0.28	0.09	0.08	0.09	0.07	-0.02	0.13	0.19	0.25	0.07	0.04	0.04	0.09	0.02	0.03	-0.01	0.29	-0.02	0.02	0.56	
8 Core Fixed Income (Market Duration)								1.00	0.84	0.82	0.80	0.34	-0.02	0.24	0.40	0.65	0.52	0.38	0.22	0.21	0.07	0.07	0.04	0.07	0.04	0.05	0.09	
9 Long Duration Bonds – Gov't / Credit									1.00	0.97	0.96	0.29	-0.02	0.19	0.33	0.52	0.50	0.37	0.17	0.13	0.02	0.02	0.01	-0.07	0.01	0.02	-0.16	
10 Long Duration Bonds – Credit										1.00	0.86	0.48	0.22	0.18	0.31	0.49	0.63	0.49	0.29	0.21	0.06	0.06	0.07	-0.05	0.08	0.05	-0.14	
11 Long Duration Bonds – Gov't											1.00	0.05	-0.27	0.19	0.33	0.52	0.33	0.22	0.02	0.05	-0.03	-0.02	-0.06	-0.08	-0.07	-0.03	-0.16	
12 High Yield Bonds												1.00	0.72	0.13	0.16	0.16	0.78	0.69	0.68	0.42	0.25	0.24	0.39	0.25	0.39	0.22	0.11	
13 Bank Loans													1.00	-0.02	-0.02	-0.02	0.50	0.44	0.47	0.31	0.18	0.17	0.28	0.07	0.29	0.16	0.05	
14 Non-US Developed Bonds (0% Hedged)														1.00	0.96	0.39	0.17	0.13	0.14	0.05	0.01	0.02	-0.02	0.32	-0.01	0.00	0.17	
15 Non-US Developed Bonds (50% Hedged)															1.00	0.64	0.24	0.17	0.15	0.10	0.03	0.03	-0.01	0.08	0.00	0.01	0.21	
16 Non-US Developed Bonds (100% Hedged)																1.00	0.29	0.20	0.10	0.17	0.05	0.06	0.01	0.13	0.00	0.04	0.22	
17 Emg. Mkt. Bonds (Sov. USD)																	1.00	0.76	0.74	0.37	0.21	0.20	0.32	0.21	0.32	0.18	0.02	
18 Emg. Mkt. Bonds (Corp)																		1.00	0.66	0.31	0.19	0.18	0.20	0.11	0.29	0.16	0.02	
19 Emg. Mkt. Bonds (Local)																			1.00	0.32	0.21	0.20	0.33	0.22	0.33	0.18	0.09	
20 Hedge Funds Universe																					1.00	0.25	0.24	0.33	0.17	0.32	0.21	0.12
21 Real Estate (Broad Market)																						1.00	0.95	0.52	0.08	0.30	0.17	0.07
22 Real Estate (Core)																							1.00	0.49	0.08	0.29	0.16	0.08
23 US REITs																								1.00	0.18	0.43	0.25	0.06
24 Commodities																									1.00	0.10	0.06	0.48
25 Private Equity																										1.00	0.27	0.05
26 Infrastructure																											1.00	0.06
27 Inflation																												1.00

Explanation of US Capital Market Assumptions (30 Years) – 2012 Q4

The following capital market assumptions were developed by Aon Hewitt's Global Asset Allocation Team and represent the long-term capital market outlook (i.e., 30 years) based on data at the end of the third quarter of 2012. The assumptions were developed using a building block approach, reflecting observable inflation and interest rate information available in the fixed income markets as well as Consensus Economics forecasts. Our long-term assumptions for other asset classes are based on historical results, current market characteristics, and our professional judgment.

Inflation – Expected Level (2.3%)

Based on Consensus Economics long-term estimates and our near-term economic outlook, we expect U.S. consumer price inflation to be approximately 2.3% during the next 30 years.

Real Returns for Asset Classes

Fixed Income

- Cash (0.3%) – Over the long run, we expect the real yield on cash and money market instruments to produce a real return of 0.3% in a moderate- to low-inflationary environment.
- TIPS (0.6%) – We expect intermediate duration Treasury Inflation-Protected Securities to produce a real return of about 0.6%.
- Core Fixed Income (i.e., Market Duration) (1.0%) – We expect intermediate duration Treasuries to produce a real return of about 0.6%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 0.4%, resulting in a long-term real return of 1.0%.

Explanation of US Capital Market Assumptions (30 Years) – 2012 Q4

- Long Duration Bonds – Government and Credit (1.4%) – We expect Treasuries with a duration comparable to the Long Government Credit Index to produce a real return of 0.9%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 0.5%, resulting in an expected real return of 1.4%.
- Long Duration Bonds – Credit (1.8%) – We expect Treasuries with a duration comparable to the Long Credit Index to produce a real return of 0.9%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 0.9%, resulting in an expected real return of 1.8%.
- Long Duration Bonds – Government (0.9%) – We expect Treasuries with a duration of ~12 years to produce a real return of 0.9% during the next 30 years.
- High Yield Bonds (2.5%) – We expect intermediate duration Treasuries to produce a real return of about 0.6%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 1.9%, resulting in an expected real return of 2.5%.
- Bank Loans (2.5%) – We expect LIBOR to produce a real return of about 0.9%. We estimate the fair value credit spread (credit risk premium + expected losses from defaults and downgrades) to be 1.6%, resulting in an expected real return of 2.5%.
- Non-US Developed Bonds: 50% Hedged (1.3%) – We forecast real returns for non-US developed market bonds to be 1.3% over a 30-year period after adjusting for a 50% currency hedge. We assume a blend of one-third investment grade corporate bonds and two-thirds government bonds. We also produce assumptions for 0% hedged and 100% hedged non-US developed bonds.

Explanation of US Capital Market Assumptions (30 Years) – 2012 Q4

- Emerging Market Bonds (Sovereign USD) (2.2%) – We forecast real returns for emerging market sovereign bonds denominated in USD to be 2.2% over a 30-year period.
- Emerging Market Bonds (Corporate USD) (2.7%) – We forecast real returns for emerging market corporate bonds denominated in USD to be 2.7% over a 30-year period.
- Emerging Market Bonds (Sovereign Local) (3.1%) – We forecast real returns for emerging market sovereign bond denominated in local currency to be 3.1% over a 30-year period.

Equities

- Large Cap U.S. Equity (5.1%) – This assumption is based on our 30-year outlook for large cap U.S. company dividends and real earnings growth. Adjustments are made for valuations as needed.
- Small Cap U.S. Equity (5.5%) – Adding a 0.4% return premium for small cap U.S. equity over large cap U.S. equity results in an expected real return of 5.5%. This return premium is theoretically justified by the higher risk inherent in small cap U.S. equity versus large cap U.S. equity, and is also justified by historical data. The 0.4% premium reflects the fact that the increase in the relative valuation of small caps equity versus large cap equity in recent years indicates that the risk premium demanded by investors may be shrinking.
- Global Equity (Developed & Emerging Markets) (6.1%) – We employ a building block process similar to the U.S. equity model using the developed and emerging equity markets that comprise the MSCI All-Country World Index. Our roll-up model produces an expected real return of 6.1% for global equity.

Explanation of US Capital Market Assumptions (30 Years) – 2012 Q4

- International (Non-U.S.) Equity, Developed Markets (6.1%) – We employ a building block process similar to the U.S. equity model using the non-U.S. developed equity markets that comprise the MSCI EAFE Index.
- Emerging Market Stocks (7.6%) - We employ a building block process similar to the U.S. equity model using the non-U.S. emerging equity markets that comprise the MSCI Emerging Markets Index.

Alternative Asset Classes

- Hedge Funds Universe (3.7%) – The generic category “hedge funds” encompasses a wide range of strategies. Our assumption is based on diversified and conservative fund-of-funds with more exposure to non-directional strategies than directional or equity-oriented investments. Our assumption is somewhat more conservative than historical results to account for flaws inherent in hedge funds indices, including survivorship bias and self-reporting bias. We also assume the median manager is selected. A top-tier portfolio of individual managers (hedge funds buy-list) could add an additional 1.7% in return at similar volatility based on alpha, lower fees (i.e., fewer fund-of-funds fees), and better risk management.
- Real Estate (5.0%) – Our real return assumption for broad real estate market is based on a gross income of about 7%, management fees of roughly 2%, and future capital appreciation slightly below inflation during the next 30 years. We assume a portfolio of equity real estate holdings that is diversified by property type and by geographic region.
- Core Real Estate (4.0%) – Our real return assumption for core real estate is based on a gross income of about 6%, management fees of roughly 2%, and future capital appreciation slightly below inflation during the next 30 years. We assume a portfolio of equity real estate holdings that is diversified by property type and geographic region.

Explanation of US Capital Market Assumptions (30 Years) – 2012 Q4

- U.S. REITs (3.9%) – Our real return assumption for U.S. REITs is based on income of about 4.0% and future capital appreciation near the rate of inflation during the next 30 years. REITs are a sub-set of the U.S. small/mid cap equity universe.
- Commodities (3.0%) – Our commodity assumption is for a diversified portfolio of commodity futures contracts. Commodity futures returns are composed of three parts: spot price appreciation, collateral return, and roll return (positive or negative change implied by the shape of the future curve). We believe that spot prices will converge with CPI over the long run (i.e., 2.3%). Collateral is assumed to be LIBOR cash 0.9%. Also, we believe the roll effect will be near zero, resulting in a real return of about 3.0% for commodities.
- Private Equity (7.2%) – Our private equity assumption reflects a diversified fund of funds with exposure to buyouts, venture capital, distressed debt, and mezzanine debt.
- Infrastructure (6.3%) – Our infrastructure assumption is formulated using a cash flow based approach that projects cash flows (on a diversified portfolio of assets) over a 30 year period. Income and capital growth as well as gearing levels, debt costs and terms, relevant tax and management expenses are all taken into consideration. Our approach produces an expected real return of 6.3% for infrastructure.

Explanation of US Capital Market Assumptions (30 Years) – 2012 Q4

Volatility / Correlation Assumptions

- Assumed volatilities are formulated with reference to implied volatilities priced into option contracts of various terms, as well as with regard to historical volatility levels. For asset classes which are not marked to market (for example real estate), we “de-smooth” historical returns before calculating volatilities. Importantly, we consider expected volatility trends in the future – in recent years we assumed the re-emergence of an economic cycle and a loss of confidence in central bankers would lead to an increase in volatility. Correlation assumptions are generally similar to actual historical results; however, we do make adjustments to reflect our forward-looking views as well as current market fundamentals.