Commonwealth of Pennsylvania
Public School Employees' Retirement System

DATE: May 28, 2014

SUBJECT: Proposed Revisions to the Investment Policy Statement, Objectives, and Guidelines

TO: Members of the Finance Committee

FROM: James H. Grossman, Jr., CPA, CFA
Chief Investment Officer

At the June 12, 2014 Finance Committee Meeting, we will request that the Committee adopt Exhibit B (new exhibit) and the proposed revisions to Exhibits C & D (previously exhibits B & C) of the Investment Policy Statement, Objectives, and Guidelines ("IPS").

Exhibit B

Staff and Hewitt EnnisKnupp (HEK) will recommend the Board adopt a 10-Year Target Allocation which is intended to provide a road map for our long-term asset allocation. This is a new Exhibit and will be discussed during the Finance Committee. The first paragraph of the exhibit more fully explains the purpose of Exhibit B.

Exhibits C and D

Staff and HEK will recommend modest changes to the Current Target Allocation (Exhibit C) effective October 1, 2014. These changes also flow through to the Policy Index (Exhibit D). The following changes will be recommended:

- Decrease the allocation to Publicly-traded Global Equity from 19.0% to 17.0%;
- Increase the allocation to Real Estate from 13.0% to 14.0% (increase reflects the actual allocation, not a tactical increase in the allocation);
- Increase the allocation to Risk Parity from 5.0% to 8.0%;
- Increase the allocation to Master Limited Partnerships (MLPs)/Infrastructure from 3.0% to 4.0% (note that Infrastructure was added as a potential expansion of the MLP allocation to other areas); and,
- Increase the amount of Leverage from 9.0% to 12.0%.

The decrease in Publicly-traded Global Equity is an offset to the increase in Real Estate and MLPs. Over the next few years, as distributions start to outpace contributions to both our

Private Markets and Real Estate programs, we anticipate decreasing the allocations to Private Markets and Real Estate and increasing the allocation to Publicly-traded Global Equity as shown in the 10-Year Target Allocation. The increase in the allocation to Real Estate is based on the current actual allocation. The increase in MLPs is due to its attractive projected risk/return profile over the next decade. The increase in Risk Parity provides a risk-balanced approach in a very liquid manner to global market risk premiums. Leverage will be increased by 3% to fund the total net increase in the other asset classes. Given the very low yields on cash investments, a prudent use of leverage will allow the Fund to obtain incremental returns without incurring much incremental risk. Policy ranges are generally consistent with last year's allocation with the exception of Net Leverage which is slightly higher (2% on the high end).

The net result of these changes is a modest increase in the expected return (7.61% vs. 7.50%) and a modest increase in expected risk (11.17% vs. 11.16%) using HEK's capital market assumptions.

Also please note the revisions to the format of Exhibit C. We have broken the asset allocation into the following investment types which coincide with their purpose in a diversified portfolio:

- Equity Exposure
- Fixed Income Exposure
- Real Asset Exposure
- Risk Parity (which is a combination the previous three exposures using a risk-balanced approach)
- Absolute Return (should have very little exposure to equity, fixed income, or real asset beta)
- Net Leverage

We have also included a breakdown of the sources of exposure from either the cash markets on a fully-funded basis or planned exposures obtained through leverage. Leverage can be used to gain exposure to any of the publicly-traded markets within the Board-approved Policy Ranges.

Exhibit D was reformatted to match the format of Exhibits B and C. Major changes to the Policy Index include:

- Decreased the MSCI ACW IMI with USA (gross) Index from 19.0% to 15.5%;
- Added the MSCI Emerging Markets Equity Index with an allocation of 1.5% to acknowledge a strategic exposure to emerging market equities;
- Increased the Real Estate policy weight from 13.0% to 14.0%;
- Increased the MLP policy weight from 3.0% to 4.0%;
- Increased the Risk Parity policy weight from 5.0% to 8.0%; and
- Increased the Financing Cost of Leverage from (9.0%) to (12.0%).

Exhibit D is effective October 1, 2014 except for the change to the Absolute Return benchmark, which is effective July 1, 2014 as approved by the Finance Committee at the May 1, 2014 Finance Committee meeting, and the change to the Risk Parity benchmark which staff and HEK recommend be revised as follows to better represent the objectives of the risk parity allocation:

	Previous Benchmark	Recommended Benchmark
MSCI ACWI ($Net)	35%	50%
Barclays Capital U.S. Treasury Index	75%	75%
Barclays Capital World Inflation Bond Index (Hedged)	120%	55%
DJ/UBS Commodity Index	15%	15%
DJ/UBS Gold Subindex	5%	5%
3-Month LIBOR	(150%)	(100%)

In addition, the Real Estate policy index was revised due to the discontinuation of the calculation of the All Opportunistic sub-index by NTFI. Effective March 31, 2014, we started to use the Closed-End Value-Added Index by NFI as a proxy for our opportunistic real estate exposure until such time as staff, HEK, and Courtland Partners can find a suitable replacement. A revised definition of NFI is included in your materials.

In addition to quarterly performance, HEK will be covering the Asset/Liability Study, including asset allocation changes, at the Finance Committee meeting.

If you have any questions regarding the changes to Exhibits B, C, and D, please contact me at 717-720-4703.

Pennsylvania School Employees' Retirement System

Pension Asset Liability Study: Recommendations
June 12, 2014

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Outline

Executive Summary

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Observations and Conclusions

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Executive Summary

Executive Summary

- At the last Board meeting, we presented the preliminary results from the asset/liability modeling and asset allocation exercise
  - Analysis showed that investment returns alone would not close PSERS' funding gap – a combination of prudent funding and investment returns is the solution
  - Additionally, given the proportion that net cash flows represent of total assets, liquidity could be challenged, especially in pessimistic market scenarios
    - A prudent reduction in the exposure to illiquid asset classes over time is necessary to meet PSERS' liquidity needs
  - PSERS' asset allocation results in better diversification of risk than a traditional asset allocation (60/40 equity/bond mix)
    - Incorporates exposure to all major traditional and alternative asset classes
    - Expected return over the long term expected to meet or exceed actuarial rate of return with an attractive Sharpe Ratio (utilizing reasonable levels of leverage at the aggregate fund level)

Executive Summary (Cont'd…)

- At today's meeting we present recommendations on asset allocation for the Board's consideration
  - Since the last meeting, Staff and HEK have continued to analyze appropriate asset allocation choices given PSERS' circumstances
  - Recommend modest changes to current policy mix for next year, with implementation set for October 2014
  - Also provide recommended long-term policy mix (10-years) that reflects a scaling down on allocation to illiquid assets
  - Recommended portfolio emphasizes continued build out of the risk-balancing approach that has been adopted and implemented over the past four plus years
  - Recommended portfolio offers an attractive risk-adjusted return to meet actuarial objectives, while at the same time providing for greater liquidity

Executive Summary – Portfolios Recommended for Consideration

Asset Class	Current Target	Recommended for Next Year	10-Year Target Allocation
Global Equities	18.0%	15.5%	20.5%
Emerging Market Equities	-	1.5	2.0
Private Equity	21.0	21.0	15.0
Total Equities	***39.0***	***38.0***	***37.5***
U.S. Bonds	5.0	5.0	5.0
Global Bonds	1.0	1.0	1.0
Emerging Market Debt	2.0	2.0	2.0
U.S. Treasuries	3.0	3.0	2.5
High Yield Debt	6.0	6.0	6.0
U.S. TIPS	12.0	12.0	12.0
Total Fixed Income	***29.0***	***29.0***	***28.5***
Real Estate	14.0	14.0	12.0*
MLPs & Infrastructure	3.0	4.0	5.0
Commodities	4.0	4.0	5.0
Gold	2.0	2.0	3.0
Total Real Assets	***23.0***	***24.0***	***25.0***
Risk Parity	***5.0***	***8.0***	***10.0***
Absolute Return	***10.0***	***10.0***	***10.0***
Cash	3.0	3.0	3.0
Leverage	-9.0	-12.0	-14.0
Notional Leverage	***-6.0***	***-9.0***	***-11.0***
Total	**100.0**	**100.0**	**100.0**

*Includes publicly traded real estate (REITS)

Asset Liability Projection Analysis: Act 120 Contributions

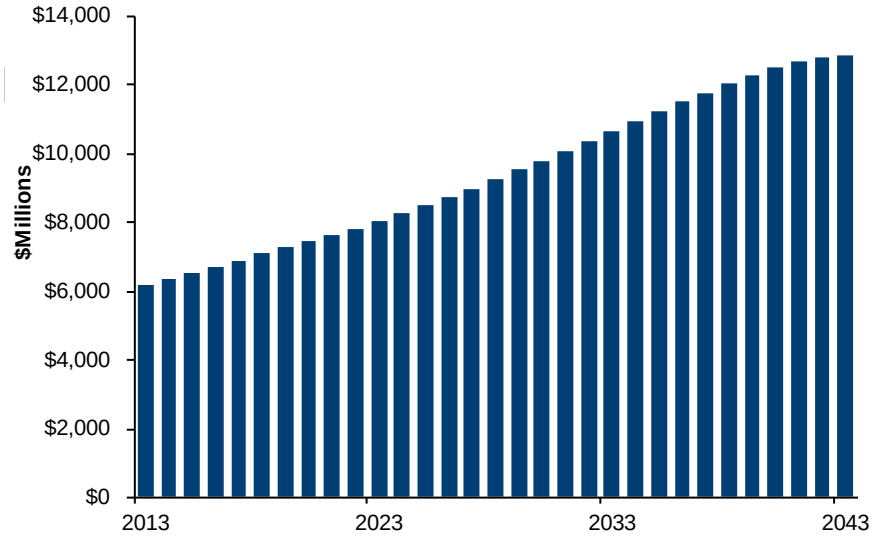
Overview

- This section of the presentation covers the asset/liability projections and includes comparisons of key financial metrics across the current and recommended portfolio
- For the purpose of the asset/liability projections, we have focused on the long-term (10-year) portfolio, given the long-term nature of the exercise

PSERS 6/30/2013 Asset-Liability Profile

Asset-Liability Snapshot as of 6/30/2013			
Metric ($, Millions)	**Value**	**Fund %: (MVA)**	**(AVA)**
Market Value of Assets	$49,116		
Actuarial Value of Assets	$57,453		
Liability Metrics			
Actuarial Liability (AL)	$90,052 [1]	55%	64%

Expected Benefit Payments



Asset Allocation as of 6/30/2013	
Metric	**Alloc %**
Global Equity	19%
Private Equity	21%
Real Estate	13%
MLPs	3%
Hedge Funds	15%
Commodities	6%
High Yield Bonds	6%
Emerging Market Debt	2%
Core Bonds	5%
US Long Treasuries	3%
TIPS	12%
Developed Int'l Debt	1%
Cash & Short Duration Bonds	-6%

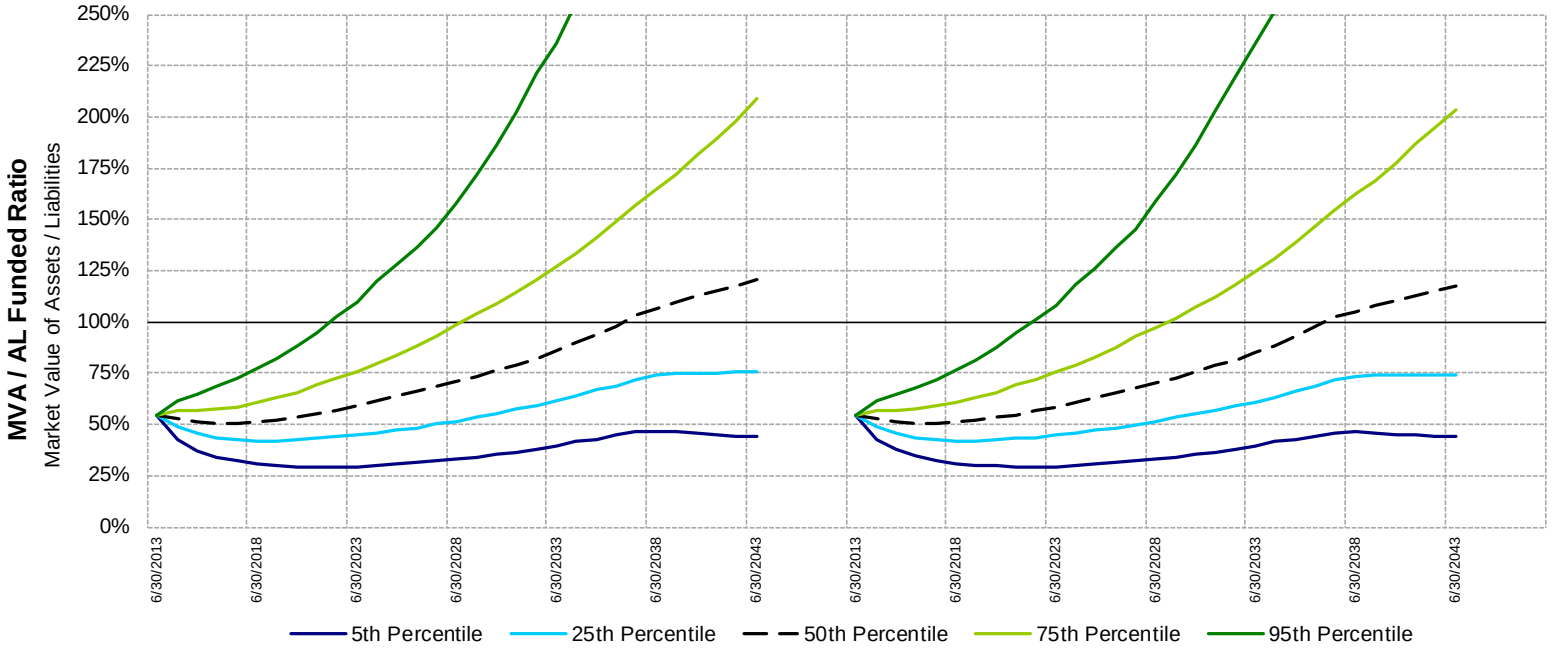
Asset-Liability Growth Metrics			
Metric ($, Millions)	**Value**	**% Liability**	**% Assets**
AL Interest Cost	$6,753.9	7.5%	13.8%
AL Normal Cost	$2,063.1	2.3%	4.2%
Total Liability Hurdle Rate	**$8,817.0**	**9.8%**	**18.0%**
Expected Return on Assets	$3,683.7	4.1%	7.5%
ER + EE Contributions	$2,702.1	3.0%	5.5%
Total Exp. Asset Growth	**$6,385.8**	**7.1%**	**13.0%**
Hurdle Rate Shortfall	**-$2,431.2**	**-2.7%**	**-5.0%**
Benefit Payments	$6,177.5	6.9%	12.6%

[1] Based on plan's valuation interest rate of 7.50%

Risk/Return Profile: Current and Recommended Portfolios

Asset Class	A Current (85% RS, 9% Lvg)	B Proposed Next Year (88% RS, 12% Lvg	C Proposed 10 Year Target (90% RS, 14% Lvg)
Return-Seeking	**85%**	**88%**	**90%**
- Global Equity	19%	17%	22%
- Private Equity	21%	21%	15%
- Real Estate	13%	14%	12%
- MLPs / Infrastructure	3%	4%	5%
- Hedge Funds	10%	10%	10%
- Risk Parity	5%	8%	10%
- Commodities	6%	6%	8%
- High Yield Bonds	6%	6%	6%
- Emerging Market Debt	2%	2%	2%
Risk-Reducing	**24%**	**24%**	**24%**
- Core Bonds	5%	5%	5%
- US Long Treasuries	3%	3%	3%
- Developed Int'l Debt	1%	1%	1%
- TIPS	12%	12%	12%
- Cash	3%	3%	3%
Leverage	**-9%**	**-12%**	**-14%**
- Leveraged Cash	-9%	-12%	-14%
Total	**100%**	**100%**	**100%**
10 Year Expected Return	**7.47%**	**7.57%**	**7.43%**
10 Year Expected Risk	11.16%	11.18%	11.00%
10 Year Sharpe Ratio	0.401	0.409	0.403
10 Year Expected Inflation	2.20%	2.20%	2.20%
30 Year Expected Return	**7.93%**	**7.99%**	**7.86%**
30 Year Expected Risk	11.55%	11.56%	11.36%
30 Year Sharpe Ratio	0.306	0.311	0.304
30 Year Expected Inflation	2.30%	2.30%	2.30%

Market Value of Assets / Actuarial Liability Funded Ratio



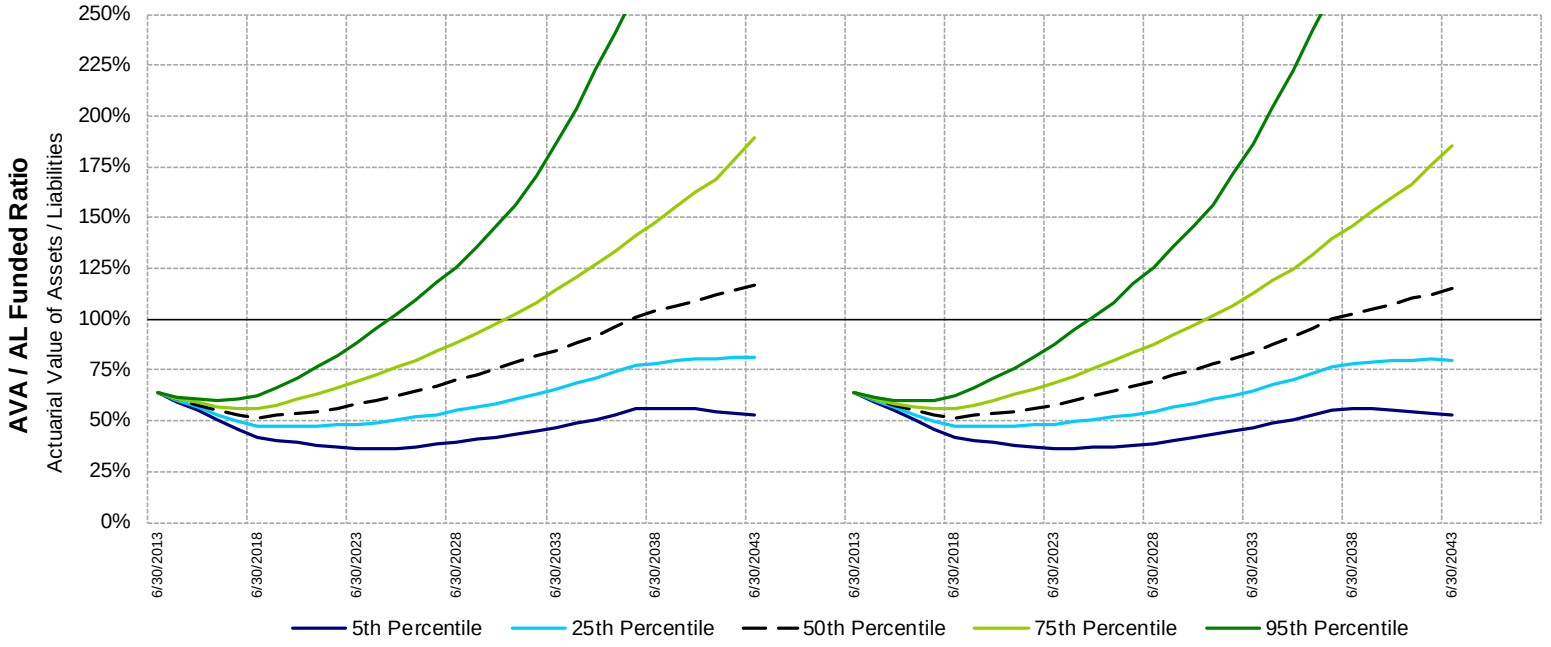
Strategy	Current (85% RS, 9% Lvg)			Proposed Target (90% RS, 14% Lvg)		
Year	**6/30/2023**	**6/30/2033**	**6/30/2043**	**6/30/2023**	**6/30/2033**	**6/30/2043**
5th Percentile	29%	40%	44%	29%	40%	44%
25th Percentile	45%	62%	75%	45%	61%	74%
50th Percentile	59%	86%	**121%**	59%	85%	**118%**
75th Percentile	76%	127%	209%	75%	125%	204%
95th Percentile	110%	236%	563%	108%	236%	538%
Probability > 100%	**11%**	**41%**	**61%**	**10%**	**41%**	**60%**

Key Takeaways:

- Under the current policy, the funded ratio exceeds 100% in 61% of projected outcomes

* Projections assume constant 7.5% discount rate for pension liabilities for all investment policies studied

Actuarial Value of Assets / Actuarial Liability Funded Ratio



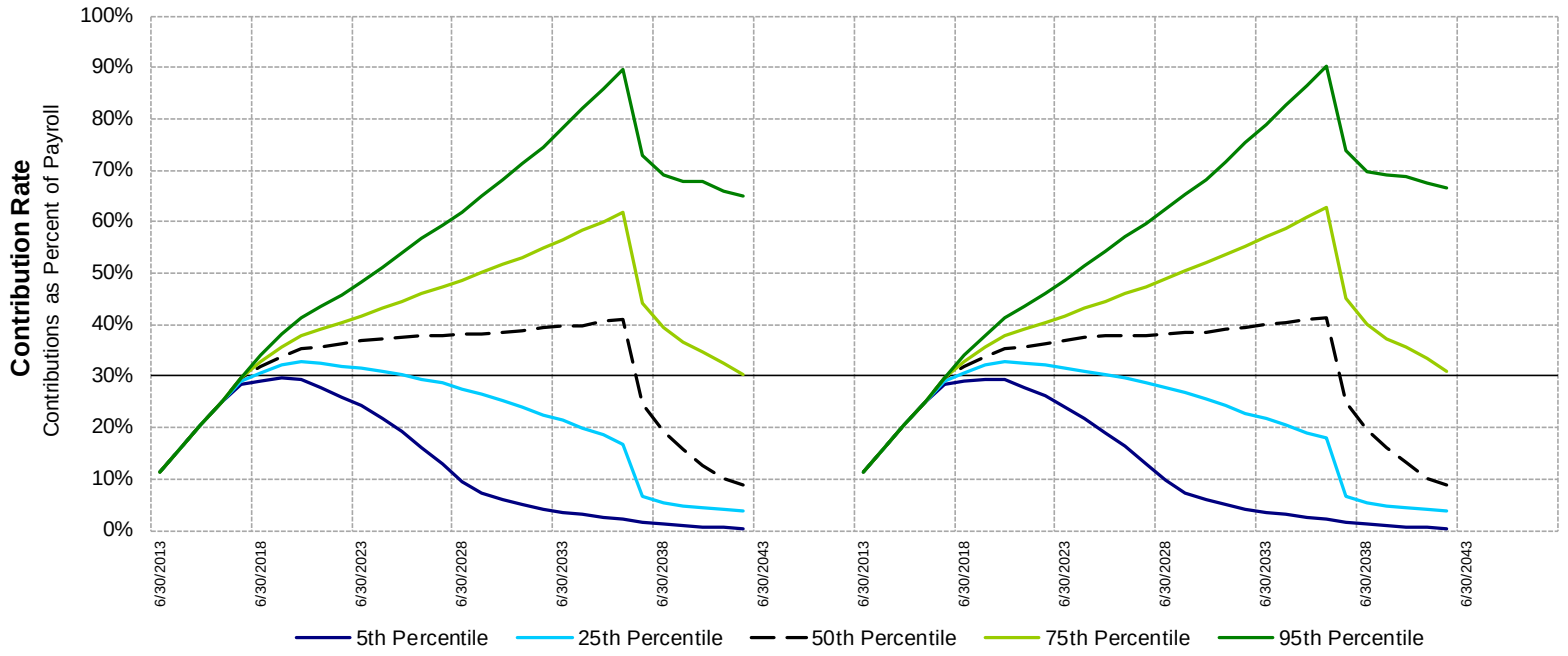
Strategy	Current (85% RS, 9% Lvg)			Proposed Target (90% RS, 14% Lvg)		
Year	**6/30/2023**	**6/30/2033**	**6/30/2043**	**6/30/2023**	**6/30/2033**	**6/30/2043**
5th Percentile	36%	47%	53%	36%	47%	53%
25th Percentile	48%	66%	81%	48%	65%	80%
50th Percentile	58%	84%	**117%**	58%	84%	**115%**
75th Percentile	69%	114%	189%	69%	113%	186%
95th Percentile	88%	186%	450%	88%	186%	448%
Probability > 100%	**<5%**	**37%**	**62%**	**<5%**	**36%**	**61%**

Key Takeaways:

- Under the current policy, the funded ratio exceeds 100% in 62% of projected outcomes

* Projections assume constant 7.5% discount rate for pension liabilities for all investment policies studied

Employer Contribution Rate



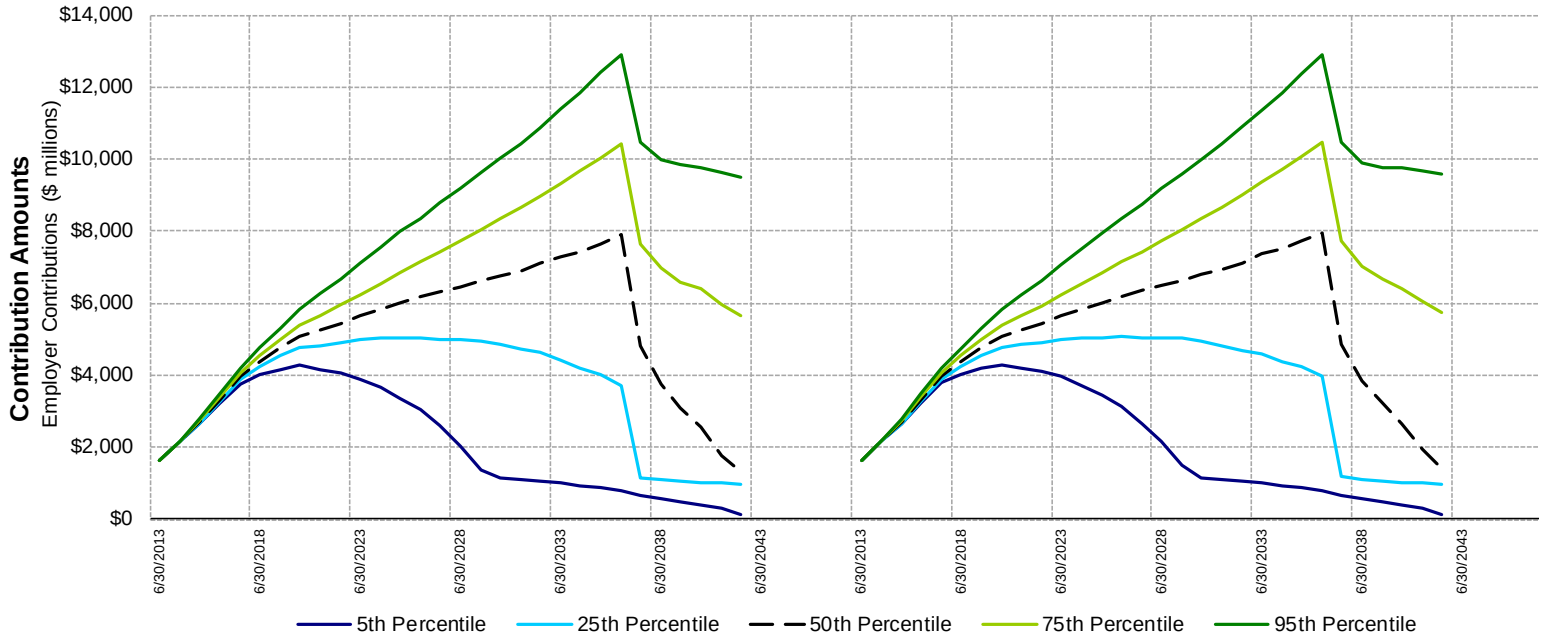
Strategy	Current (85% RS, 9% Lvg)			Proposed Target (90% RS, 14% Lvg)		
Year	**6/30/2022**	**6/30/2032**	**6/30/2042**	**6/30/2022**	**6/30/2032**	**6/30/2042**
5th Percentile	26%	4%	0%	26%	4%	0%
25th Percentile	32%	23%	4%	32%	23%	4%
50th Percentile	36%	39%	**9%**	36%	40%	**9%**
75th Percentile	40%	55%	30%	40%	55%	31%
95th Percentile	46%	75%	65%	46%	75%	67%
Probability > 30%	**82%**	**64%**	**25%**	**82%**	**64%**	**26%**

Key Takeaways:

- Act 120 contribution collar drives contribution rate in early years
- In the expected case, the contribution rate will level out at around 40% before dropping in 2036 due to full recognition of the initial Act 120 amortization amount

* Projections assume constant 7.5% discount rate for pension liabilities for all investment policies studied

Employer Contribution Dollars



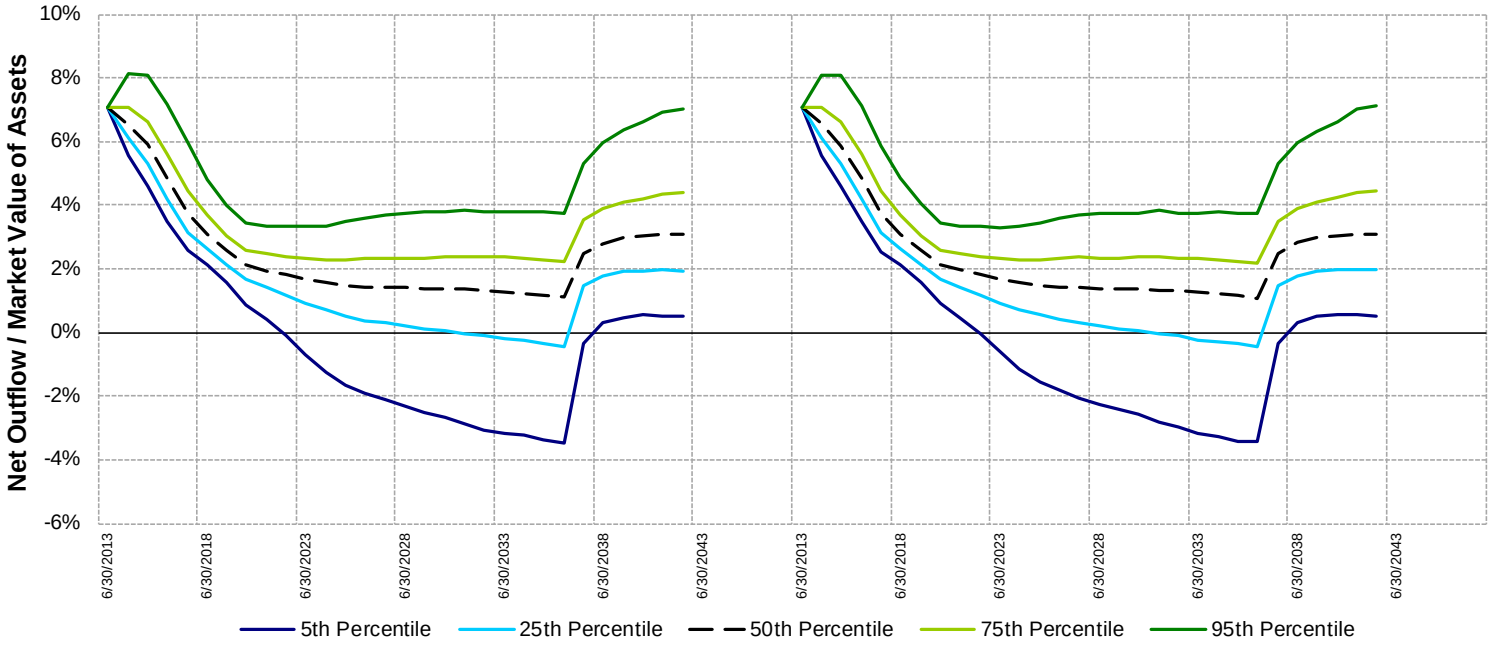
Strategy	Current (85% RS, 9% Lvg)			Proposed Target (90% RS, 14% Lvg)		
Year	6/30/2022	6/30/2032	6/30/2042	6/30/2022	6/30/2032	6/30/2042
5th Percentile	$4,052	$1,059	$154	$4,095	$1,054	$154
25th Percentile	$4,902	$4,622	$981	$4,901	$4,667	$977
50th Percentile	$5,427	$7,113	**$1,335**	$5,434	$7,121	**$1,397**
75th Percentile	$5,944	$8,982	$5,659	$5,934	$8,997	$5,759
95th Percentile	$6,665	$10,882	$9,491	$6,630	$10,895	$9,592

Key Takeaways:

- Act 120 contribution collar drives contribution amounts in early years
- In the expected case, contribution amounts approach $8B before dropping in 2036 due to full recognition of the initial Act 120 amortization amount

* Projections assume constant 7.5% discount rate for pension liabilities for all investment policies studied

Net Outflow Analysis



Strategy	Current (85% RS, 9% Lvg)			Proposed Target (90% RS, 14% Lvg)		
Year	**6/30/2022**	**6/30/2032**	**6/30/2042**	**6/30/2022**	**6/30/2032**	**6/30/2042**
5th Percentile	0%	-3%	1%	0%	-3%	1%
25th Percentile	1%	0%	2%	1%	0%	2%
50th Percentile	2%	1%	**3%**	2%	1%	**3%**
75th Percentile	2%	2%	4%	2%	2%	4%
95th Percentile	3%	4%	7%	3%	4%	7%
Probability > 0%	**93%**	**73%**	**>95%**	**94%**	**73%**	**>95%**

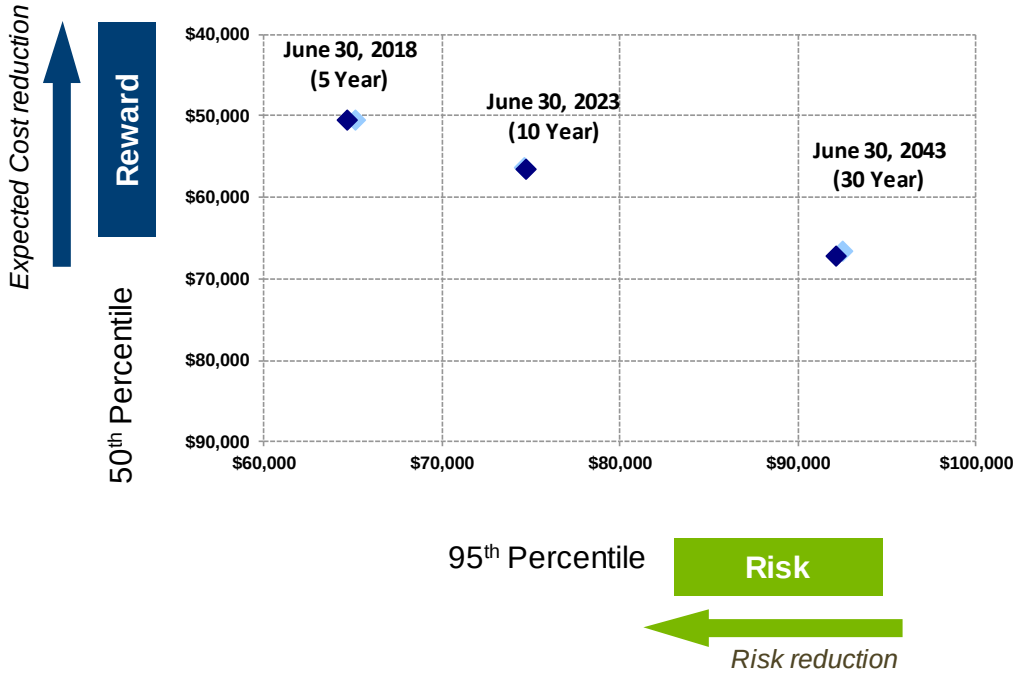
Key Takeaways:

- Large net outflows result from Act 120 imposed limits on funding, increasing the need for liquidity in early years
- If PSERS funds the actuarial required contribution, net outflow will be less than 4% per year for the next 25 years

* Projections assume constant 7.5% discount rate for pension liabilities for all investment policies studied

Economic Cost
5 Year, 10 Year, and 30 Year Horizons

Present Value of Contributions plus AL Funding Shortfall/(Surplus)* at 7.50%, $millions



Strategy ($Millions)	June 30, 2018 Cost	Risk
Current (85% RS, 9% Lvg)	$50,514	$65,127
Proposed Target (90% RS, 14% Lvg)	$50,627	$64,709

Strategy ($Millions)	June 30, 2023 Cost	Risk
Current (85% RS, 9% Lvg)	$56,363	$74,601
Proposed Target (90% RS, 14% Lvg)	$56,545	$74,680

Strategy ($Millions)	June 30, 2043 Cost	Risk
Current (85% RS, 9% Lvg)	$66,660	$92,496
Proposed Target (90% RS, 14% Lvg)	$67,264	$92,114

Key Takeaways:

- Proposed target portfolio exhibits risk/reward trade-off relative to the current policy
- The magnitude of the risk/reward trade-off changes over a longer-term projection

* Projections assume constant 7.5% discount rate for pension liabilities for all investment policies studied

Observations from Asset Liability Projection Analysis

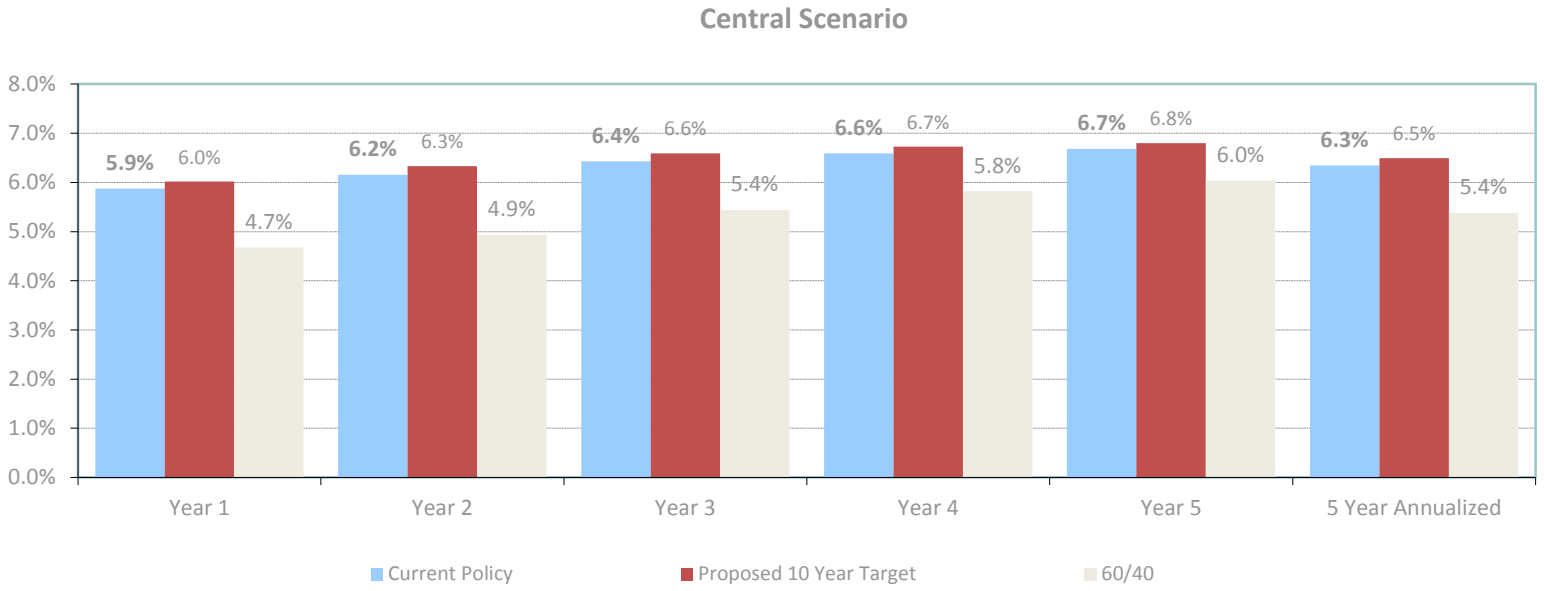
- The plan is projected to attain 100% funding within 25 years assuming Act 120 funding rates. Lower contribution rates may be sustainable, but with significant risk to the fund's solvency
- Investment returns alone will likely not solve the shortfall – the solution to today's funding shortfall will likely be a combination of prudent funding and positive investment performance
- The current fund liquidity also poses a hazard, particularly in pessimistic economic scenarios. A reduction in the illiquid asset exposure may be warranted

Asset-Only Scenario Analysis – Deterministic Basis

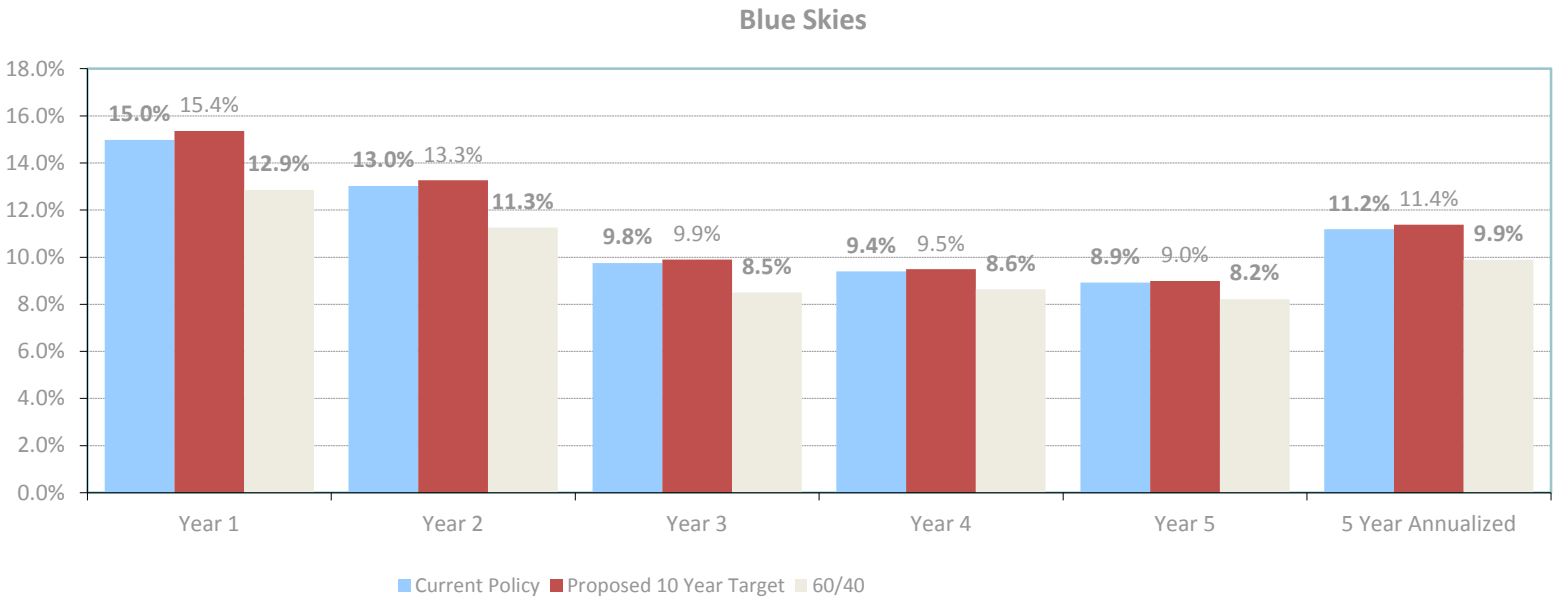
Overview

- In this section of the presentation, we analyze portfolio outcomes (asset-only basis) across a range of potential economic scenarios over the next five years
- We compare the current and the recommended portfolio outcomes against those that would result from a portfolio comprising 60/40 global equities/bond
- Across all scenarios, the current and recommended portfolio perform favorably relative to a 60/40 portfolio on account of their better diversification and efficiency
- Additionally, the recommended portfolio performs in line with or favorably relative to the current portfolio across all scenarios

Modeled Portfolios – Central Scenario

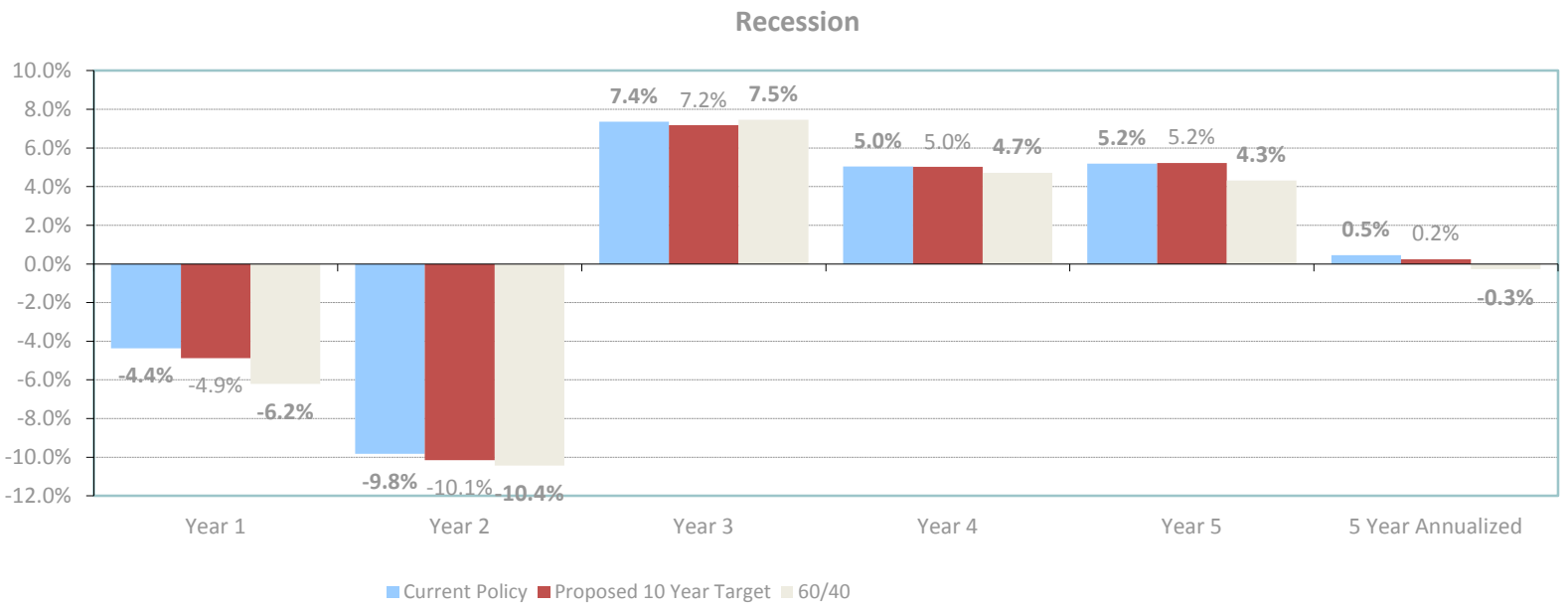


Modeled Portfolios – Blue Skies



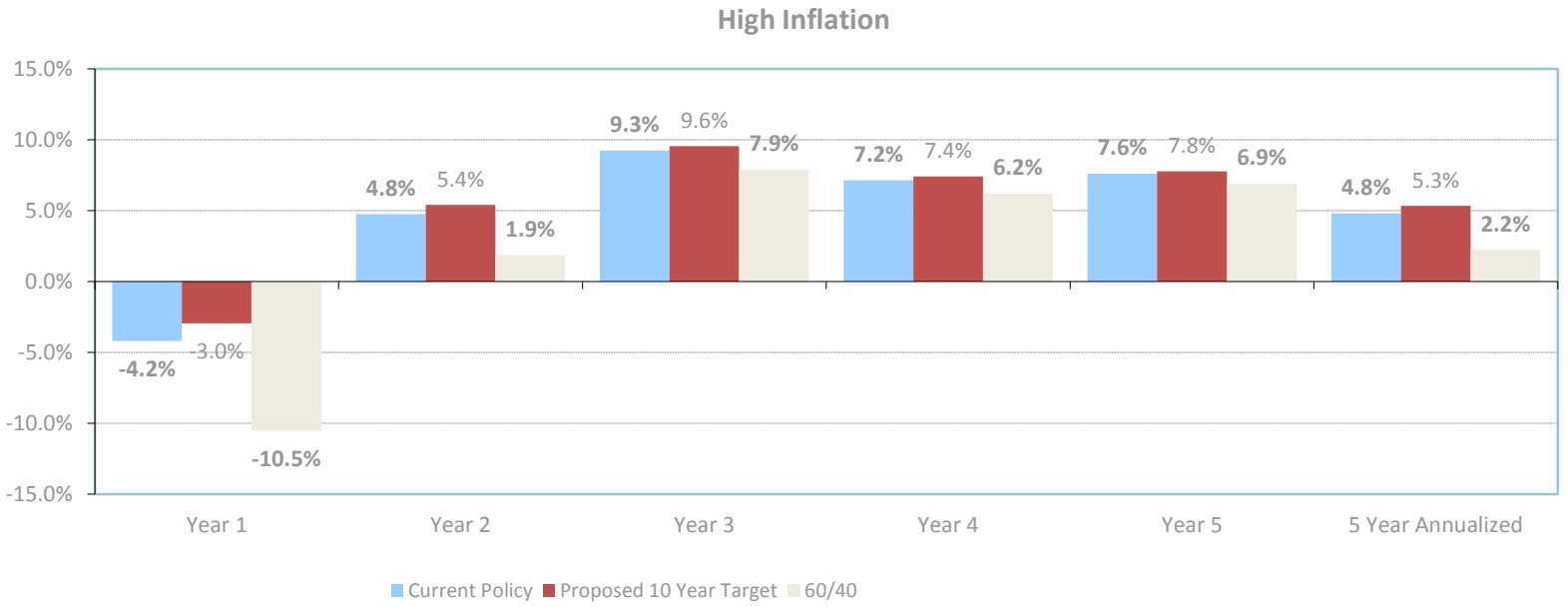
Portfolios with the highest equity and real estate allocations perform best

Modeled Portfolios – Recession



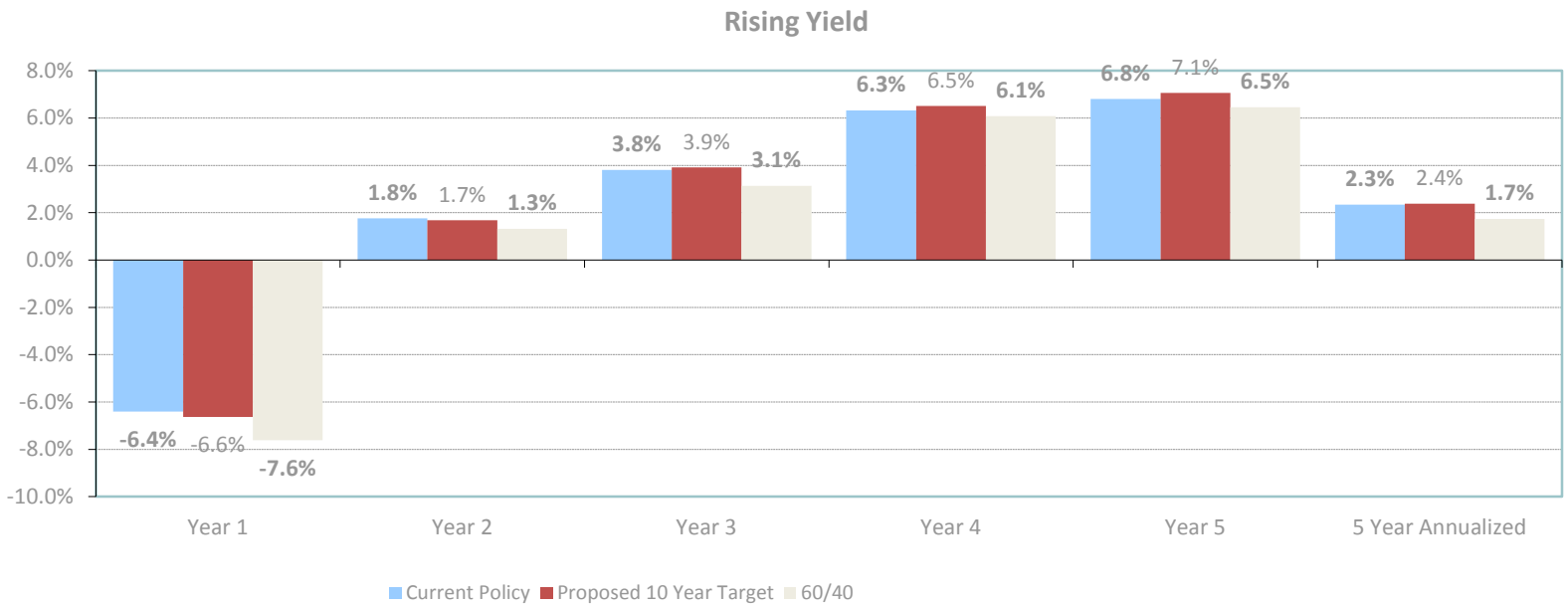
- Flight to quality helps risk parity with its heavy exposure to government bonds in the early years
- Equities begin to recover in year 3 and beyond
- Yields rising from very low levels, hurts bonds in the later years

Modeled Portfolios – High Inflation



- Rising yields hurt bond returns in the first year. Equities fall as well.
- Higher commodity allocations help returns in the first two years as commodities rally
- Risk assets have a strong rebound in the third year
- Bonds prices begin to recover in the later years

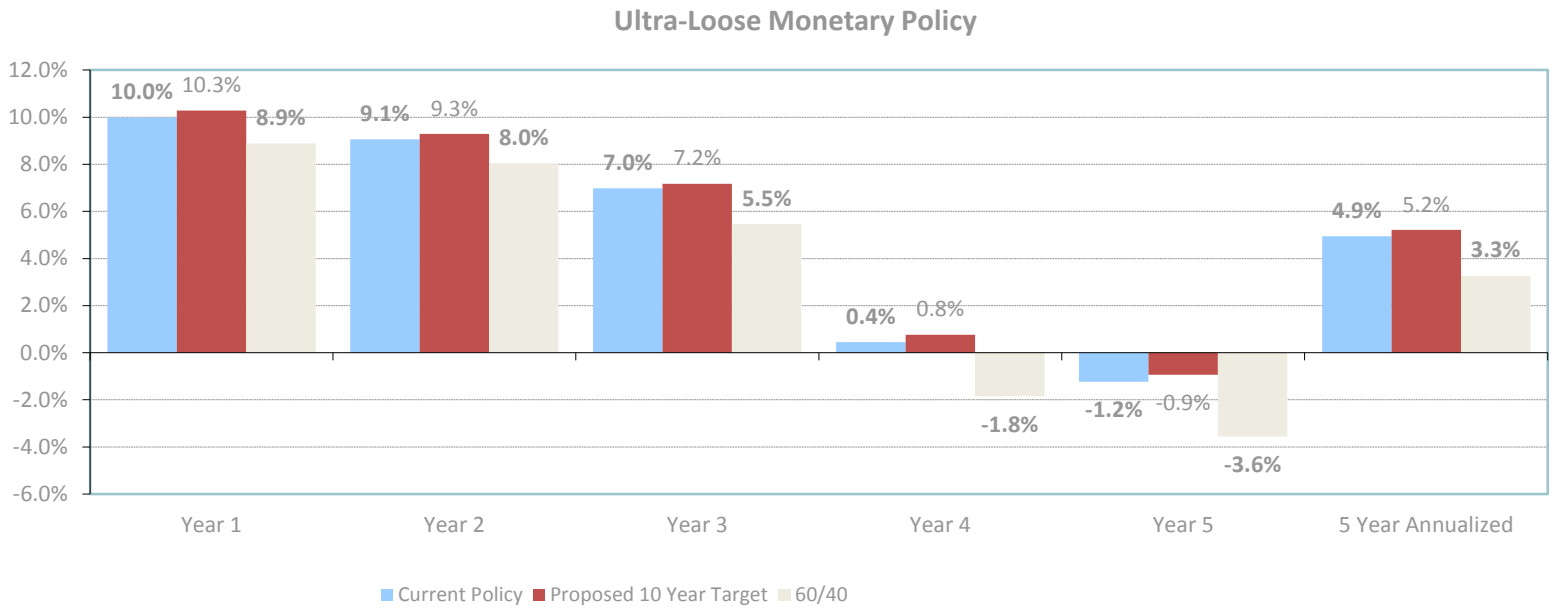
Modeled Portfolios – Rising Yield



- Bond returns are poor in the early years and then begin to recover in the later years

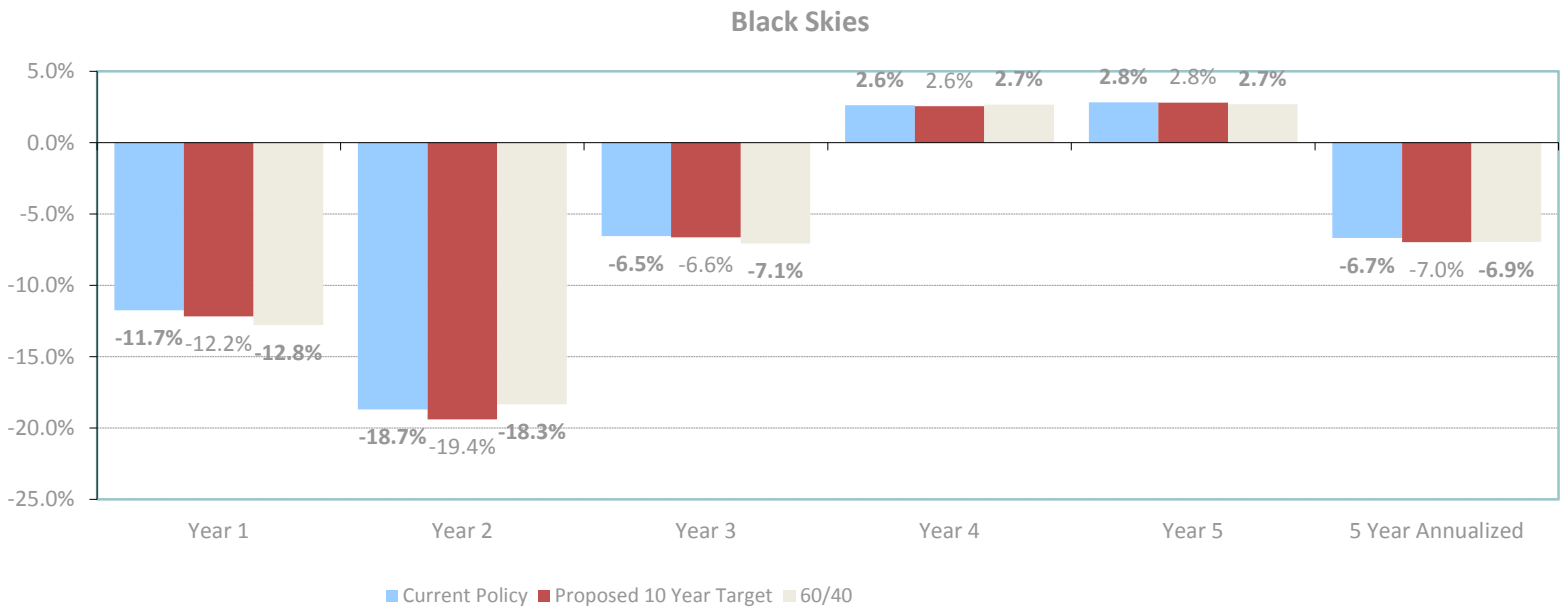
- Lower profit margins cause negative equity returns in the first few years. Equity returns recover in the later years, however equity returns remain below average for the remainder of the period

Modeled Portfolios – Ultra-Loose Monetary Policy



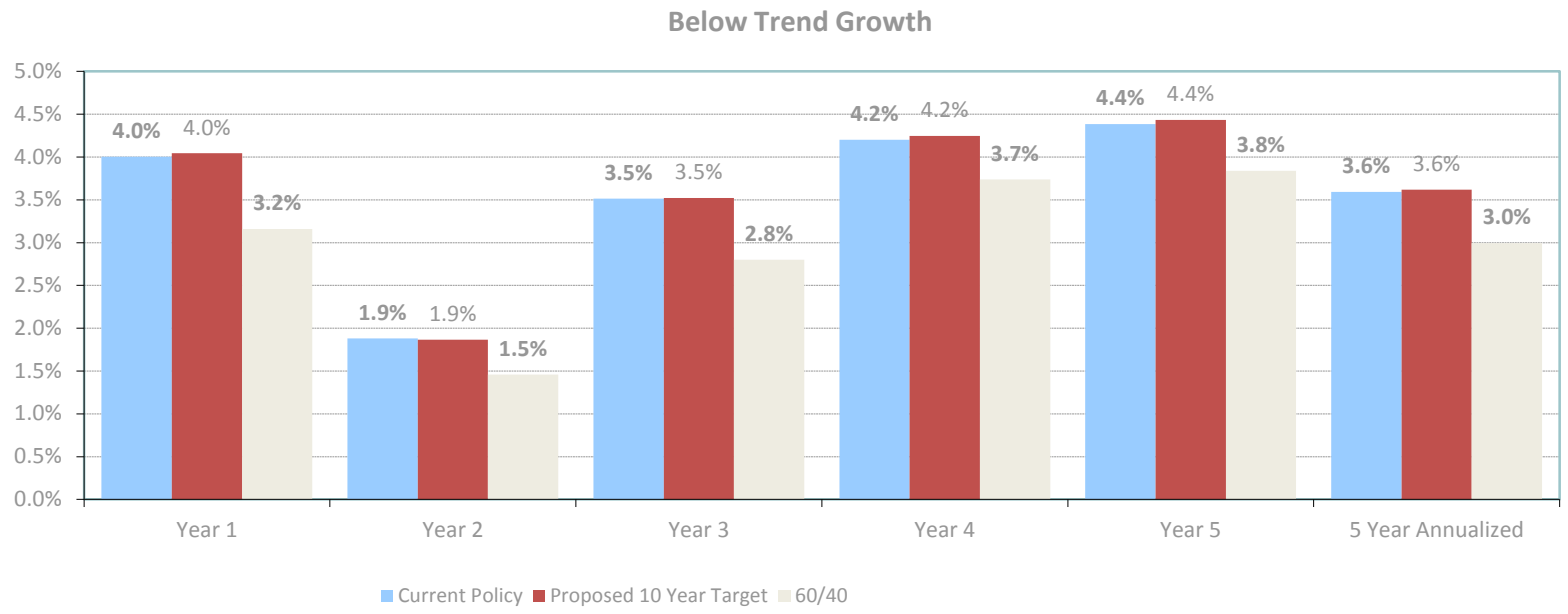
- Low rates and stable inflation help risk assets and bonds in the first few years
- Worries about a withdrawal of quantitative easing and higher inflation results in higher yields in the later years hurting both equities and bonds

Modeled Portfolios – Black Skies



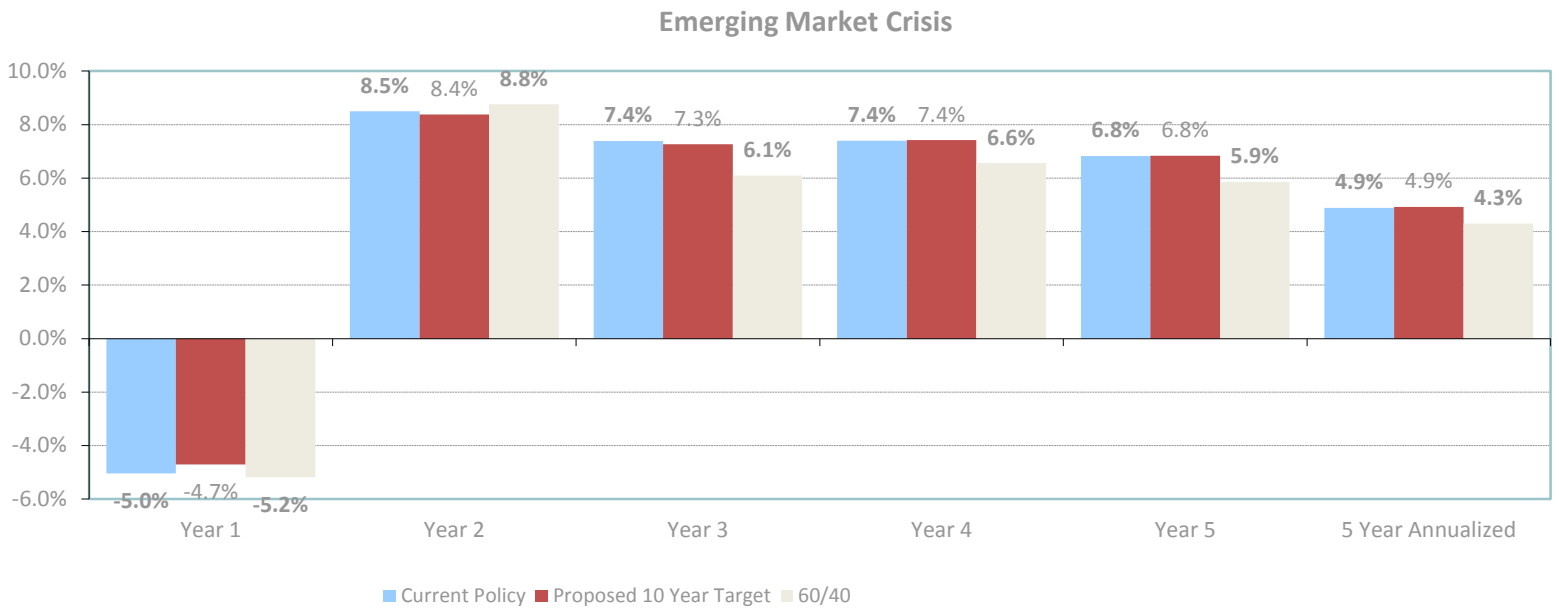
- Flight to quality and falling rates provides a positive environment for government bonds in the first year
- Risk assets are down sharply in the first three years and turn positive in the later years, however returns remain below average for the remainder of the period
- Government bonds perform poorly in the later years as yields begin to rise from very low levels

Modeled Portfolios – Below Trend Growth



- Government spending is cut resulting in slowing economic growth which keep rates and inflation low helping government bonds
- Yields begin to rise from very low levels in the later years which produces low/negative bond returns
- Lower government spending creates a long-term drag on the economy which results in below average returns for risk assets

Modeled Portfolios – Emerging Market Crisis



- Problems in emerging markets spreads to most risk assets in the first year
- U.S. bonds perform well as there is a flight to quality, in the first year
- As a result of the crisis, monetary policy is loosened helping most risk assets recover in the later years, however U.S. bond returns are hurt

Observations and Conclusions

Observations and Conclusions

- Asset/liability analysis showed that investment returns alone would not close PSERS' funding gap – a combination of prudent funding and investment returns is the solution
- Additionally, given the proportion that net cash flows represent of total assets, liquidity could be challenged, especially in pessimistic market scenarios; prudent reduction in allocation to illiquid asset classes is necessary in order to meet PSERS' liquidity needs
- The asset allocation recommended for consideration has an expected return over the long term that is expected to meet or exceed actuarial rate of return with an attractive Sharpe Ratio (utilizing reasonable levels of leverage at the aggregate fund level)
  - Recommended portfolio emphasizes continued build out of the risk-balancing approach that has been adopted and implemented over the past four plus years
  - Represents modest change from the existing strategy – essentially to facilitate better balancing of risk exposures and to provide for greater liquidity

Appendix – Assumptions for the Study

US Capital Market Assumptions (10 Years) – 2014 Q1

		Expected Real Return[1]	Expected Nominal Return[1]	Expected Volatility	Sharpe Ratio
	Equity				
1	Large Cap U.S. Equity	4.5%	6.8%	19.0%	0.200
2	Small Cap U.S. Equity	4.7%	7.0%	25.0%	0.160
3	Global Equity	5.0%	7.3%	19.5%	0.221
4	International Developed Equity	4.9%	7.2%	20.5%	0.205
5	Emerging Markets Equity	6.5%	8.8%	28.5%	0.204
	Fixed Income				
6	Cash (Gov't)	0.7%	2.9%	2.0%	(0.050)
7	Cash (LIBOR)	0.8%	3.0%	2.0%	-
8	TIPS	1.0%	3.2%	4.5%	0.044
9	Core Fixed Income (Market Duration)	1.4%	3.6%	4.5%	0.133
10	Long Duration Bonds – Gov't / Credit	1.8%	4.0%	9.5%	0.105
11	Long Duration Bonds – Credit	2.1%	4.3%	11.0%	0.118
12	Long Duration Bonds – Gov't	1.4%	3.6%	9.5%	0.063
13	High Yield Bonds	2.3%	4.5%	14.0%	0.107
14	Bank Loans	2.3%	4.5%	7.0%	0.214
15	Non-US Developed Bonds (0% Hedged)	0.7%	2.9%	10.0%	(0.010)
16	Non-US Developed Bonds (50% Hedged)	1.0%	3.2%	6.0%	0.033
17	Non-US Developed Bonds (100% Hedged)	1.0%	3.2%	3.0%	0.067
18	Emerging Market Bonds (Sovereign USD)	3.1%	5.4%	12.0%	0.200
19	Emerging Market Bonds (Corporate USD)	3.1%	5.4%	12.0%	0.200
20	Emerging Market Bonds (Sovereign Local)	4.4%	6.7%	14.0%	0.264
	Alternative Investments				
21	Hedge Fund-of-Funds[2]	3.0%	5.3%	8.0%	0.288
22	Broad Hedge Funds[3]	4.6%	6.9%	8.0%	0.488
23	Real Estate (Broad Market)	4.9%	7.2%	14.5%	0.290
24	Real Estate (Core)	3.9%	6.2%	12.5%	0.256
25	U.S. REITs	4.5%	6.8%	20.5%	0.185
26	Commodities	2.9%	5.2%	19.0%	0.116
27	Private Equity	6.8%	9.1%	26.0%	0.235
28	Infrastructure	5.5%	7.8%	16.5%	0.291
29	U.S. Inflation	--	2.2%	1.0%	(0.800)

[1] All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees.

[2] Represents diversified portfolio of Fund of funds investments (includes additional layer of fees at the FoF level)

[3] Represents diversified portfolio of Direct hedge fund investments

US Capital Market Assumptions (30 Years) – 2014 Q1

		Expected Real Return[1]	Expected Nominal Return[1]	Expected Volatility	Sharpe Ratio
	Equity				
1	Large Cap U.S. Equity	4.5%	6.9%	19.5%	0.128
2	Small Cap U.S. Equity	5.0%	7.4%	25.5%	0.118
3	Global Equity	5.1%	7.5%	20.0%	0.155
4	International Developed Equity	5.0%	7.4%	21.0%	0.143
5	Emerging Markets Equity	6.5%	9.0%	29.0%	0.159
	Fixed Income				
6	Cash (Gov't)	1.9%	4.2%	2.5%	(0.080)
7	Cash (LIBOR)	2.1%	4.4%	2.5%	-
8	TIPS	1.7%	4.0%	5.0%	(0.080)
9	Core Fixed Income (Market Duration)	2.5%	4.9%	5.5%	0.091
10	Long Duration Bonds – Gov't / Credit	2.6%	5.0%	11.5%	0.052
11	Long Duration Bonds – Credit	3.1%	5.5%	12.5%	0.088
12	Long Duration Bonds – Gov't	2.1%	4.4%	11.0%	-
13	High Yield Bonds	3.0%	5.4%	14.5%	0.069
14	Bank Loans	2.9%	5.3%	7.5%	0.120
15	Non-US Developed Bonds (0% Hedged)	2.0%	4.3%	11.0%	(0.009)
16	Non-US Developed Bonds (50% Hedged)	2.1%	4.4%	7.0%	-
17	Non-US Developed Bonds (100% Hedged)	2.1%	4.4%	4.5%	-
18	Emerging Market Bonds (Sovereign USD)	4.0%	6.4%	13.0%	0.154
19	Emerging Market Bonds (Corporate USD)	4.2%	6.6%	12.5%	0.176
20	Emerging Market Bonds (Sovereign Local)	4.3%	6.7%	14.5%	0.159
	Alternative Investments				
21	Hedge Fund-of-Funds[2]	3.8%	6.2%	9.0%	0.200
22	Broad Hedge Funds[3]	5.4%	7.8%	9.0%	0.378
23	Real Estate (Broad Market)	4.9%	7.3%	14.5%	0.200
24	Real Estate (Core)	3.8%	6.2%	12.5%	0.144
25	U.S. REITs	4.5%	6.9%	21.0%	0.119
26	Commodities	4.2%	6.6%	19.0%	0.116
27	Private Equity	6.6%	9.1%	27.0%	0.174
28	Infrastructure	5.4%	7.8%	17.0%	0.200
29	U.S. Inflation	--	2.3%	2.0%	(1.050)

[1] All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees.

[2] Represents diversified portfolio of Fund of funds investments (includes additional layer of fees at the FoF level)

[3] Represents diversified portfolio of Direct hedge fund investments

US Capital Market Assumptions – 2014 Q1

		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	28	29
1	Large Cap U.S. Equity	1.00	0.92	0.95	0.80	0.80	0.09	0.09	-0.03	0.03	-0.01	0.09	-0.12	0.59	0.40	-0.03	-0.02	0.00	0.40	0.39	0.46	0.59	0.59	0.41	0.40	0.68	0.30	0.62	0.38	0.06
2	Small Cap U.S. Equity		1.00	0.87	0.73	0.74	0.07	0.07	-0.03	0.02	-0.01	0.08	-0.12	0.55	0.37	-0.03	-0.03	-0.01	0.37	0.36	0.42	0.55	0.54	0.38	0.37	0.62	0.26	0.59	0.36	0.05
3	Global Equity			1.00	0.94	0.91	0.08	0.08	-0.02	0.03	-0.01	0.09	-0.12	0.62	0.39	0.18	0.15	0.00	0.43	0.41	0.49	0.57	0.57	0.42	0.40	0.65	0.37	0.60	0.37	0.08
4	International Equity (Developed)				1.00	0.85	0.06	0.06	-0.02	0.02	-0.01	0.08	-0.10	0.54	0.33	0.38	0.32	-0.01	0.38	0.36	0.45	0.48	0.48	0.39	0.37	0.56	0.40	0.51	0.31	0.08
5	Emerging Markets Equity					1.00	0.07	0.07	-0.03	0.03	0.00	0.10	-0.12	0.64	0.40	0.22	0.18	0.00	0.46	0.44	0.53	0.52	0.52	0.38	0.37	0.56	0.34	0.52	0.32	0.09
6	Gov Cash						1.00	1.00	0.53	0.55	0.29	0.26	0.29	0.20	-0.01	0.20	0.39	0.71	0.26	0.17	0.16	-0.01	-0.01	0.14	0.16	0.09	0.23	0.08	0.13	0.53
7	LIBOR Cash							1.00	0.53	0.55	0.29	0.26	0.29	0.20	0.00	0.20	0.39	0.71	0.26	0.17	0.16	-0.01	0.00	0.14	0.16	0.09	0.22	0.08	0.13	0.53
8	TIPS								1.00	0.47	0.27	0.25	0.27	0.15	-0.05	0.12	0.21	0.32	0.20	0.12	0.11	-0.05	-0.05	0.04	0.05	0.00	0.21	-0.01	0.04	0.45
9	Core Fixed Income (Market Duration)									1.00	0.86	0.84	0.80	0.45	0.05	0.23	0.40	0.65	0.60	0.41	0.34	0.03	0.03	0.07	0.08	0.04	0.07	0.03	0.06	0.16
10	Long Duration Bonds – Gov't / Credit										1.00	0.96	0.95	0.37	-0.03	0.20	0.34	0.54	0.55	0.40	0.31	0.00	0.00	0.02	0.02	0.00	-0.05	0.00	0.02	-0.08
11	Long Duration Bonds – Credit											1.00	0.84	0.56	0.22	0.19	0.32	0.50	0.66	0.50	0.42	0.18	0.18	0.06	0.06	0.07	-0.03	0.07	0.06	-0.07
12	Long Duration Bonds – Gov't												1.00	0.11	-0.30	0.20	0.34	0.53	0.38	0.24	0.16	-0.21	-0.21	-0.04	-0.03	-0.08	-0.06	-0.08	-0.03	-0.08
13	High Yield Bonds													1.00	0.70	0.16	0.20	0.21	0.74	0.65	0.65	0.64	0.64	0.28	0.27	0.41	0.24	0.42	0.27	0.12
14	Bank Loans														1.00	-0.03	-0.04	-0.03	0.45	0.41	0.40	0.69	0.68	0.19	0.17	0.28	0.06	0.29	0.17	0.01
15	Non-US Developed Bond (0% Hedged)															1.00	0.95	0.38	0.19	0.13	0.16	-0.03	-0.03	0.01	0.02	-0.01	0.37	0.00	0.01	0.16
16	Non-US Developed Bond (50% Hedged)																1.00	0.64	0.26	0.18	0.20	-0.04	-0.04	0.03	0.04	0.00	0.34	0.00	0.03	0.22
17	Non-US Developed Bond (100% Hedged)																	1.00	0.34	0.22	0.18	-0.04	-0.04	0.06	0.08	0.02	0.10	0.01	0.06	0.27
18	Emerging Market Bonds (Sov. USD)																		1.00	0.73	0.75	0.42	0.42	0.21	0.20	0.28	0.13	0.29	0.20	0.07
19	Emerging Market Bonds (Corporate,																			1.00	0.67	0.39	0.38	0.20	0.19	0.27	0.08	0.28	0.18	0.09
20	Emerging Market Bonds (Sov., Local)																				1.00	0.41	0.41	0.22	0.22	0.32	0.20	0.32	0.20	0.03
21	Hedge Fund-of-Funds[1]																					1.00	0.99	0.26	0.25	0.41	0.13	0.40	0.24	0.03
22	Broad Hedge Funds[2]																						1.00	0.26	0.25	0.40	0.13	0.40	0.24	0.03
23	Real Estate																							1.00	0.96	0.52	0.10	0.32	0.20	0.10
24	Core Real Estate																								1.00	0.50	0.10	0.31	0.19	0.11
25	REITs																									1.00	0.19	0.44	0.27	0.07
26	Commodities																										1.00	0.11	0.09	0.43
27	Private Equity																											1.00	0.30	0.07
28	Infrastructure																												1.00	0.09
29	Inflation																													1.00

[1] Represents diversified portfolio of Fund of funds investments (includes additional layer of fees at the FoF level)

[2] Represents diversified portfolio of Direct hedge fund investments

Explanation of US Capital Market Assumptions (30 Years) – 2014 Q1

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 fourth quarter of 2013. 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 (1.9%)** – Over the long run, we expect the real yield on cash and money market instruments to produce a real return of 1.9% in a moderate- to low-inflationary environment.

- **TIPS (1.7%)** – We expect intermediate duration Treasury Inflation-Protected Securities to produce a real return of about 1.7%.

- **Core Fixed Income (i.e., Market Duration) (2.5%)** – We expect intermediate duration Treasuries to produce a real return of about 2.0%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 0.5%, resulting in a long-term real return of 2.5%.

- **Long Duration Bonds – Government and Credit (2.6%)** – We expect Treasuries with a duration comparable to the Long Government Credit Index to produce a real return of 2.1%. 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 2.6%.

Explanation of US Capital Market Assumptions (30 Years) – 2014 Q1

- **Long Duration Bonds – Credit (3.1%)** – We expect Treasuries with a duration comparable to the Long Credit Index to produce a real return of 2.1%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 1.0%, resulting in an expected real return of 3.1%.

- **Long Duration Bonds – Government (2.1%)** – We expect Treasuries with a duration of ~12 years to produce a real return of 2.1% during the next 30 years.

- **High Yield Bonds (3.0%)** – We expect intermediate duration Treasuries to produce a real return of about 2.0%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults and downgrades) to be 1.0%, resulting in an expected real return of 3.0%.

- **Bank Loans (2.9%)** – We expect LIBOR to produce a real return of about 2.1%. We estimate the fair value credit spread (credit risk premium - expected losses from defaults) to be 0.8%, resulting in an expected real return of 2.9%.

- **Non-US Developed Bonds: 50% Hedged (2.0%) –** We forecast real returns for non-US developed market bonds to be 2.0% 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.

- **Emerging Market Bonds (Sovereign; USD) (4.0%) –** We forecast real returns for emerging market sovereign bonds denominated in USD to be 4.0% over a 30-year period.

- **Emerging Market Bonds (Corporate; USD) (4.2%)** – We forecast real returns for emerging market corporate bonds denominated in USD to be 4.2% over a 30-year period.

- **Emerging Market Bonds (Sovereign; Local) (4.3%)** – We forecast real returns for emerging market sovereign bond denominated in local currency to be 4.3% over a 30-year period.

Explanation of US Capital Market Assumptions (30 Years) – 2014 Q1

Equities

- **Large Cap U.S. Equity (4.5%)** – 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 (5.0%)** – Adding a 0.5% return premium for small cap U.S. equity over large cap U.S. equity results in an expected real return of 5.0%. 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. In recent years, higher small cap valuations relative large cap equity has reduced the small cap premium.

- **Global Equity (Developed & Emerging Markets) (5.1%)** – We employ a building block process similar to the U.S. equity model using the developed and emerging markets that comprise the MSCI All-Country World Index. Our roll-up model produces an expected real return of 5.1% for global equity.

- **International (Non-U.S.) Equity, Developed Markets (5.0%)** – 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 (6.5%)** - 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 Fund-of-Funds Universe (3.8%)** – The generic category "hedge funds" encompasses a wide range of strategies accessed through "fund-of-funds" vehicles. 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 and also allow for the additional costs associated with Fund-of-Funds management. A top-tier portfolio of individual managers (hedge fund-of-funds buy-list) could add an additional 0.6% in return at similar volatility based on alpha, lower fees, and better risk management.

Explanation of US Capital Market Assumptions (30 Years) – 2014 Q1

- **Broad Hedge Funds (5.4%)** – Represents a diversified portfolio of direct hedge fund investments. This investment will tend to be less diversified than a typical "fund-of-funds" strategy as there will be fewer underlying managers.

- **Real Estate (4.9%)** – 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 near the rate of 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 (3.8%)** – 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 near the rate of inflation during the next 30 years. We assume a portfolio of equity real estate holdings that is diversified by property type and geographic region.

- **U.S. REITs (4.5%)** – Our real return assumption for U.S. REITs is based on income of about 4.5% 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 (4.2%)** – 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 2.1%. Also, we believe the roll effect will be near zero, resulting in a real return of approximately 4.2% for commodities.

- **Private Equity (6.6%)** – Our private equity assumption reflects a diversified fund of funds with exposure to buyouts, venture capital, distressed debt, and mezzanine debt.

- **Infrastructure (5.4%)** – 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 5.4% for infrastructure.

Explanation of US Capital Market Assumptions (30 Years) – 2014 Q1

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.

HEK Versus Horizon Capital Market Assumptions – 2013 Survey

	Horizon Survey		HEK			
	Sample Average		10 Year Forecasts		30 Year Forecasts	
Asset Class	Geometric Return	Risk	Geometric Return	Risk	Geometric Return	Risk
US Equity - Large Cap	7.6%	18.1%	7.1%	19.0%	7.1%	19.5%
US Equity - Small/Mid Cap	8.1%	22.5%	7.3%	25.0%	7.6%	25.5%
Non-US Equity - Developed	8.0%	20.5%	7.3%	20.5%	7.4%	21.0%
Non-US Equity - Emerging	9.1%	27.5%	8.9%	28.5%	9.1%	29.0%
US Fixed Income - Core	3.4%	5.3%	3.3%	4.0%	4.6%	5.5%
US Fixed Income - Long Duration	4.2%	11.8%	3.8%	9.5%	4.8%	11.5%
US Fixed Income - High Yield	5.9%	12.3%	4.6%	14.0%	5.9%	14.5%
Non-US Fixed Income - Developed	3.0%	8.2%	2.9%	6.0%	4.1%	6.5%
Non-US Fixed Income - Emerging	5.4%	12.4%	5.3%	12.0%	6.3%	13.0%
Treasuries (Cash Equivalents)	2.2%	1.8%	2.5%	1.5%	3.8%	2.0%
TIPS (Inflation-Protected)	2.6%	5.9%	2.7%	4.5%	3.6%	4.5%
Real Estate	6.8%	12.4%	6.2%	12.5%	6.2%	12.5%
Hedge Funds	6.4%	9.4%	5.2%	8.0%	6.1%	8.5%
Commodities	5.1%	18.5%	4.8%	19.0%	6.3%	19.0%
Infrastructure	7.1%	15.2%	7.8%	16.5%	7.8%	17.0%
Private Equity	10.1%	26.2%	9.3%	26.0%	9.3%	27.0%
Inflation	2.5%	2.0%	2.1%	1.0%	2.2%	2.0%

Notes (Horizon Survey):

Source: Horizon Actuarial survey of 2013 capital market assumptions from 19 independent investment advisors

Expected returns are annualized over 10-20 years (geometric). Returns are 'blended,' using 10-year assumptions when 20-year assumptions are not available.

Notes (HEK Forecasts):

HEK Forecasts are for Q4 2013

US Equity - Small/Mid Cap forecasts represents HEK forecasts for US Small Cap

US Fixed Income - Long Duration forecasts represents HEK forecasts for Long Duration Govt/Credit

Non-US Fixed Income - Developed forecasts represents HEK forecasts for Non-US Fixed Income - Developed (50% Hedged)

Real Estate forecasts represents HEK forecasts for Core Private Real Estate

Hedge Funds forecasts represents HEK forecasts for Hedge Fund-of-Funds

Scenario Analysis – Asset/Liability Projections

"What if?" Scenario Analysis
2023 Market Value Funded Ratio

Economic Environment

Low Growth, High Inflation

Inflation expectations take-off as monetary stimulus feeds through to much higher commodity prices

Low Growth, Low Inflation

The global economy slips back into recession

Moderate Growth, Inflation

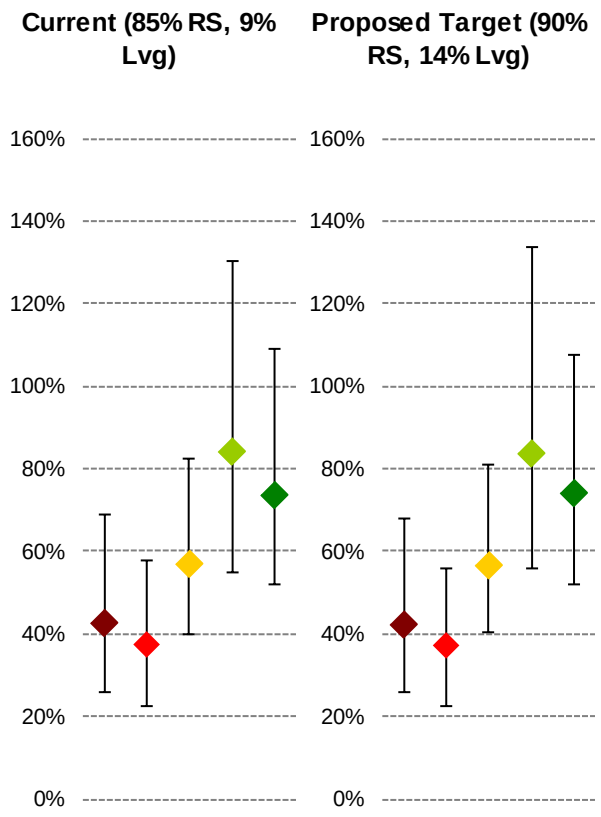
World events unfold in a fashion consistent with our Global Capital Market Assumptions

High Growth, High Inflation

Economy grows more than expected mainly due to inflationary forces

High Growth, Low Inflation

Pronounced cyclical upswing with world Return-Seeking above and even substantially above long-term trend while inflation expectations remain contained

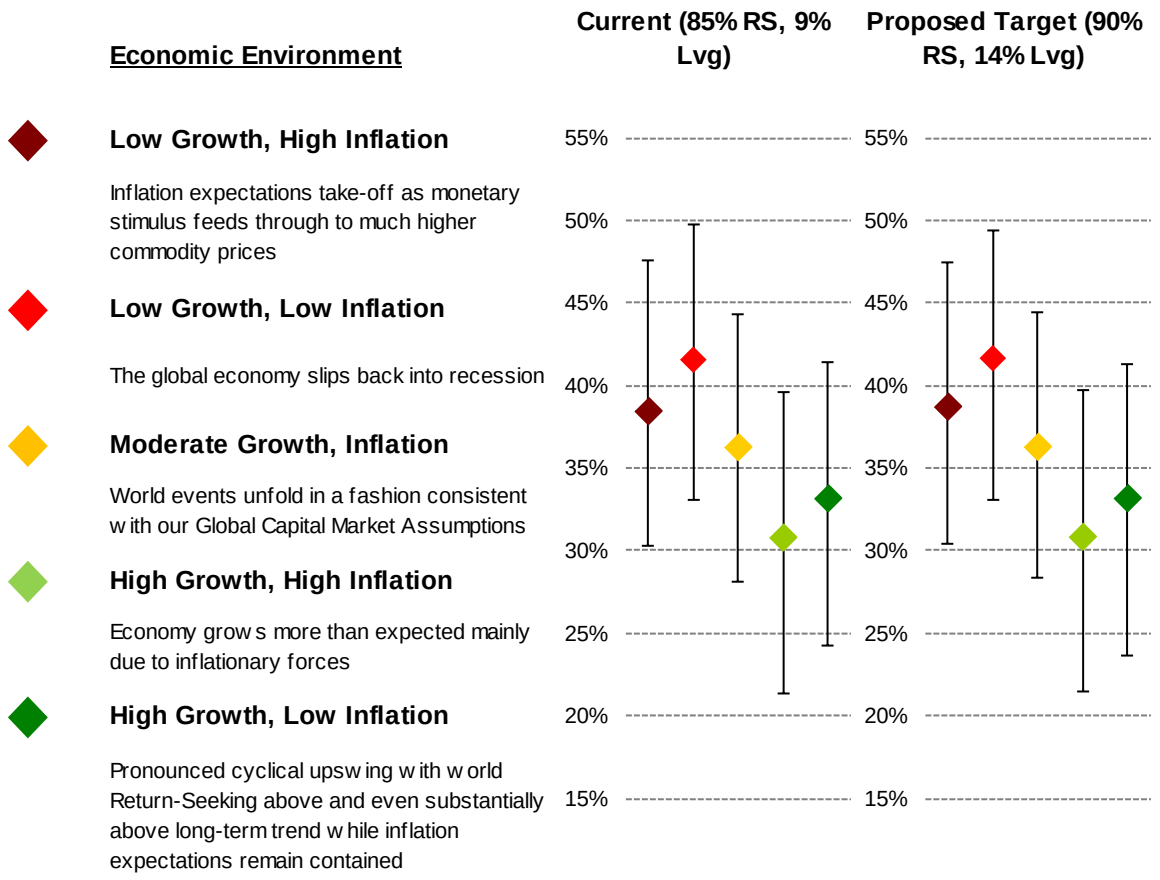


Key Takeaways:

- The plan will perform well in high growth environments and suffer in low growth environments
- In low growth environments, the resulting higher contribution rates impose a floor on the funded ratio, especially for riskier asset allocations

* Projections assume constant 7.5% discount rate for pension liabilities for all investment policies studied

"What if?" Scenario Analysis
2023 Contribution Rate



Key Takeaways:

- The plan will perform well in high growth environments and suffer in low growth environments
- Larger allocations to return-seeking assets and leverage drive down the expected contribution rate, but add volatility

* Projections assume constant 7.5% discount rate for pension liabilities for all investment policies studied

US Five Year Economic Scenarios Fourth Quarter 2013

What are the 5 Year Economic Scenarios?

- A set of fairly **extreme economic scenarios** that are designed to have a significant impact on pension plan funded status and endowment portfolio returns.
- Each scenario describes how economic and financial factors may evolve over the next five years:
  - **Macro Factors:** real GDP growth, inflation, unemployment
  - **Yields and Returns:** treasuries, TIPS, corporate bonds
  - **Risk Asset Returns:** equities, commodities, real estate, hedge funds, private equity, infrastructure, high yield bonds, bank loans and emerging market debt (hard and local), and cash.

Scenario Analysis

- A set of fairly **extreme economic scenarios** that are designed to have a significant impact on pension plan funded status and endowment portfolio returns.
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Description of Scenarios

The economic scenarios are split into three categories:

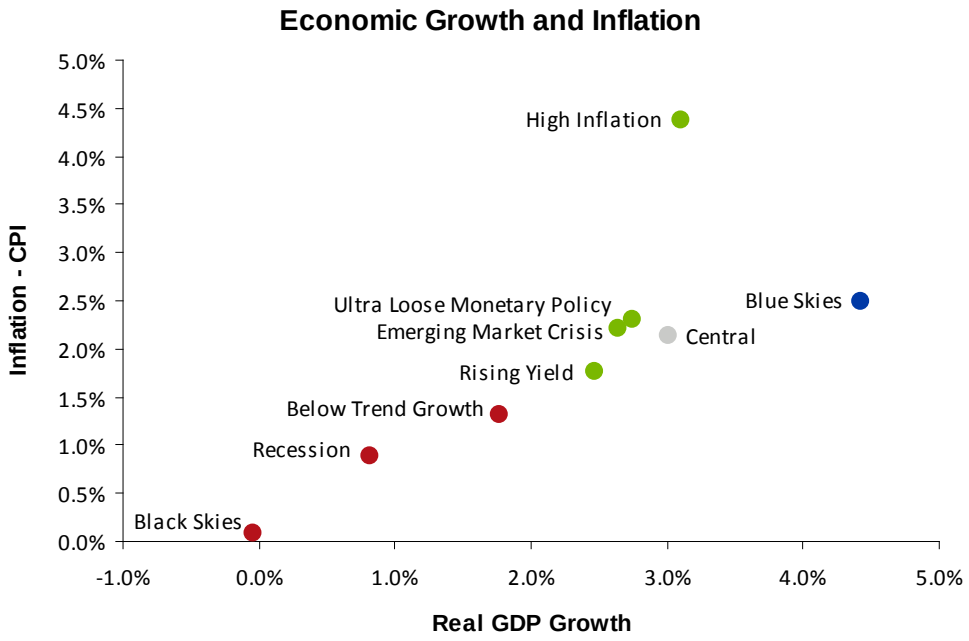
- **Optimistic – positive outlook for pension schemes**
  - **Blue Skies** – robust economic recovery and moderate inflation.

- **Low Demand – negative outlook for pension schemes**
  - **Below Trend Growth** – weak recovery but avoids recession.
  - **Recession** – recession followed by recovery.
  - **Black Skies** – deep protracted recession with no rebound.

- **Topical – captures current events that may be positive or negative**
  - **High Inflation** – rising energy and commodity prices cause inflation.
  - **Rising Yields** – due to a loss of confidence in the bond markets.
  - **Ultra Loose Monetary Policy (ULMP) –** loose monetary policy starts to disrupt market performance in later years.
  - **Emerging Market Crisis** – a widespread slowdown in emerging market growth leads to a divergence of fortunes for developed and emerging markets.

Macroeconomic Outlook

- **Optimistic Scenarios**
  - *Blue Skies* - robust recovery with moderate inflation
- **Low Demand Scenarios**
  - Weak growth outlook and low inflation.
  - Severity of downturn determines how low inflation and growth goes.
- **Topical Scenarios**
  - *High inflation* – marginally higher growth at the expense of much higher inflation.
  - *ULMP* – loose monetary policy causes inflation in later years but partially offsets the weaker growth outlook.
  - *Rising Yields* – high yields dampen growth and inflation
  - Emerging Market Crisis – weak demand from emerging markets lowers growth but accommodative monetary policy offsets disinflationary pressures.



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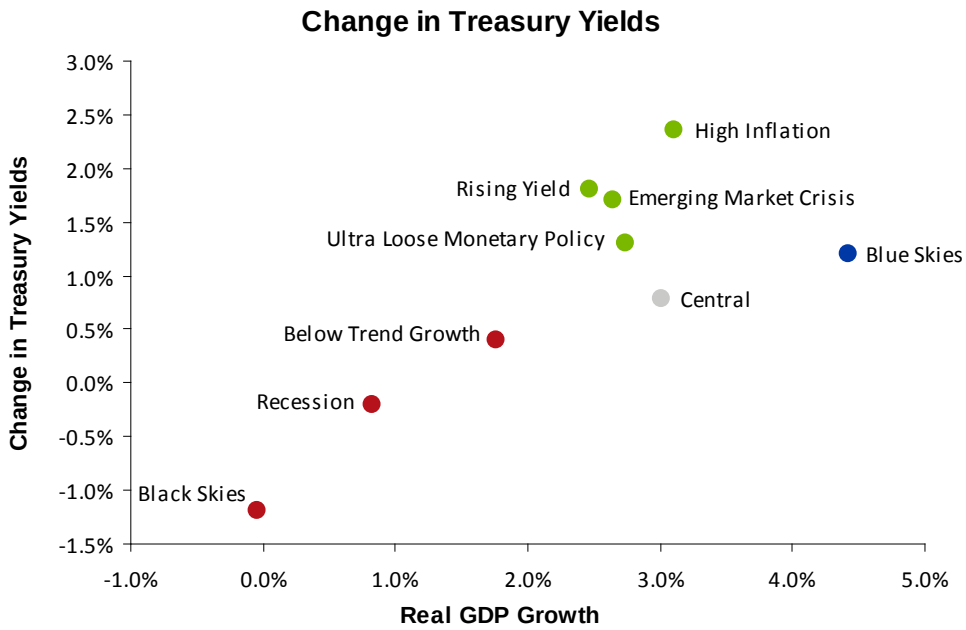
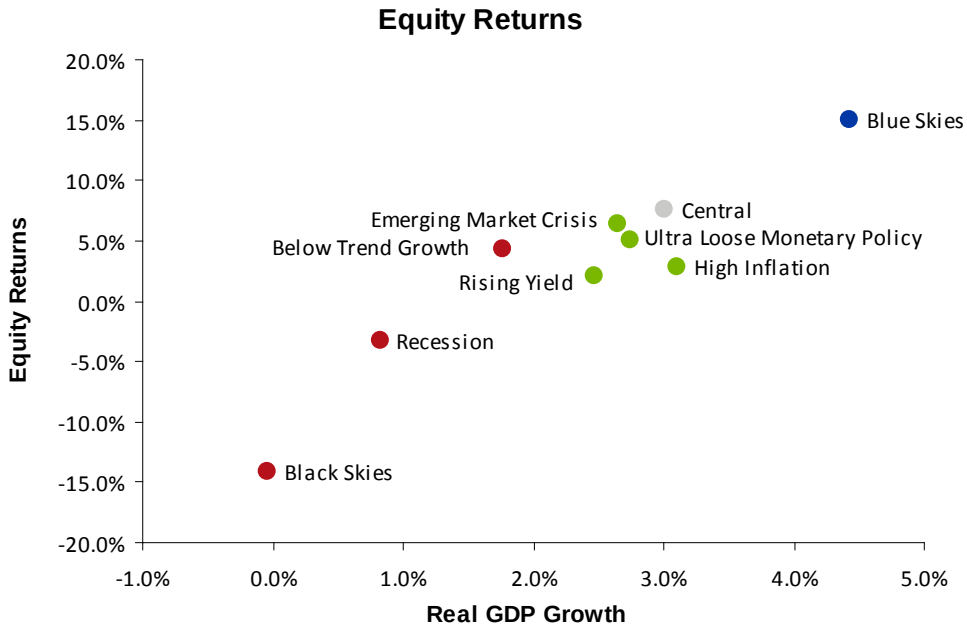
Bond Yield Movements

- Optimistic Scenarios
  - *Blue Skies* – robust recovery produces a moderate rise in Treasury yields
- Low Demand Scenarios
  - Treasury yields fall due to a weaker economic growth outlook and low inflation
- Topical Scenarios
  - *High inflation* – higher inflation pushes Treasury yields upwards.
  - *Rising Yields* – Treasury yields rise as Quantitative easing (QE) is reduced and sovereign debt levels cause a loss of confidence in the bond market.
  - *ULMP* – in later years excess liquidity results in higher inflation which pushes up Treasury yields.
  - *Emerging Market Crisis* - further monetary stimulus combined with US economic growth strengthening pushes up Treasury yields.



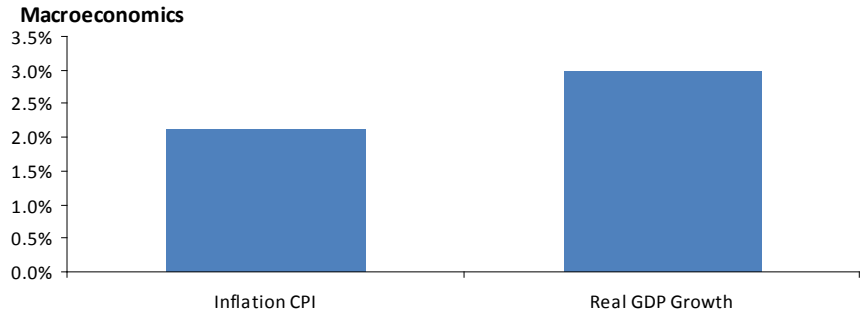
Equity Returns

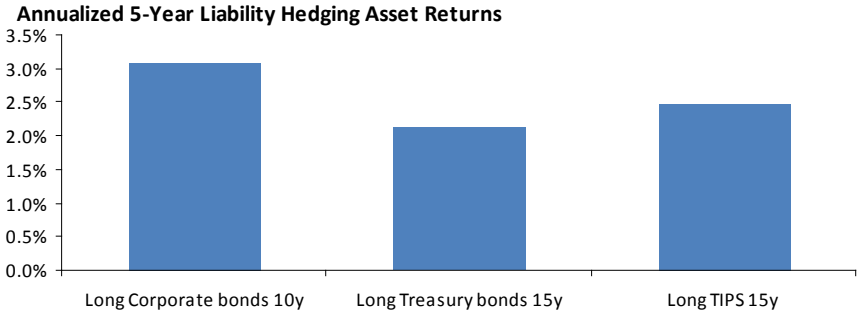
- Optimistic Scenarios
  - *Blue Skies* – a robust recovery produces high equity returns. Alternative assets also perform well.
- Low Demand Scenarios
  - *Below Trend Growth* – equity returns are lower but remain positive as a recession is avoided.
  - *Recession / Black Skies* – a recession results in equity losses.
- Topical Scenarios
  - *High inflation* – hurts profit margins in early years, which hampers equity returns.
  - *ULMP* – equity returns perform poorly as QE is withdrawn.
  - *Rising Yields* – high yields hamper equity returns.
  - *Emerging Market Crisis* – equity returns are lower but monetary stimulus and a strengthening US recovery are supportive in later years.

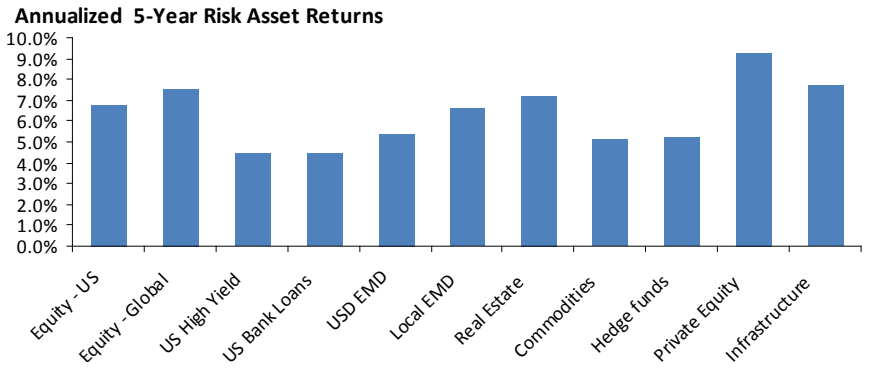


Central Scenario - World events unfold in a fashion consistent with our Capital Market Assumptions

- Yield and return series are based on the central simulations from Aon Hewitt's stochastic model.
- The pace of recovery in the US improves in 2014 as consumption and business investment is buoyed by a more optimistic economic outlook..
- The US economy stays on course for a modest recovery.
- Inflation gradually rises and stabilizes slightly above the Federal Reserve's target of 2%.
- Treasury and corporate bond yields gradually rise. Corporate spreads remain stable.
- Risk asset returns are in line with the our long term assumptions.







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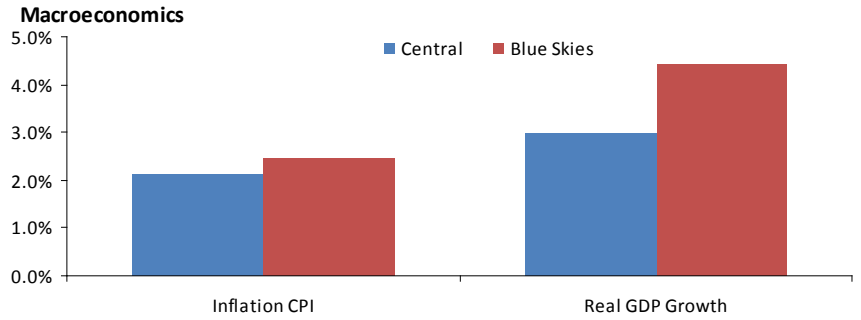
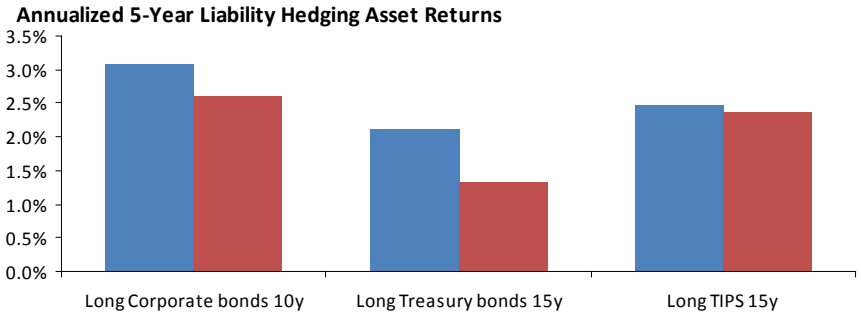
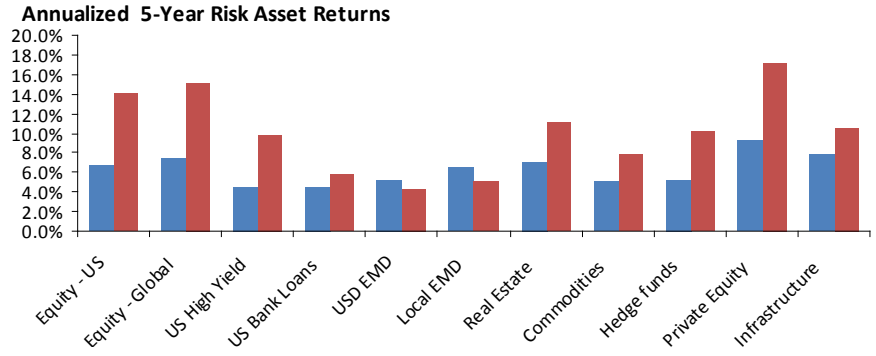
Blue Skies Scenario - The world economy grows ahead of consensus expectations, while inflation remains subdued

- The US experiences a strong recovery as global growth is more robust than expected.
- The Fed maintains an accommodative monetary policy until confidence in the economic recovery is fully established. Fiscal tightening is limited.
- Stronger economic growth results in moderate rises in bond yields and inflation.
- Credit conditions improve substantially and corporate spreads narrow.
- Risk assets perform well with high returns over the five year period.







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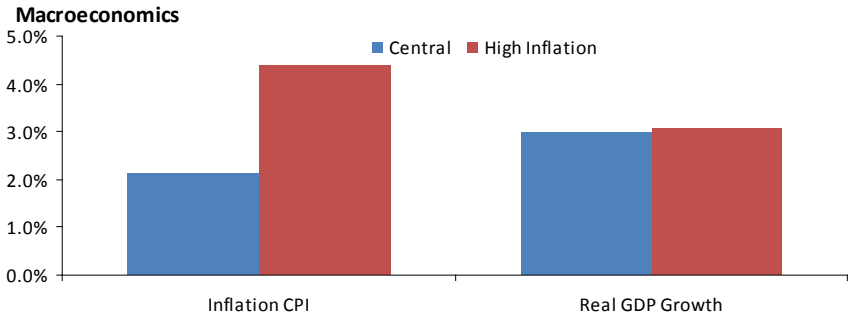
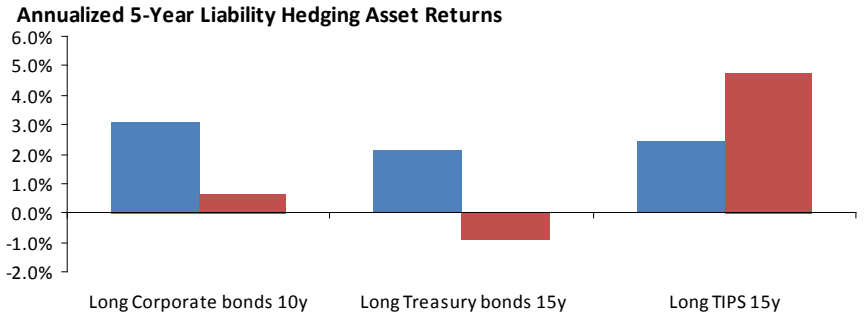
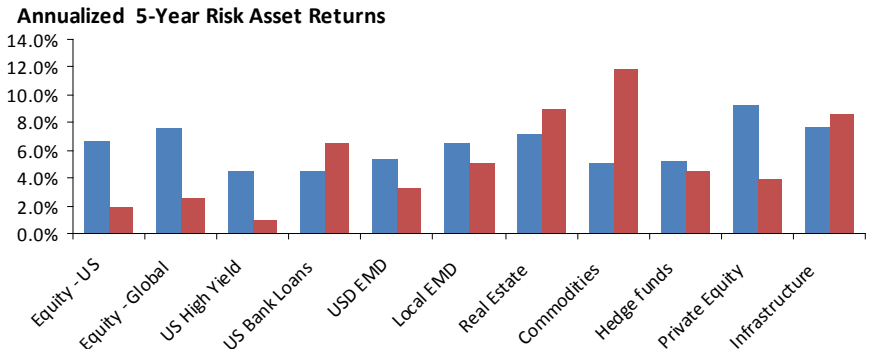
High Inflation Scenario - The world economy grows quicker than the central scenario but at the expense of much higher inflation

- The US economy maintains stable growth by limiting fiscal consolidation and keeping monetary policy loose.
- Commodity prices surge due to loose monetary policy and an escalation of political problems in some oil-producing regions.
- Persistent high inflation drives nominal bond yields upwards. TIPS yields rise at a slower pace than the central scenario as yield rises from economic recovery are offset by investors demanding inflation protection.
- Increased market uncertainty and risk aversion means credit spreads initially widen. Concerns subsequently subside and corporate spreads gradually narrow.
- Higher inflation squeezes profit margins and hurts equity returns in the first 12 months. Higher prices are then passed on and returns improve.
- Risk assets with inflation linkage (such as real estate) perform better than the central scenario over the 5 year period.

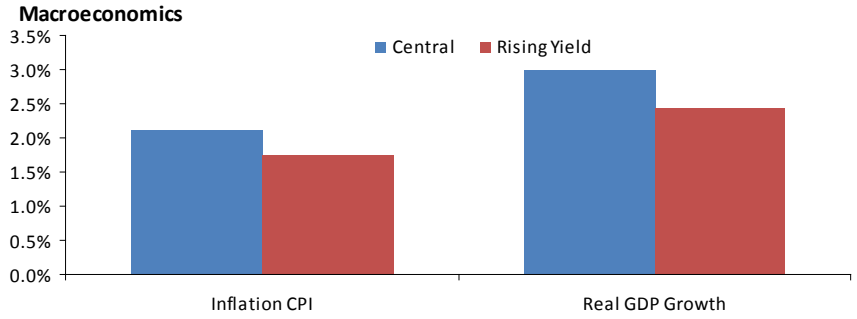


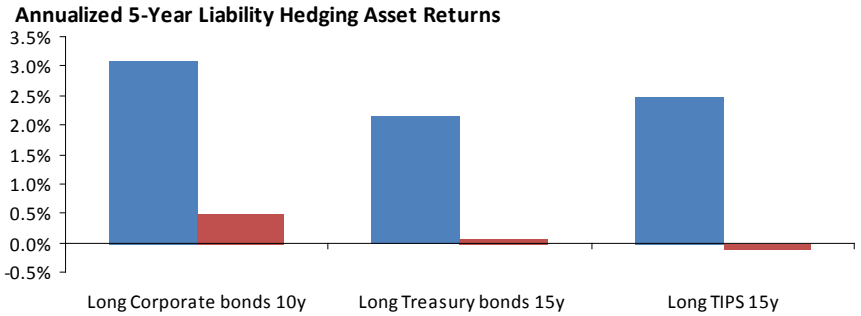


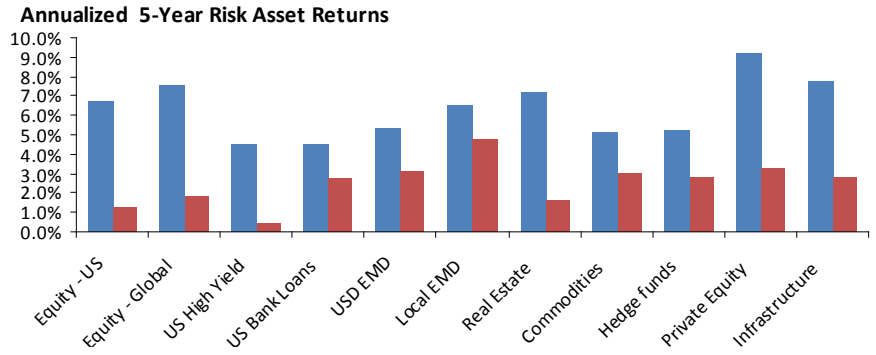


Rising Yield Scenario - A loss of confidence in the bond market results in an increase in bond yields

- An improvement in the US economy leads to reduced quantitative easing.
- Concerns grow over high sovereign debt levels and it results in a loss of confidence in the bond market.
- Treasury and corporate bond yields rise as investors anticipate further falls in demand for government bonds.
- Corporate spreads are wider than the central scenario due to the increased market stress.
- The improvement in US prospects proves to be transitory. Fiscal consolidation and rising yields dampens the recovery and growth ends up being below the central scenario.
- The lower growth environment and higher yields puts pressure on profit margins and equity returns are initially poor. In due course, equity returns become positive.
- Most risk assets perform poorly with returns below those in the central scenario.







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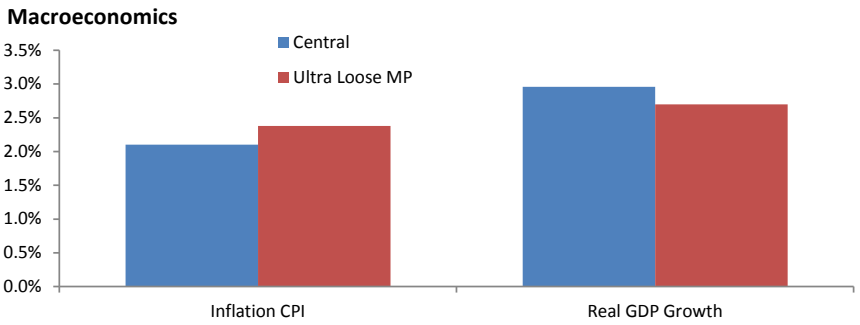
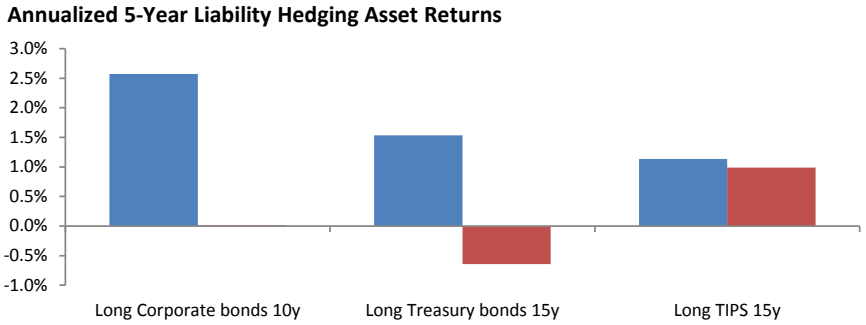
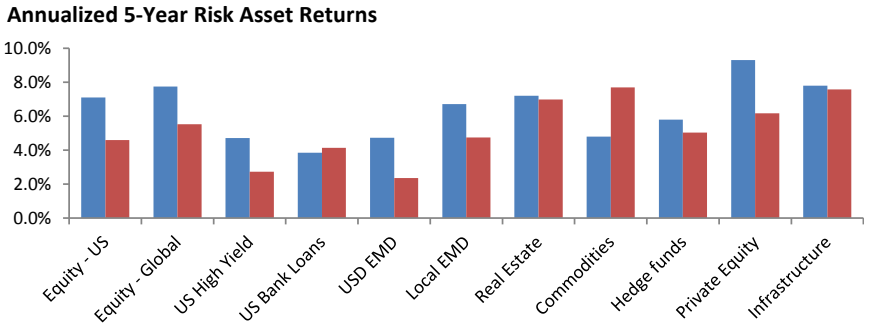
Ultra-Loose Monetary Policy Scenario - monetary policy is kept ultra-loose offsetting fiscal austerity and boosting economic activity

- Fiscal austerity and a weak global economy continues to exert a negative drag on the US economy.
- The Fed keeps monetary policy ultra-loose and interest rates remain low for an extended period of time. Other accommodative policies aimed at increasing liquidity and easing credit conditions are adopted.
- Stable inflationary environment in early years, but excess liquidity results in higher inflation later on.
- Treasury yields are pushed down in the first few years; worries over withdrawals of QE and high inflation result in yields rising above those in the central scenario in latter years.
- All asset classes perform well for some time until investor worries act as a drag on returns in later years. Equity returns turn negative in the last two years.
- Corporate spreads widen in the last two years relative to the central scenario due to increased market stress.







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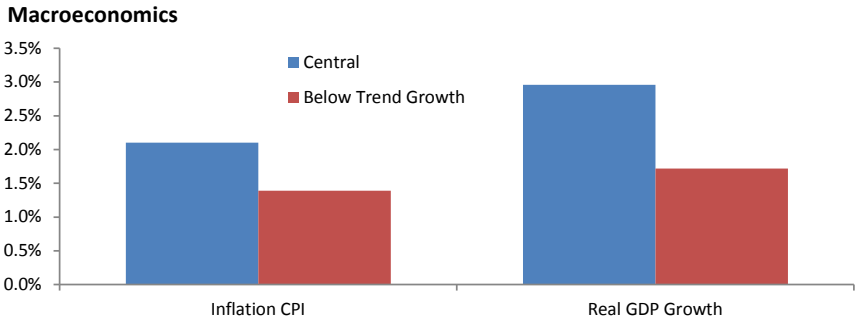
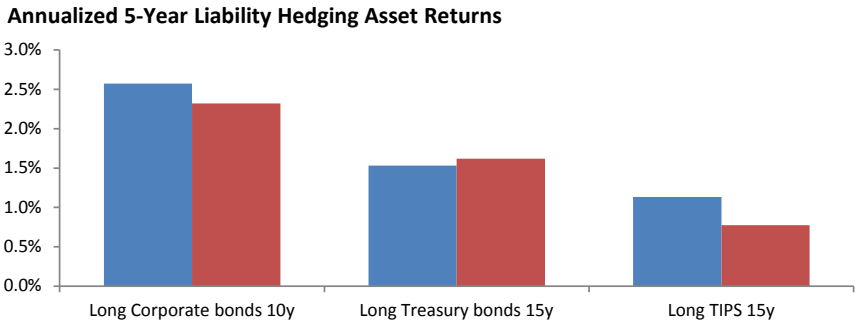
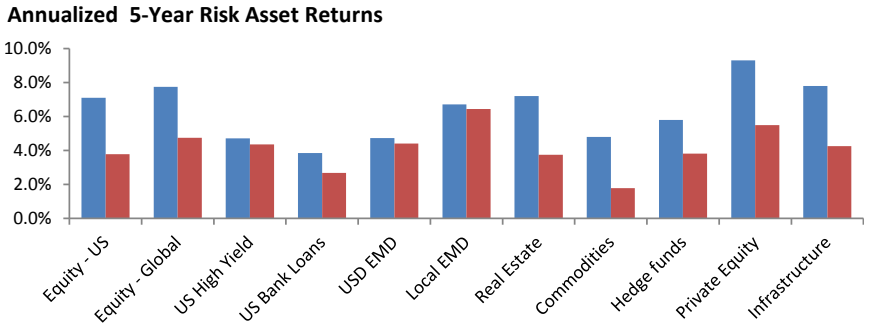
Below Trend Growth - The US experiences a prolonged period of low economic growth but manages to avoid a recession

- The US economy weakens over the next twenty four months on the back of fiscal adjustment, and then begins to gradually recover at a lackluster pace due to widespread austerity across developed regions.
- Real GDP growth remains permanently lower than in the central case.
- Inflation is lower than the central scenario.
- Treasury yields are lower than the central scenario due to a weaker economic outlook and subdued inflation expectations.
- Corporate spreads rise and remain above the central scenario but the rise is less pronounced than recession scenarios as a productivity collapse is avoided.
- Risk asset returns are lower than the central scenario but manage to remain in positive territory due to a supportive monetary policy.

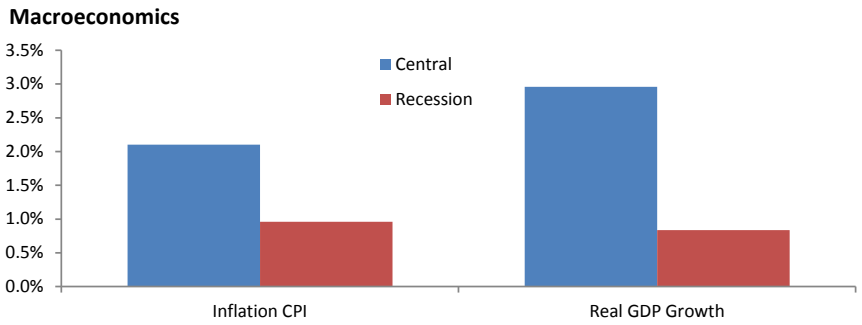


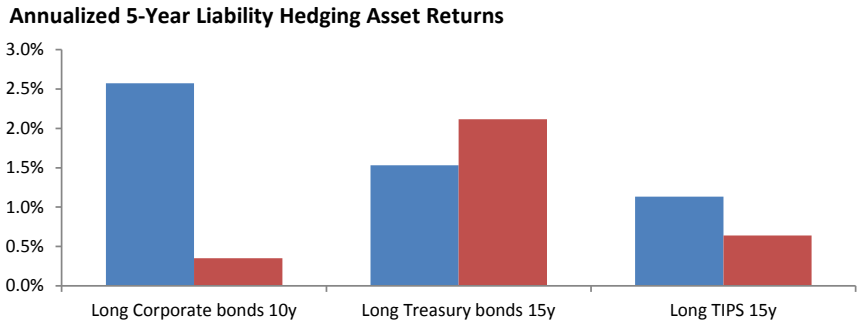


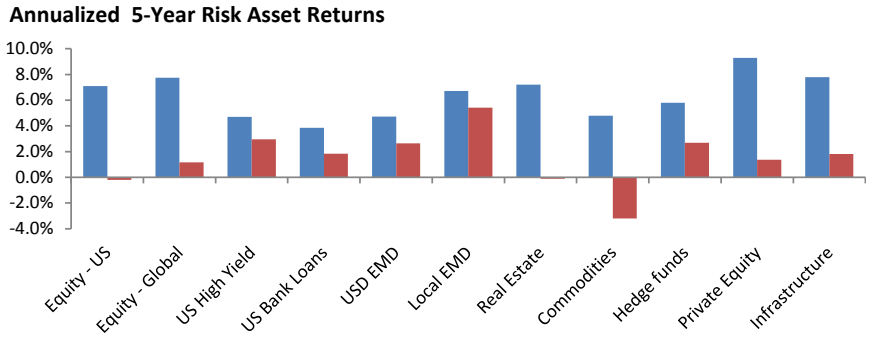


Recession Scenario - The US economy slips back into recession in 2014

- The US extends fiscal tightening, which acts as a drag on its economy, but keeps monetary policy loose.
- Public budget constraints and further disagreements in Congress prevent fiscal policy initiatives that might stem a downturn. This adversely impacts confidence.
- The US experiences a recession in 2014.
- Inflation falls over the first few years; inflation starts to rise in the second half of 2015 as an economic recovery establishes itself.
- Treasury yields fall while TIPS yields remain at low levels as the US enters recession. Yields rise in later years as a recovery gets underway.
- Corporate spreads rise significantly due to the poor economic situation and increased risks of downgrades or defaults.
- Risk assets make losses in the first two years but rebound in later years as the economy recovers.







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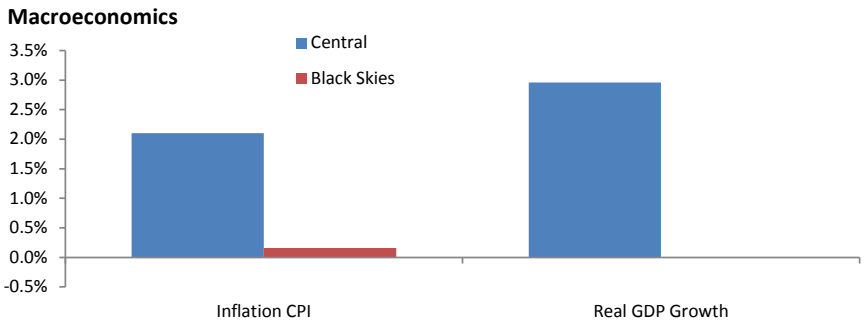
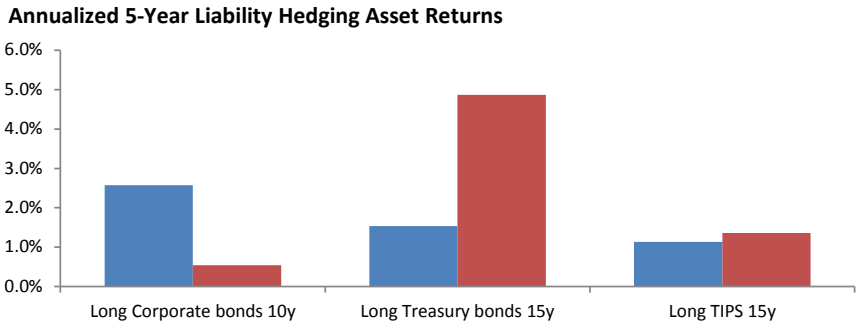
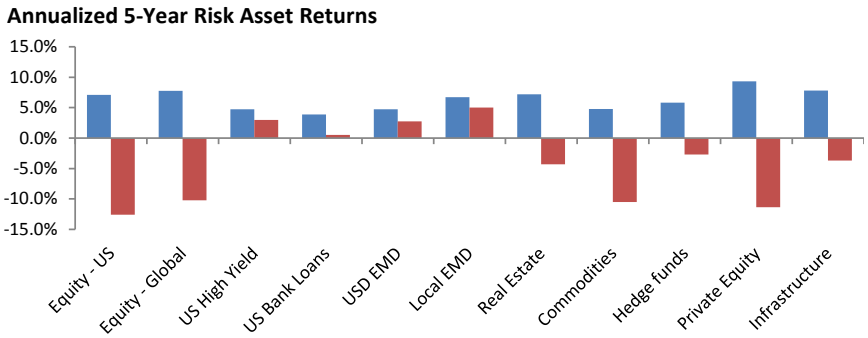
Black Skies Scenario - A deep recession followed by a longer period of stagnant growth

- The US experiences a protracted deep recession.
- Public budget constraints and further disagreements in Congress prevent fiscal policy initiatives that might stem a downturn, adversely impacting confidence.
- Inflation falls into negative territory in 2015 while continued sluggish growth over the following years means that inflation stays close to zero.
- Treasury yields fall while TIPS yields remain at low levels as the US enters recession. Yields remain at low levels.
- Corporate spreads rise significantly due to the poor economic situation and increased risks of downgrades or defaults.
- Risk assets make losses in the first few years. There is no pronounced bounce in growth and the economic situation remains poor for a long time, which weighs on returns in later years.

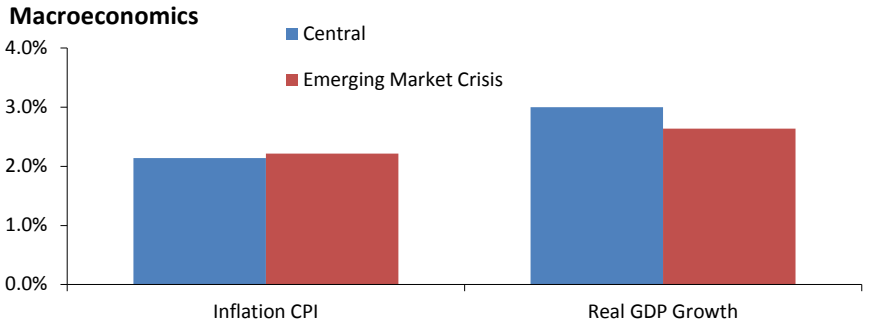


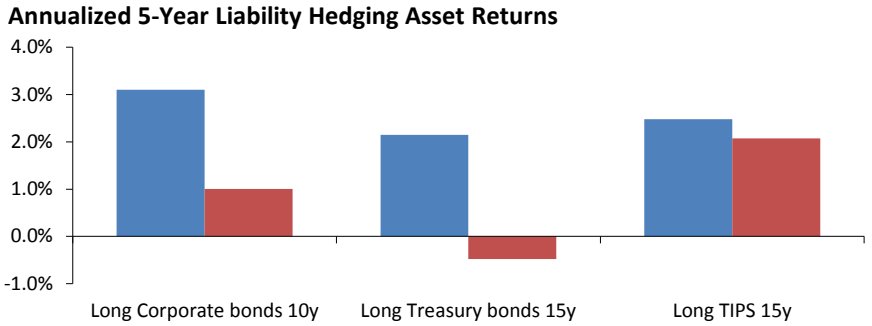


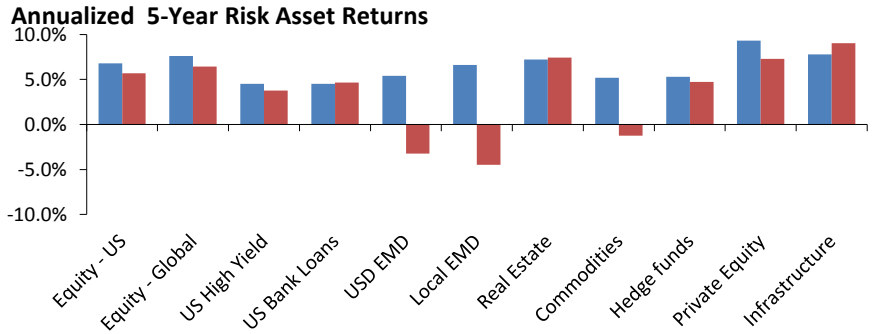


Emerging Market Crisis – A slower outlook for emerging market growth leads to a divergence of fortunes for developed and emerging markets

- China experiences slower growth as policymakers tackle credit and property bubbles, while trying to rebalance away from investment led growth to consumer led-growth.
- China's tightening monetary policy puts upward pressure on borrowing costs, resulting in weaker corporate profits, slower economic growth and higher corporate defaults hampering equity market returns in emerging markets and depressing commodity prices.
- The strength of the US recovery in 2014 causes the Federal Reserve to taper QE over 2014.
- As the problems in emerging markets become more apparent, developed market growth slows in the second half of 2014. This has a negative effect on developed market equity returns in 2014 and this results in equities (and most other assets) experiencing a lower return over the five year forecast horizon compared with the central scenario.
- Advanced economies collectively pursue unconventional monetary policy and keep rates low beyond 2016 to offset disinflationary pressures.
- Equity markets and other growth assets perform better in later years. However, there is an ongoing divergence in performance between developed and emerging equity markets.







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Appendix –
About this Material

About This Material

This material includes a summary of calculations and consulting related to the finances of Pennsylvania School Employees' Retirement System (PSERS). The following variables have been addressed:

- Contributions
- Economic Cost
- Funded Ratio

This analysis is intended to assist the Investment Committee with a review of the associated issues and options, and its use may not be appropriate for other purposes. This analysis has been prepared solely for the benefit of the Investment Committee. Any further dissemination of this report is not allowed without the written consent of Hewitt EnnisKnupp.

Our calculations were generally based on the methodologies identified in the actuary's valuation report for PSERS. We believe the methodology used in these calculations conforms to the applicable standards identified in the report.

Experience different than anticipated could have a material impact on the ultimate costs of the benefits. In addition, changes in plan provisions or applicable laws could have a significant impact on cost. Actual experience may differ from our modeling assumptions.

Our calculations were based on data provided by Buck, the plan actuary. The actuarial assumptions and methods and plan provisions reflected in these projections are the same as those used for the 2013 fiscal year actuarial valuation for PSERS as noted in the actuarial report, except where noted in this report. Unless specifically noted, our calculations do not reflect any other changes or events after June 30, 2013.

In conducting these projections, we have relied on plan design, demographic and financial information provided by other parties, including the plan's actuary and plan sponsor. While we cannot verify the accuracy of all of the information, the supplied information was reviewed for consistency and reasonableness. As a result of this review, we have no reason to doubt the substantial accuracy or completeness of the information and believe that it has produced appropriate results.

These projections have been conducted in accordance with generally accepted actuarial principles and practices, including applicable Actuarial Standards of Practice as issued by the Actuarial Standards Board. The undersigned actuary is familiar with the near-term and long-term aspects of pension valuations and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinions contained herein. All sections of this report are considered an integral part of the actuarial opinions.

To our knowledge, no associate of Hewitt EnnisKnupp providing services to PSERS has any direct financial interest or indirect material interest in PSERS. Thus, we believe there is no relationship existing that might affect our capacity to prepare and certify this report for PSERS.

Hewitt EnnisKnupp
Phil Kivarkis FSA, EA, CFA
Richard Parker ASA, EA