

TESRS Asset / Liability Modeling Study Supplemental Report

April 5, 2016



CONTENTS

- Modeling Approach
- Asset Allocations Analyzed
- Detailed Projections
 - Projected Contributions
 - Projected Funded Status
 - Projected Market Value of Assets



MODELING APPROACH

■ Assets

Asset classes to consider were presented and approved by the Board and the Board Meeting on December 10, 2015. Included were the class returns and volatilities.

From this set of assets classes, eight new portfolios representing alternative asset allocations were developed and were analyzed next to the current allocation.

The asset class returns were stochastically modeled under lognormal assumptions without seriality which were then combined into total portfolio returns for each alternative allocation. These were projected 20 years into the future, with 1,000 trials run for each class.

■ Alpha

This study does not assume any manager alpha – the excess return that the managers produce above their benchmarks after fees. Over the last five years, this alpha has been about 70 bps.

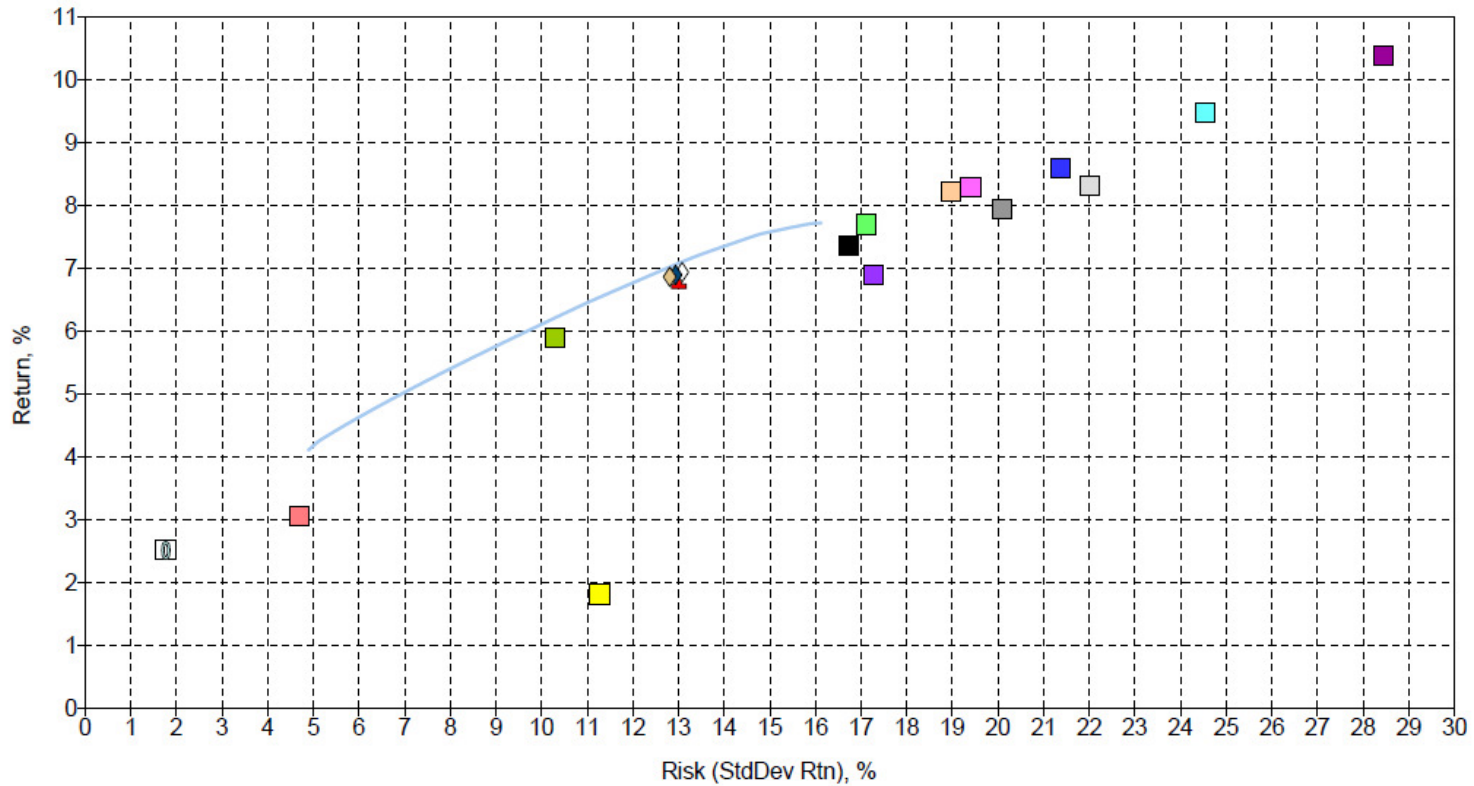
■ Funding

- Liabilities: Liabilities continued to be valued using the current 7.75% actuarial valuation rate. New entrants are expected to replace retirements on an equivalent normal cost basis.
- Contributions: These are calculated to pay the normal cost plus 30-year amortization (rolling) of that year's unfunded actuarial accrued liability. The plan's projected funded status and asset values reflect total contributions; State (max) plus Part 1 plus Part 2 contributions.



Efficient Frontier

Efficient Frontier: Return vs. Risk (StdDev Rtn)

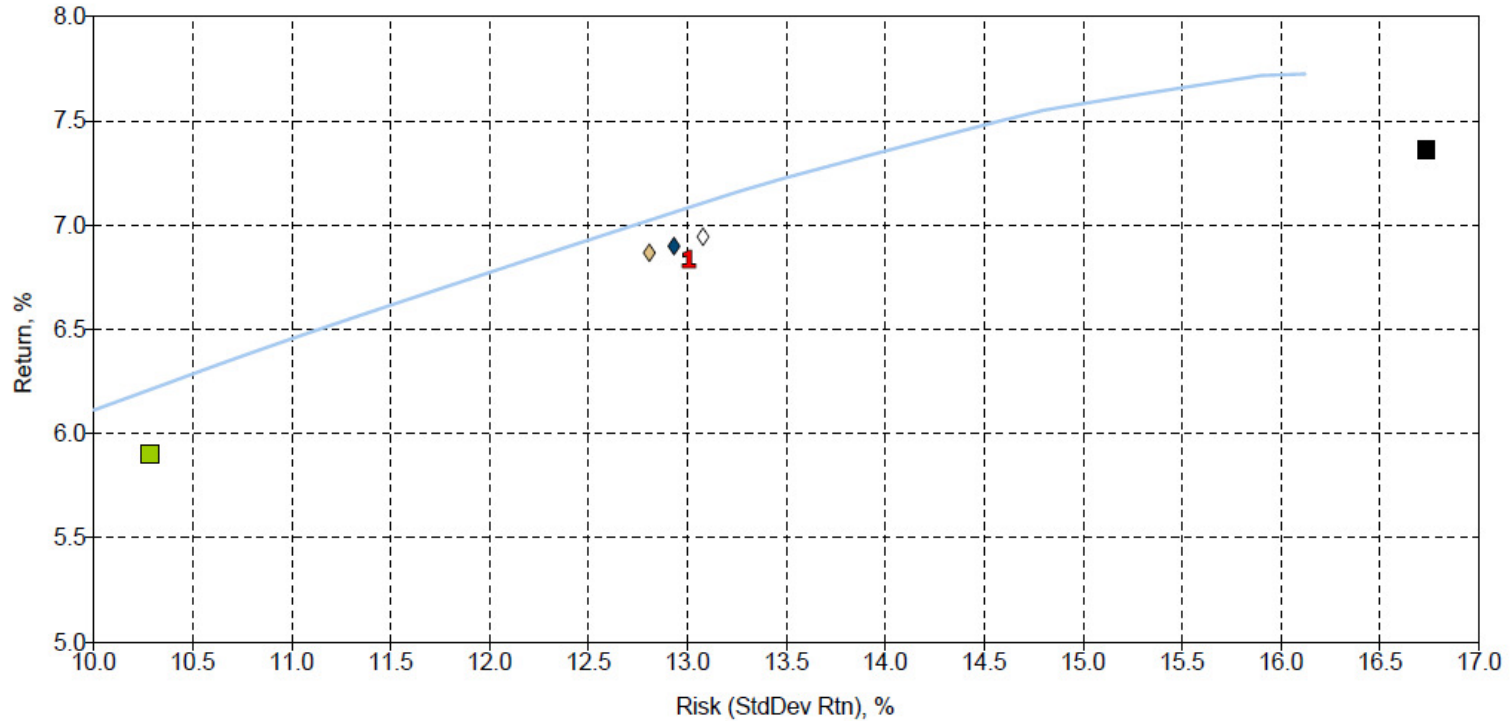


- Frontier
- ◇ No IB - SCG & SCV
- Non - US Bonds
- US Sm Cap Growth
- Emerging Markets Equity
- 1 Current Portfolio
- Cash
- US LC Growth
- US Sm Cap Core
- Master Limited Partnerships
- ◇ No IB - and SCG Only
- US LC Core
- US Sm Cap Value
- Global Real Estate
- ◆ No IB - add to Core FI
- High Yield FI
- US LC Value
- Foreign Developed Equity



Efficient Frontier

Efficient Frontier: Return vs. Risk (StdDev Rtn)



- | | | | |
|---------------------------|-------------------------------|------------------------|----------------------------|
| — Frontier | 1 Current Portfolio | ◇ No IB - and SCG Only | ◆ No IB - add to Core FI |
| ◇ No IB - SCG & SCV | ☒ Cash | ■ US Core Fixed Income | ■ High Yield FI |
| ■ Non - US Bonds | ■ US LC Growth | ■ US LC Core | ■ US LC Value |
| ■ US Sm Cap Growth | ■ US Sm Cap Core | ■ US Sm Cap Value | ■ Foreign Developed Equity |
| ■ Emerging Markets Equity | ■ Master Limited Partnerships | ■ Global Real Estate | |



ASSET ALLOCATIONS ANALYZED

Short Version Description

1. Current
7. No IB, SCG Only – reallocate out of international bonds into US core fixed income; reallocate small cap core to small cap growth
8. No IB, add to Core FI – reallocate out of international bonds into US core fixed income; keep allocations to small cap core and small cap growth
9. No IB, SCG & SCV – reallocate out of international bonds into US core fixed income; reallocate small cap core to small cap value

Next page shows the allocation within each portfolio.



ASSET ALLOCATIONS ANALYZED

Asset Class	1 Current	7 No IB, SCG Only	8 No IB, add to Core FI	9 No IB, SCG & SCV
US Core FI	21.00%	26.00%	26.00%	26.00%
High Yield FI	--	--	--	--
Non-US FI	5.00	--	--	--
US Large Cap Growth	16.00	16.00	16.00	16.00
US Large Cap Value	16.00	16.00	16.00	16.00
US Small Cap Value	--	--	--	5.00
US Small Cap Growth	5.00	10.00	5.00	5.00
US Small Cap Core	5.00	--	5.00	--
Foreign Developed Equity	21.00	21.00	21.00	21.00
Emerging Market Equity	6.00	6.00	6.00	6.00
Master Limited Partnerships	5.00	5.00	5.00	5.00
Global Real Estate	--	--	--	--

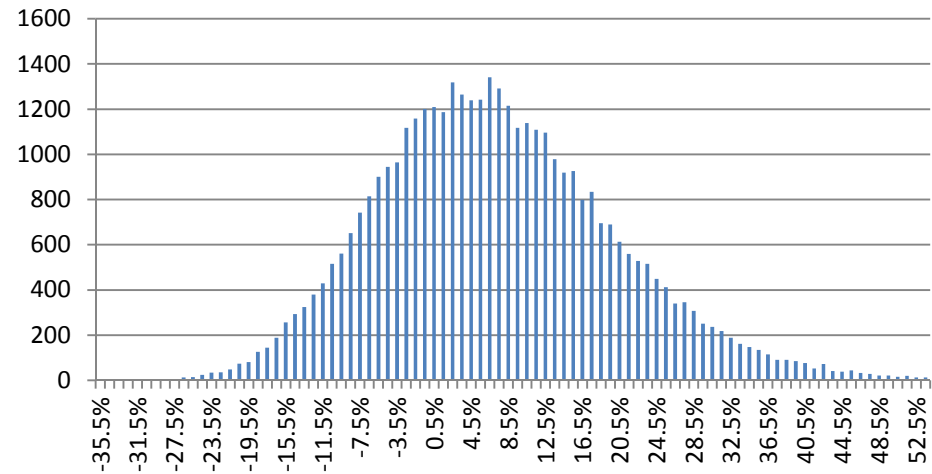
	1 Current	7 No IB, SCG Only	3 No IB, add to Core FI	9 No IB, SCG & SCV
Return	6.84%	6.94%	6.90%	6.87%
Standard Deviation	13.01%	13.08%	12.93%	12.81%
Sharpe Ratio	0.33	0.34	0.34	0.34



ASSET ALLOCATIONS ANALYZED

Asset Class	%
US Core FI	21.0
Non-US FI	5.0
US LC Growth	16.0
US LC Value	16.0
US Sm Growth	5.0
US Sm Core	5.0
Developed Intl	21.0
Emerging Mkts	6.0
MLPs	5.0

1 Current



Return	Std Dev
6.84%	13.01%

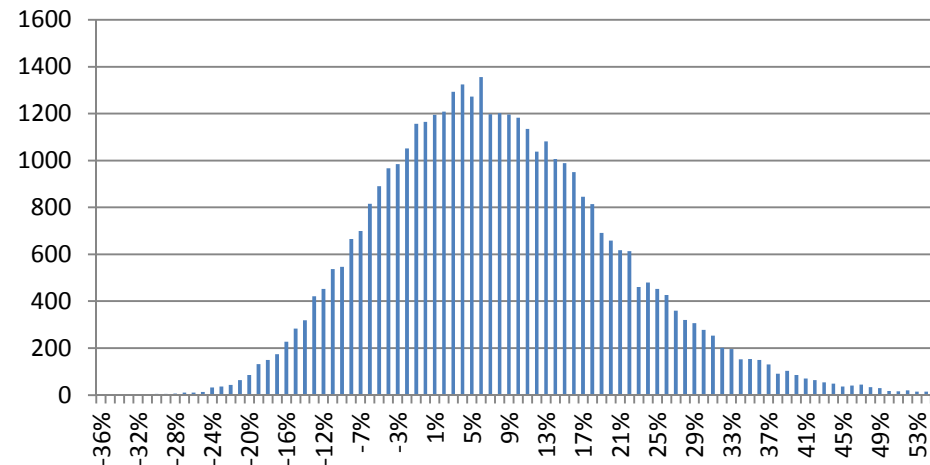
Recent Years	Historical Returns
1	18.71%
5	14.05%
10	8.38%
15	6.71%



ASSET ALLOCATIONS ANALYZED

Asset Class	%
US Core FI	26.0
US LC Growth	16.0
US LC Value	16.0
US Sm Growth	10.0
Developed Intl	21.0
Emerging Mkts	6.0
MLPs	5.0

7 No IB, SCG Only



Return	Std Dev
6.94%	13.08%

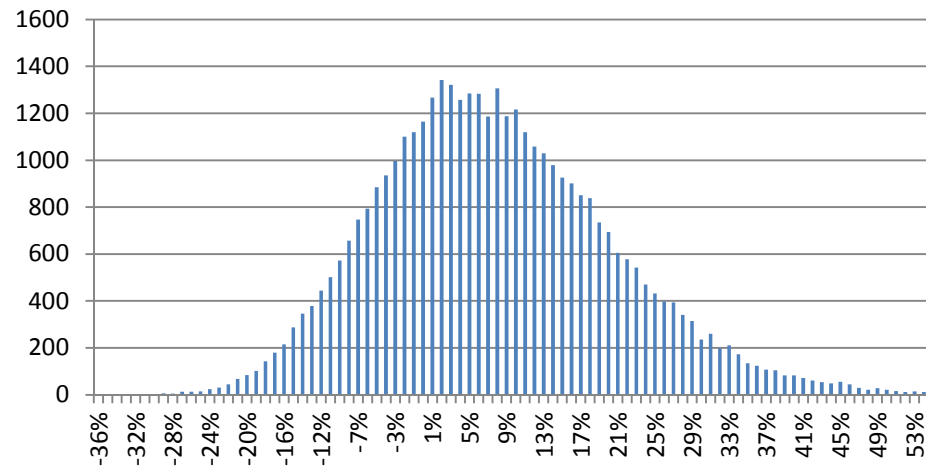
Recent Years	Historical Returns
1	18.52%
5	14.13%
10	8.38%
15	6.61%



ASSET ALLOCATIONS ANALYZED

Asset Class	%
US Core FI	26.0
US LC Growth	16.0
US LC Value	16.0
US Sm Growth	5.0
US Sm Core	5.0
Developed Intl	21.0
Emerging Mkts	6.0
MLPs	5.0

8 No IB, add to Core FI



Return	Std Dev
6.90%	12.93%

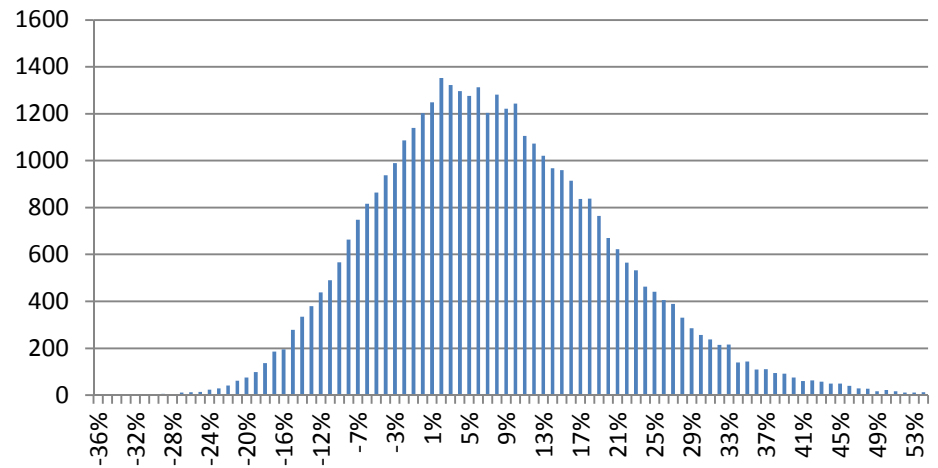
Recent Years	Historical Returns
1	19.02%
5	14.69%
10	8.08%
15	6.48%



ASSET ALLOCATIONS ANALYZED

Asset Class	%
US Core FI	26.00
US LC Growth	16.00
US LC Value	16.00
US Sm Growth	5.00
US Sm Value	5.00
Developed Intl	21.00
Emerging Mkts	6.00
MLPs	5.00

9 No IB, SCG & SCV



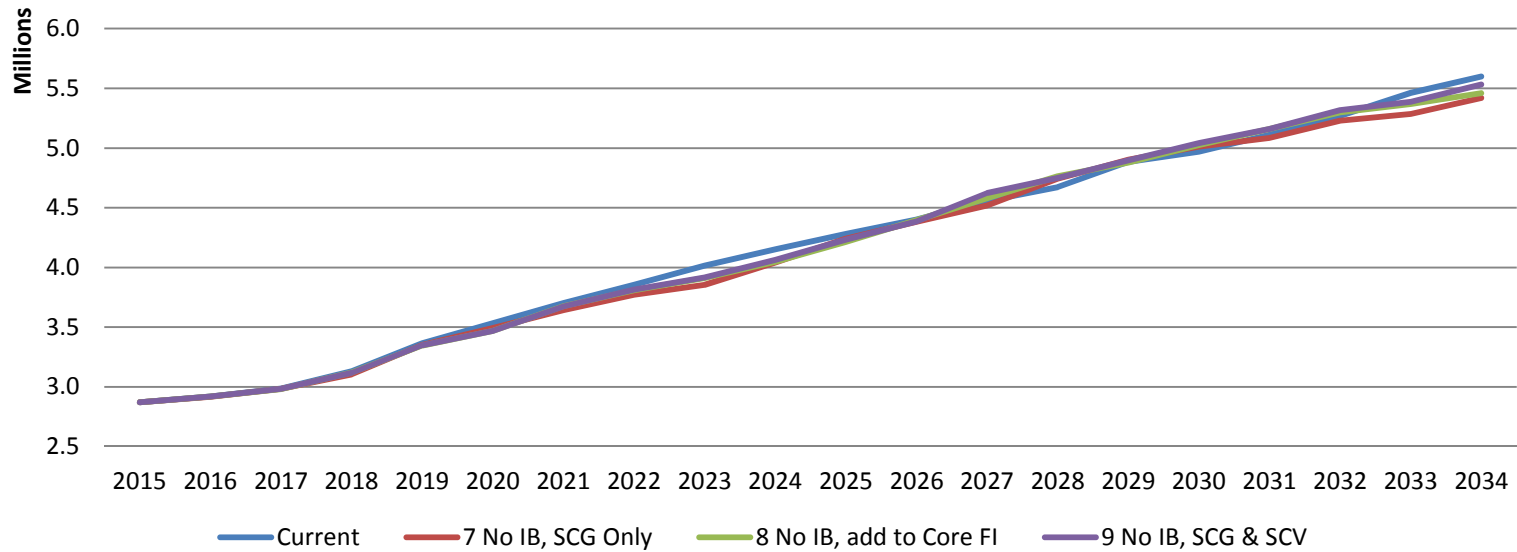
Return	Std Dev
6.87%	12.81%

Recent Years	Historical Returns
1	18.41%
5	14.09%
10	8.35%
15	6.79%



PROJECTED CONTRIBUTIONS

Required Annual Part 1 & 2 Contributions Median

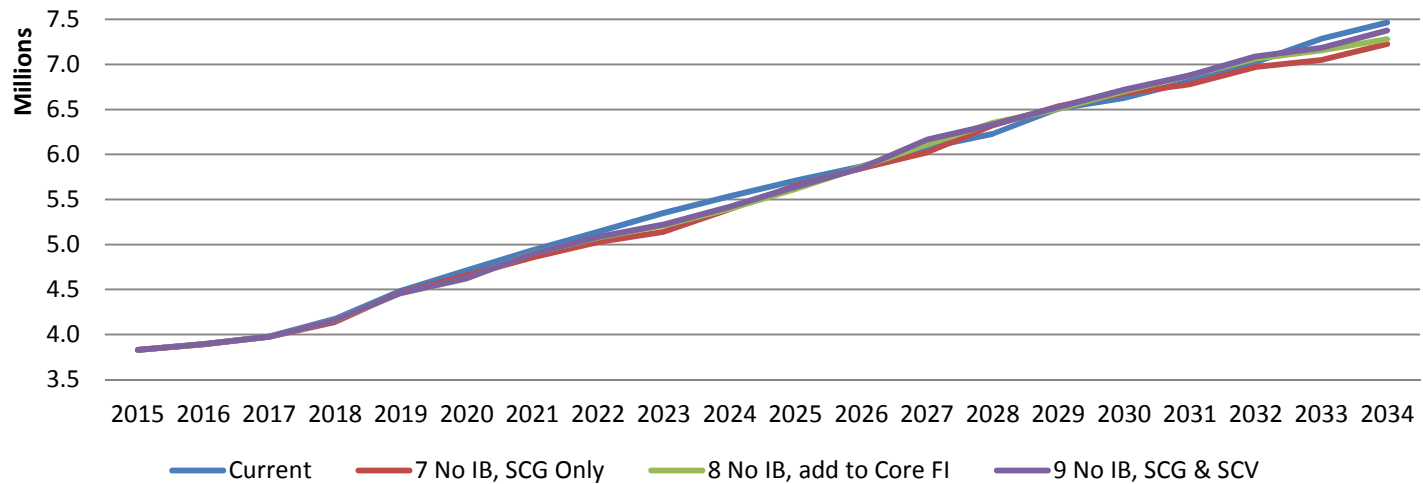


	1	7	8	9
Year 10 Contributions	Current	No IB, SCG Only	No IB, add to Core FI	No IB, SCG & SCV
Min	\$1.3	\$1.3	\$1.3	\$1.3
25 th percentile	2.7	2.6	2.5	2.6
Median	4.2	4.0	4.0	4.1
75 th percentile	5.3	5.3	5.2	5.2
Max	7.9	7.9	8.1	8.0



PROJECTED CONTRIBUTIONS

Required Annual Contributions State + Part 1 + Part2 Median



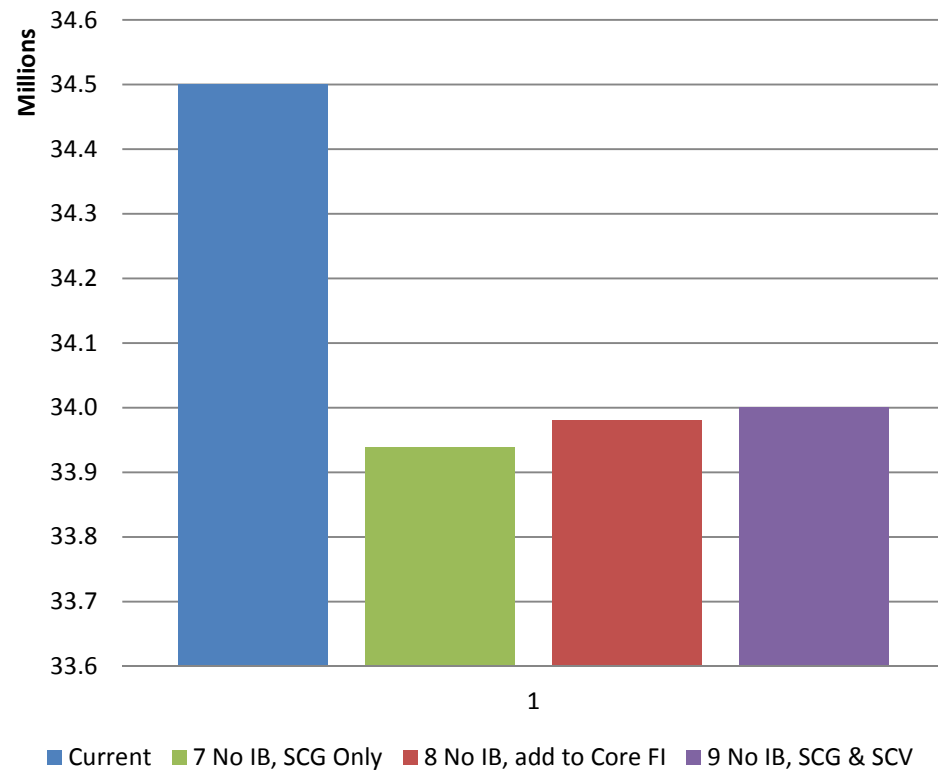
	1	7	8	9
Year 10 Contributions	Current	No IB, SCG Only	No IB, add to Core FI	No IB, SCG & SCV
Min	\$1.8	\$1.8	\$1.8	\$1.8
25 th percentile	3.6	3.5	3.4	3.4
Median	5.5	5.4	5.4	5.4
75 th percentile	7.1	7.1	7.0	7.0
Max	10.6	10.6	10.7	10.7



PROJECTED CONTRIBUTIONS

- Sum of contributions for the first 10 years, Part 1 plus Part 2 only
- See next slide for detail

**Contributions - 10 Years
Median**



PROJECTED CONTRIBUTIONS

Here is the range of expected contributions, summed over the first 10 years for each allocation (only Part 1 plus Part 2 are shown).

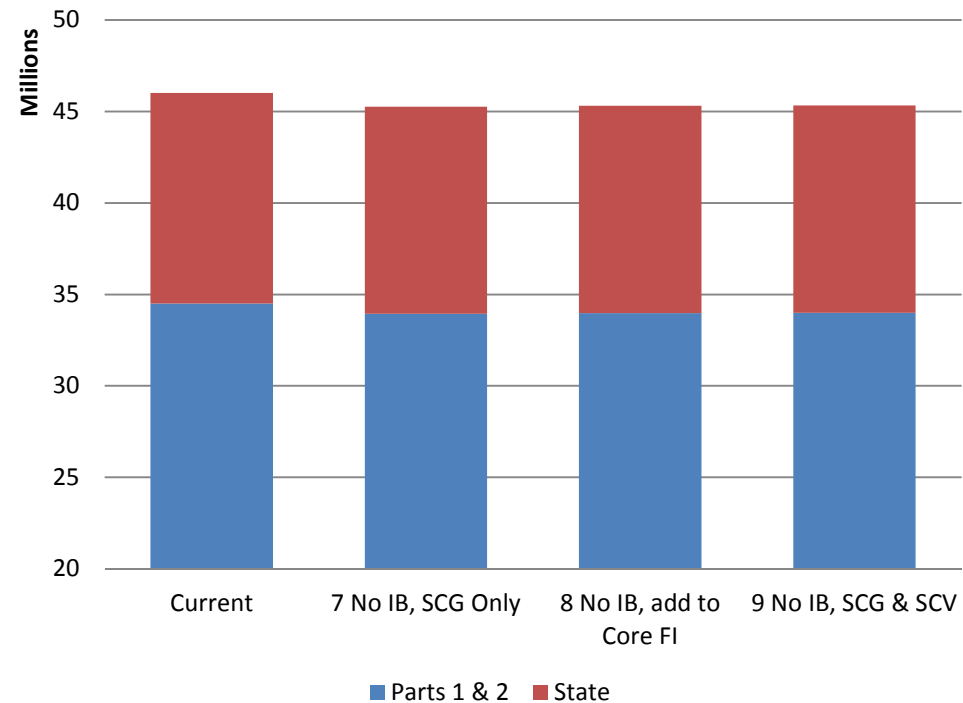
10-Year Sum of Contributions	1 Current	7 No IB, SCG Only	8 No IB, add to Core FI	9 No IB, SCG & SCV
Min	\$16.0	\$15.8	\$15.4	\$15.5
25 th percentile	27.2	27.6	27.6	27.7
Median	34.5	33.9	34.0	34.0
75 th percentile	40.1	39.8	39.8	39.6
Max	60.8	60.4	59.6	59.5



PROJECTED CONTRIBUTIONS

- Sum of contributions for the first 10 years
- See next slide for detail

**Contributions - 10 Years
State + Part 1 + Part2
Median**



PROJECTED CONTRIBUTIONS

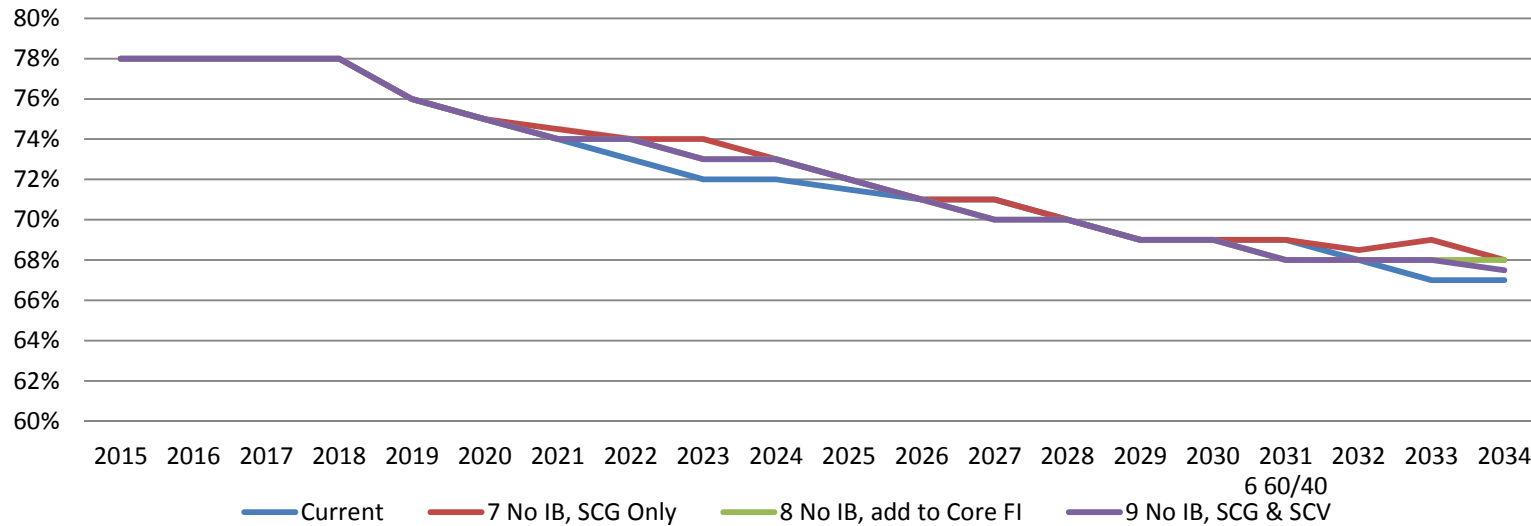
Here is the range of expected contributions, summed over the first 10 years for each allocation (only State is shown below).

10-Year Sum of Contributions	1 Current	7 No IB, SCG Only	8 No IB, add to Core FI	9 No IB, SCG & SCV
Min	\$5.3	\$5.3	\$5.1	\$5.2
25 th percentile	9.1	9.2	9.2	9.2
Median	11.5	11.3	11.3	11.3
75 th percentile	13.4	13.3	13.3	13.2
Max	20.3	20.1	19.9	19.8



PROJECTED FUNDED STATUS including State contribution

Funded Status Median



Initial funded status is 78%.

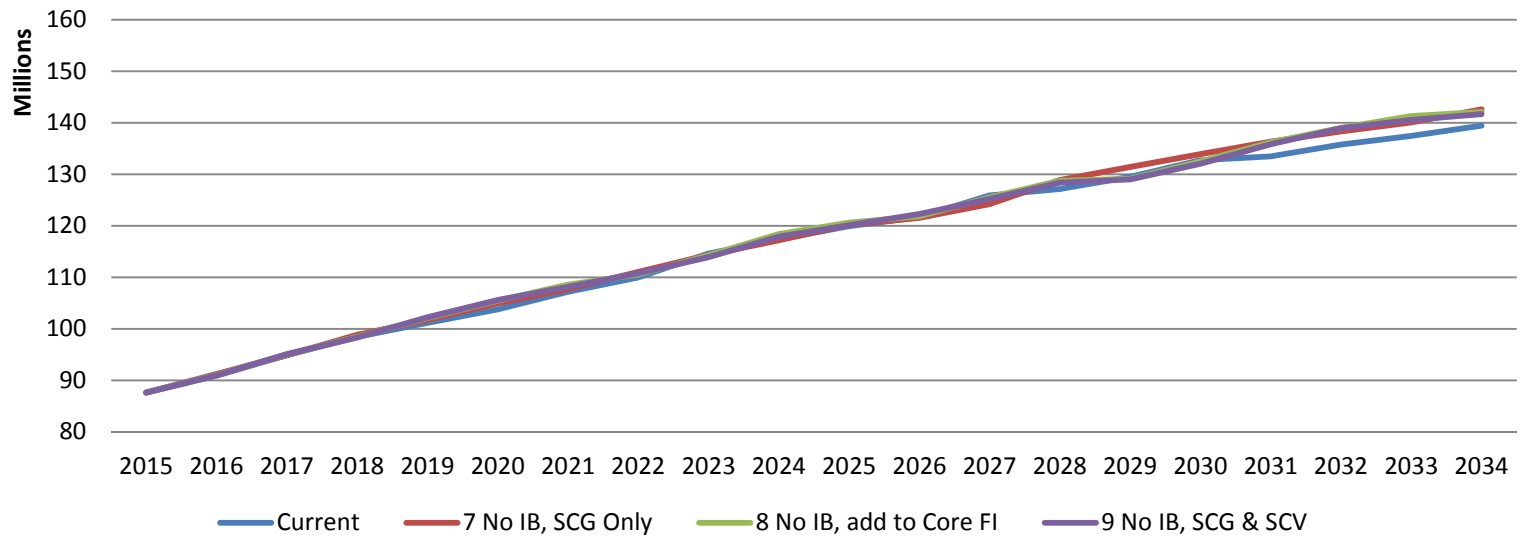
Below is the likelihood of being 78% or higher in year 10.

Allocation	1 Current	7 No IB, SCG Only	8 No IB, add to Core FI	9 No IB, SCG & SCV
Prob \geq 78%	40%	41%	41%	41%



PROJECTED ASSETS including State contribution

Market Value of Assets Median



Year 10 Market Values	1 Current	7 No IB, SCG Only	8 No IB, add to Core FI	9 No IB, SCG & SCV
Min	\$48.6	\$48.5	\$46.0	\$46.3
25 th percentile	94.3	93.8	93.4	93.7
Median	117.4	117.2	118.4	117.9
75 th percentile	145.2	149.2	147.6	147.1
Max	381.0	385.5	341.3	338.1



ADDITIONAL NOTES

The outcomes from the projections in this report are dependent on the assumptions used. Differences between our projections and actual amounts depend on the extent to which future experience conforms to the assumptions made for this analysis. It is certain that actual experience will not conform exactly to the assumptions to be used in this analysis. Simulated investment performance results do not reflect actual trading and have certain inherent limitations. The actual financial results for TESRS in future years may not be included among the outcomes presented in this report. Actual amounts will differ from projected amounts to the extent that actual experience is better or worse than expected.

The analysis in this report was prepared utilizing data from third parties and other sources including but not limited to internal computer software and databases. Reasonable care has been taken to assure the accuracy of the data contained herein, and comments are objectively stated and are based on facts gathered in good faith. These reports do not constitute investment advice with respect to the sale or disposition of individual securities. Milliman disclaims responsibility, financial or otherwise, for the accuracy or completeness of this report.

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