

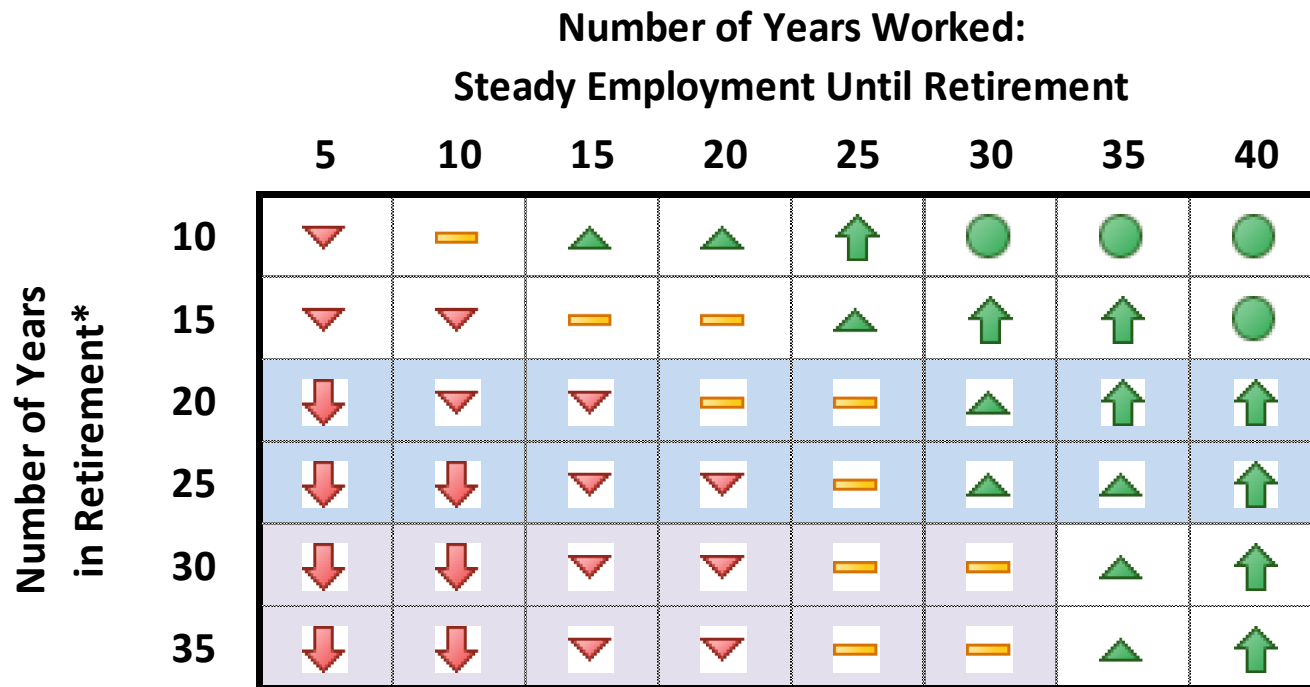
Analysis of Current KPERS Plan

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Analysis of Current KPERS Plan

- Sustainability of Current Plan – Part I
- Expected Compounded Rates of Return
- Sustainability of Current Plan – Part II
- Defined Contribution vs Defined Benefit
- A Possible Way Forward

Funding Adequacy by Employee at 8.00% Compounded Annual Investment Return



* Life expectancy of 65-year-old American: 20.2 yrs for female; 17.6 yrs for male; both increasing roughly 1 yr per decade

● = Funding excess of 75% or more

▲ = Funding excess of 37% to 75%

▬ = Funding excess of 12% to 37%

▬ = Funding at target ±12%

▼ = Funding shortfall of 12% to 37%

▼ = Funding shortfall of 37% to 75%

Employees Retiring at 65

Employees Retiring at 55

→ Conclusion: At 8% compounded annual investment return, the KPERS Plan is adequately funded for employees working 25 years or more

Expected Compounded Annual Investment Returns

Two factors will reduce the KPERS Plan's expected compounded annual investment returns (ECAIR):

1) Volatility of returns: expected volatility of returns reduces the ECAIR.

How? Consider the simple example where annual returns have a mean of 8% and a standard deviation of 10%:

- Year One return = $8\% + 10\% = 18\%$; Year Two return = $8\% - 10\% = -2\%$
 - Two year compound return = $(1 + 18\%) \times (1 - 2\%) = 1.1564$
 - Average Compound Return = Square Root of $(1.1564) = 1.07536 \rightarrow$ CAIR = 7.536%
 - Theoretical ECAIR of normally distributed returns ($\mu=8\%$, $\sigma=10\%$) = 7.5319%
- For the KPERS Plan ($\mu=8.00\%$, $\sigma=10.29\%$), ECAIR = 7.509%, a reduction of approximately 0.50% from the mean 8% return

Expected Compounded Annual Investment Returns

Historical Compounded Returns Support a 4.5% Real Compounded Annualized Investment Return

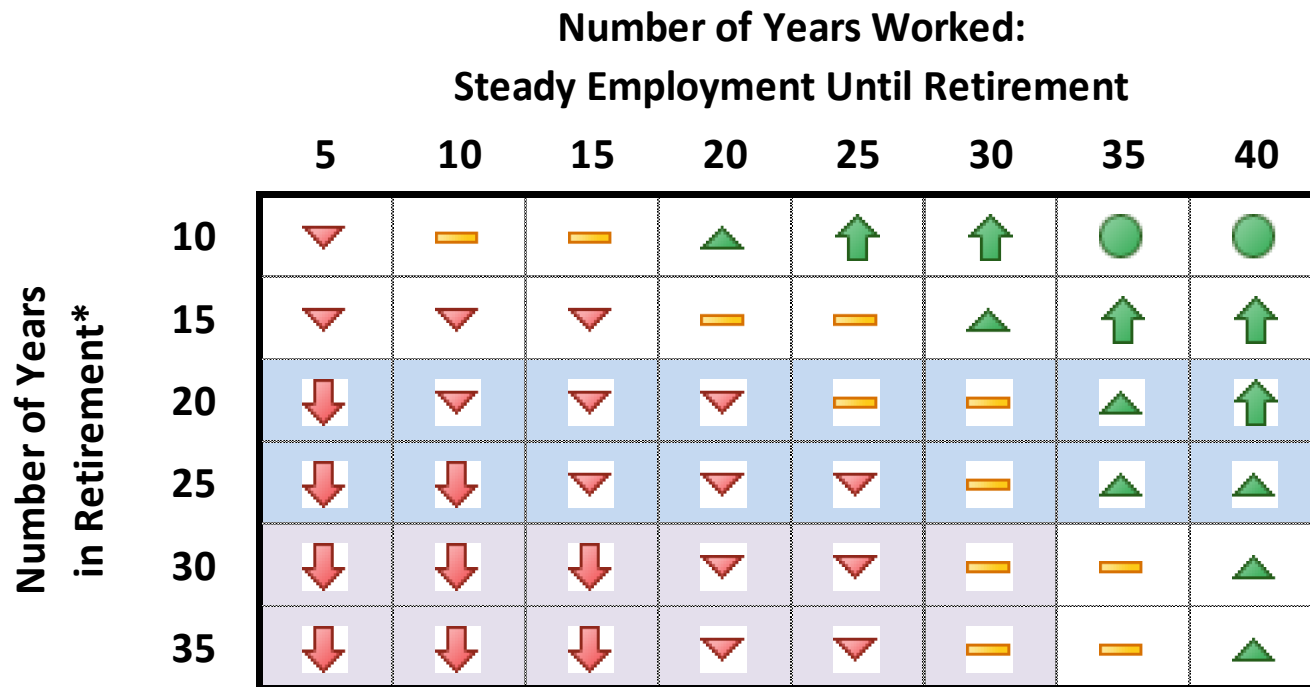
Stocks – S&P Composite Index	Time Period		Nominal Return		Real Return		Portfolio Weight	Wtd Real Compound Return	
			Average	Compound	Average	Compound		L/T Average	1976-2010
	1960-2010		10.71%	9.43%	6.45%	5.14%	55%		
	1976-2010		11.99%	10.65%	7.68%	6.39%			3.51%
75-Year	Minimum				6.90%	5.09%			
	Average				8.16%	6.47%		3.56%	
	Maximum				9.70%	8.02%			
Aggregate	Time Period		Nominal		Real		Portfolio Weight	Wtd Real Compound Return	
			Yield	Compound Rtn	Yield	Compound Rtn		L/T Average	1976-2010
	1960-2010		5.68%	5.67%	2.67%	2.66%	45%	1.20%	
	1976-2010		6.05%	6.68%	3.14%	3.68%†			1.66%
Total	Less: Management Fees							(.40%)	(.40%)
	Portfolio Return							4.36%	4.77%‡

† Average Annual Price Return of 1.02%

‡ Compares to actual KPERS return of 4.92%

- Based upon historical averages, the Real Expected Compounded Annual Investment Return likely to be close to 4.50% → or Nominal Return of 7.50% with 3% Inflation

Funding Adequacy by Employee at 7.50% Compounded Annual Investment Return



* Life expectancy of 65-year-old American: 20.2 yrs for female; 17.6 yrs for male; both increasing roughly 1 yr per decade

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▼ = Funding shortfall of 37% to 75%

Employees Retiring at 65

Employees Retiring at 55

→ Conclusion: At 7.5% compounded annual investment return, the Plan is adequately funded for employees working 30 years or more

Expected Compounded Annual Investment Returns (Continued)

Two factors will reduce the KPERS Plan's expected compounded annual investment returns (ECAIR):

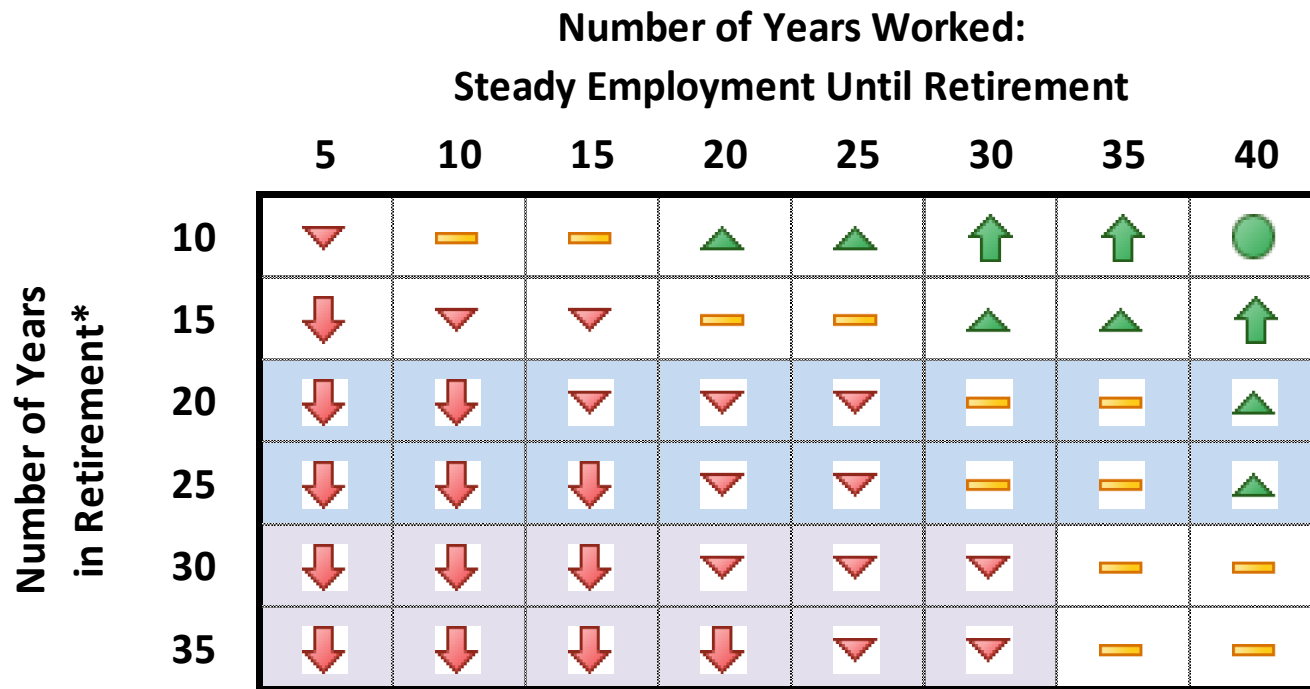
2) Low Bond Market Yields: expected returns will be reduced due to current Bond Market Yields which are 2% to 2.5% (average 2.25%) below long-term historical averages

How? Consider the following two scenarios:

- a) If current interest rates become the "new norm", expected bond market yields (and returns) will be 2.25% below the historical average, reducing the KPERS Plan returns by $2.25\% \times .45 \approx 1.01\%$
- b) If interest rates rise over time (say 5 to 10 years) to return to the historical average, the average yield of a bond portfolio will be below the historical average AND will be further reduced by the decline in principal value due to rising interest rates:
 - Impact on average 20-year KPERS Plan return: 0.60% to 0.75% lower
 - Impact on average 30-year KPERS Plan return: 0.40% to 0.50% lower
 - Impact on average 40-year KPERS Plan return: 0.35% to 0.40% lower

→ Conclusion: due to volatility and lower bond returns, the KPERS Plan's expected compounded annual return is likely to be 0.85% to 1.25% below the stated 8% return

Funding Adequacy by Employee at 7.00% Compounded Annual Investment Return



* Life expectancy of 65-year-old American: 20.2 yrs for female; 17.6 yrs for male; both increasing roughly 1 yr per decade

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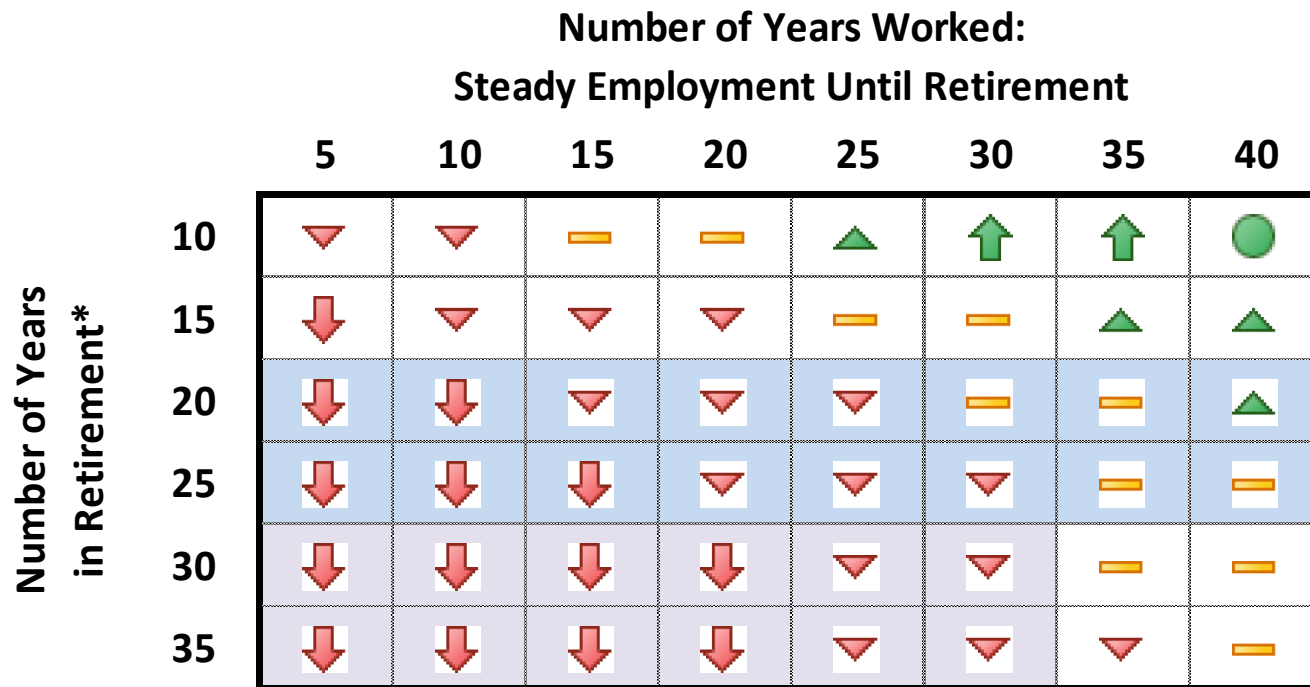
▼ = Funding shortfall of 37% to 75%

Employees Retiring at 65

Employees Retiring at 55

→ Conclusion: At 7% compounded annual investment return, the Plan is adequately funded for employees working 30 years or more; not fully funded for early retirees

Funding Adequacy by Employee at 6.75% Compounded Annual Investment Return



* Life expectancy of 65-year-old American: 20.2 yrs for female; 17.6 yrs for male; both increasing roughly 1 yr per decade

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▲ = Funding excess of 37% to 75%

▲ = Funding excess of 12% to 37%

▬ = Funding at target ±12%

▼ = Funding shortfall of 12% to 37%

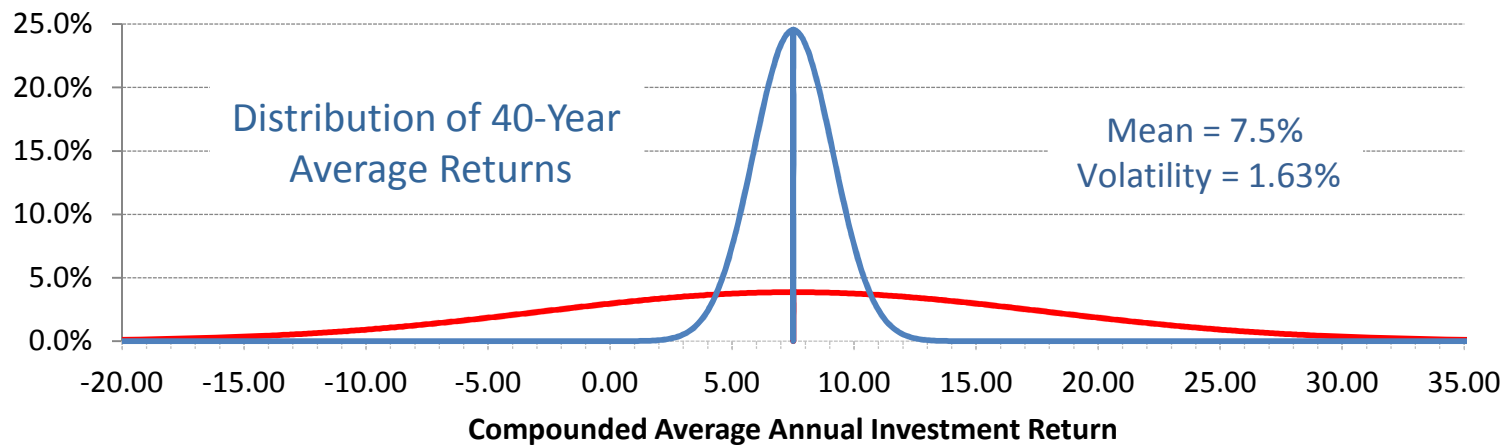
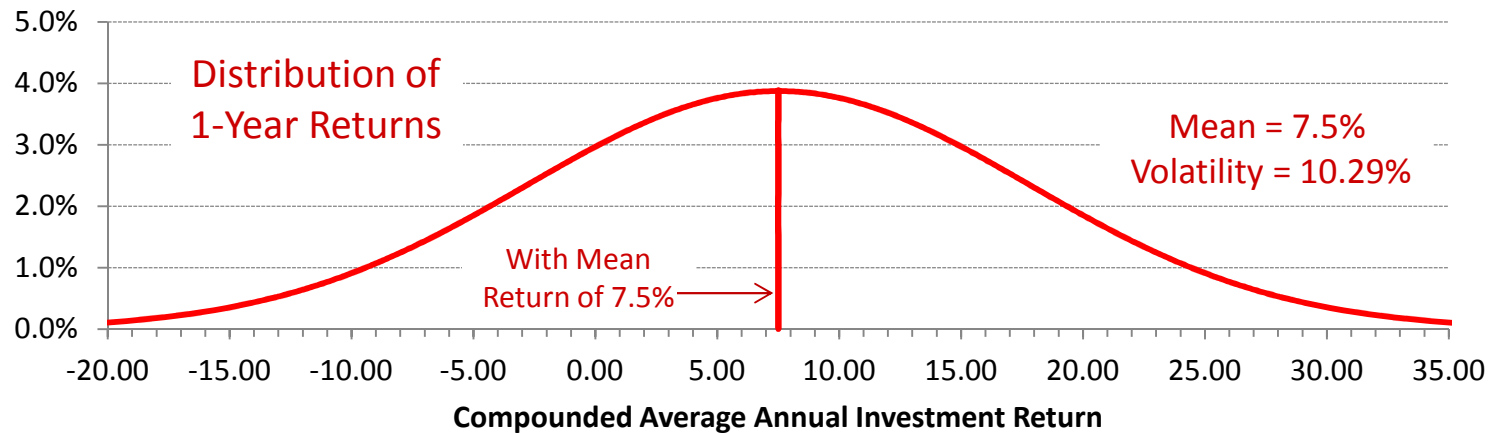
▼ = Funding shortfall of 37% to 75%

Employees Retiring at 65

Employees Retiring at 55

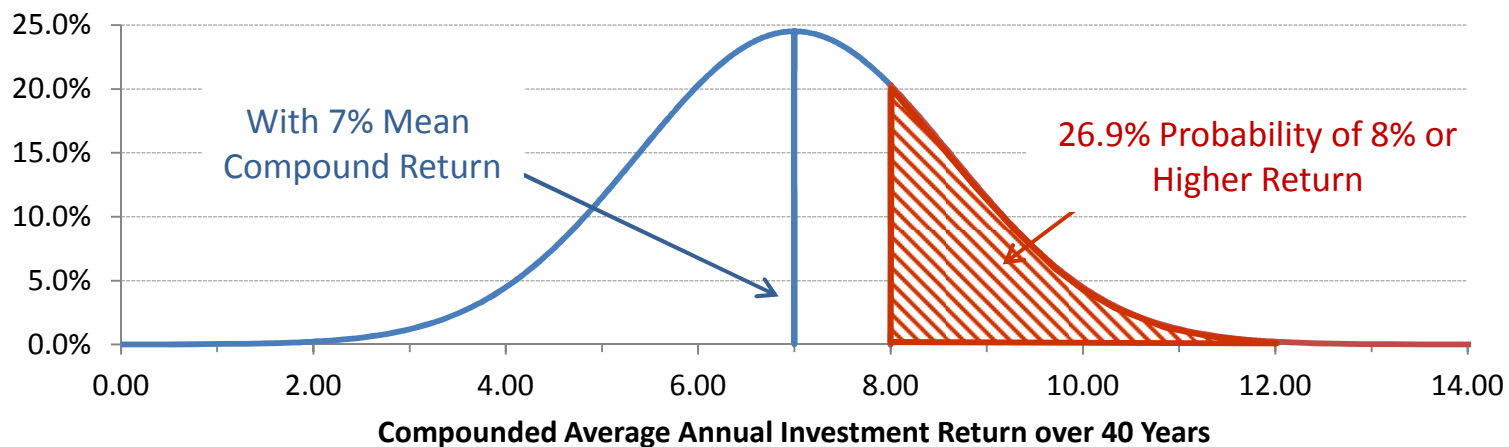
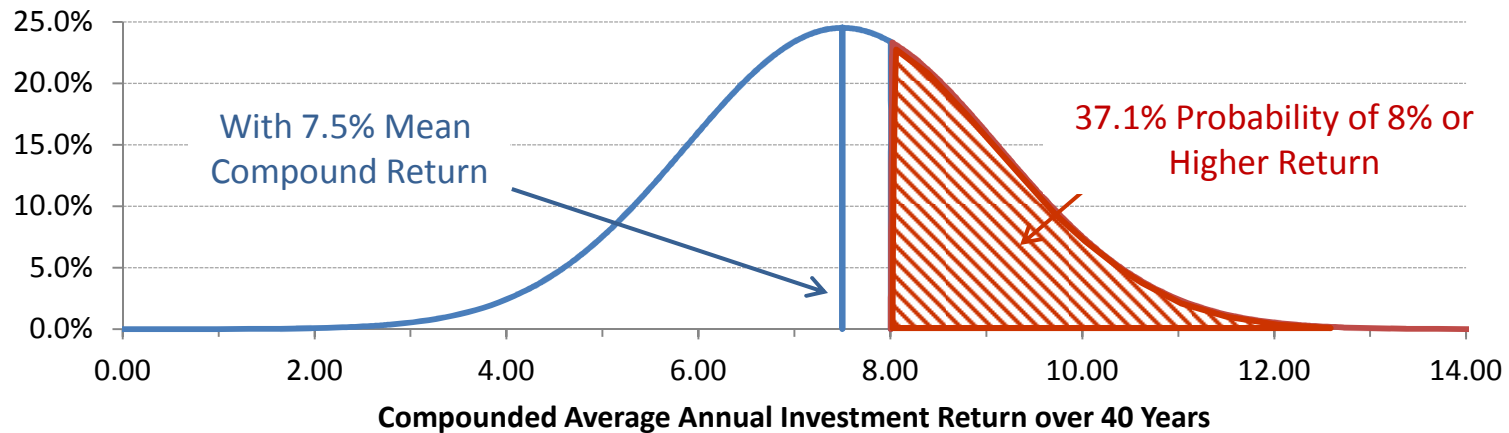
→ Conclusion: At 6.75% compounded annual investment return, the Plan is adequately funded for employees working 35 years or more; not fully funded for early retirees

Variability of Returns as a Function of Investment Time Horizon



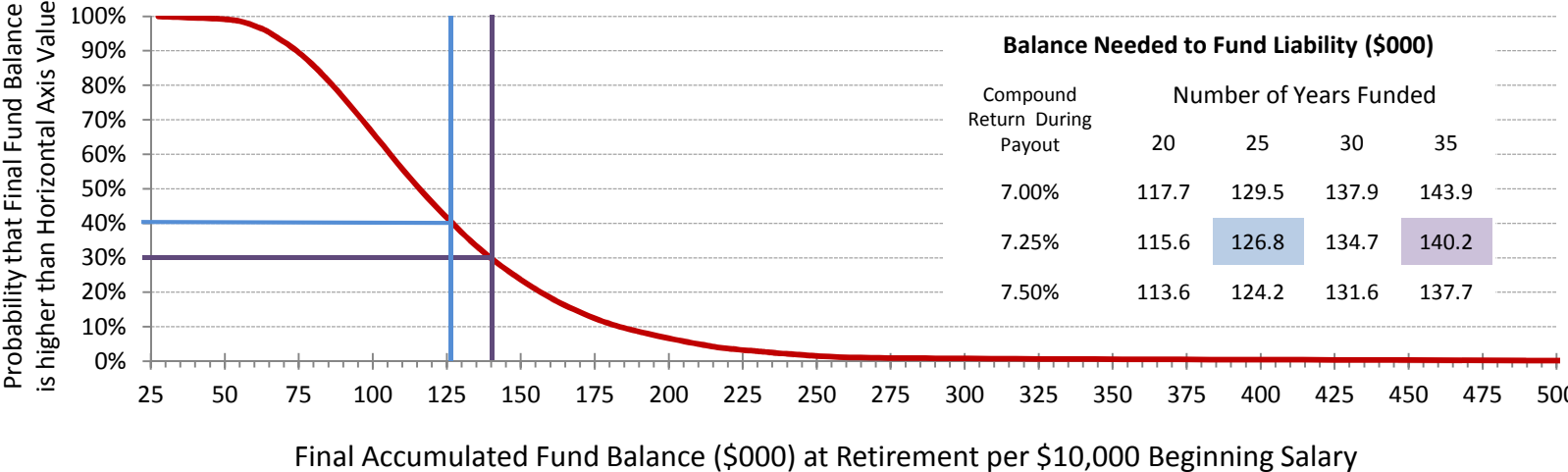
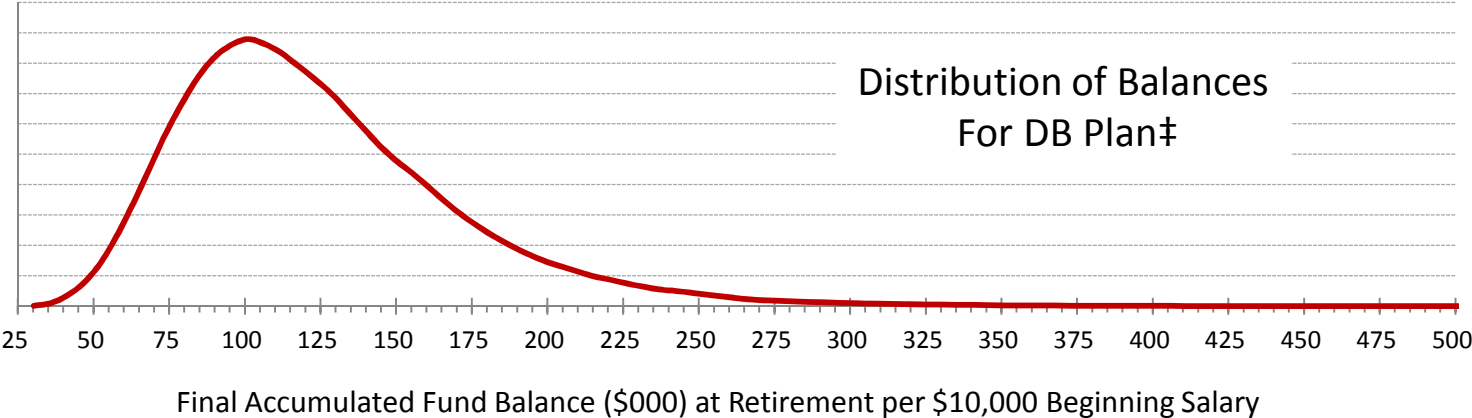
→ Average Annual Investment Returns become much more certain with long investment time horizons

Likelihood of Realizing 8% Compound Annual Investment Return



Note: with 6.75% Mean Return, there is a 22.1% probability of achieving 8% or higher return and **even with an 8.00% Mean Return, there is a 50% probability of achieving 8% or lower return**

Likelihood of Funding Pension Liability†



† Results of 100,000 simulations of 30-year employee
 ‡ Assumes 7.5% expected annual non-compounded investment return

Attributes of Selected Retirement Plans

Plan Type	Investment Risk/UpSide		Fixed/Known Retirement Payment	Portable	Transferable At Death
	Accumulation Period	Distribution Period			
Defined Benefit	Plan Sponsor	Plan Sponsor	Yes	No	No
Defined Contribution	Participant	Participant	No/Yes†	Yes	Yes
Cash-Value Pension	Plan Sponsor or Participant*	Plan Sponsor or Participant*	No/Yes†	Varies‡	Varies‡

* Typically, the Plan Sponsor will credit a fixed or market-based return (e.g., Moody A-Rated Corporate Bond Yield) but may be invested as rest of Defined Contribution Plan

† The cash balance at retirement may be annuitized as part of the Plan, if available, or may used to purchase an immediate annuity from a third-party provider

‡ Feature may or may not be available during employment but is available after retirement

Attributes of Defined Contribution Plans

An individually-owned Defined Contribution Plan has at least two significant advantages over a Defined Benefit Plan:

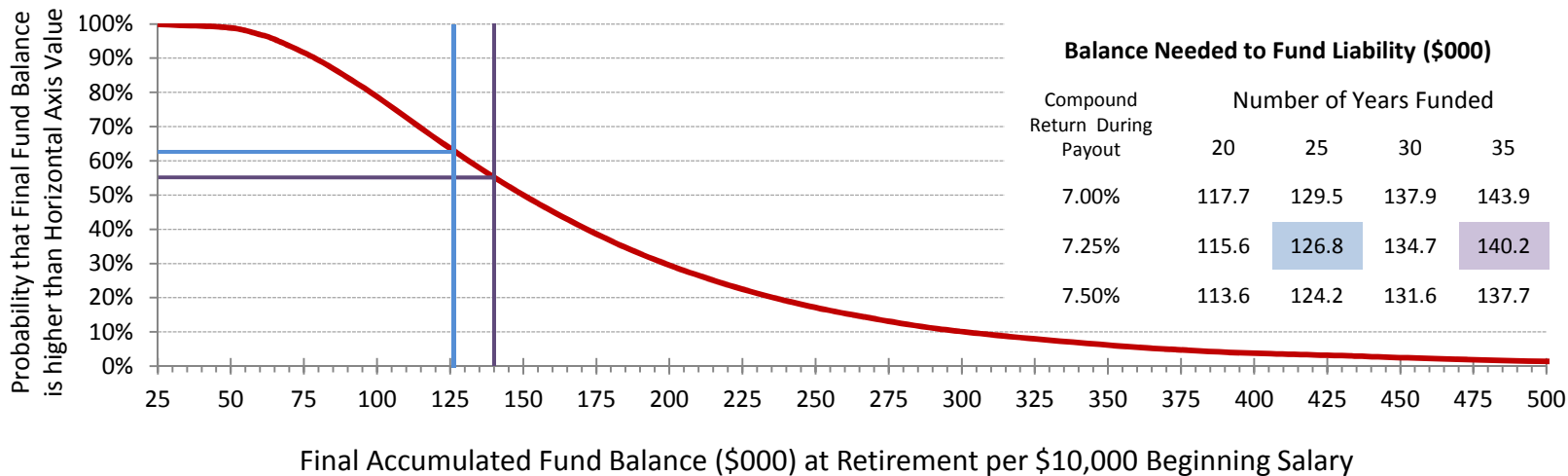
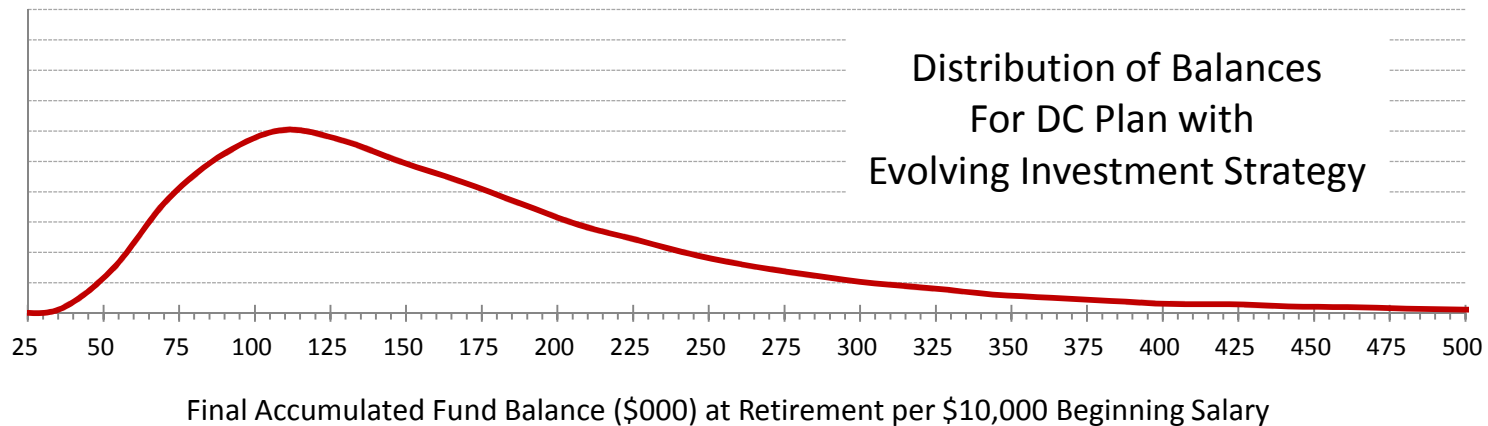
1) From an investment perspective:

- a) because each participant has his/her own portfolio, the employee can create a personalized investment strategy using their own time horizon which raises their expected returns. For example:

Years to Retirement	Percentage in		Expected Annual Return		Annual Volatility		
	Stocks	Bonds	Stated	Compounded	For 1 Year	Time-Adjusted	
						To Retirement	To Average Payout*
16 to 40	100%	0%	10.49%	9.00%	18.11%	3.42%	2.94%
11 to 15	80%	20%	9.46%	8.45%	15.05%	3.89%	3.14%
6 to 10	75%	25%	9.20%	8.26%	14.30%	5.06%	3.37%
0 to 5	60%	40%	8.43%	7.75%	12.09%	7.65%	3.42%

* Assumes retirement payout of 20 years

Likelihood of Funding Pension Liability†



† Results of 100,000 simulations of 30-year employee

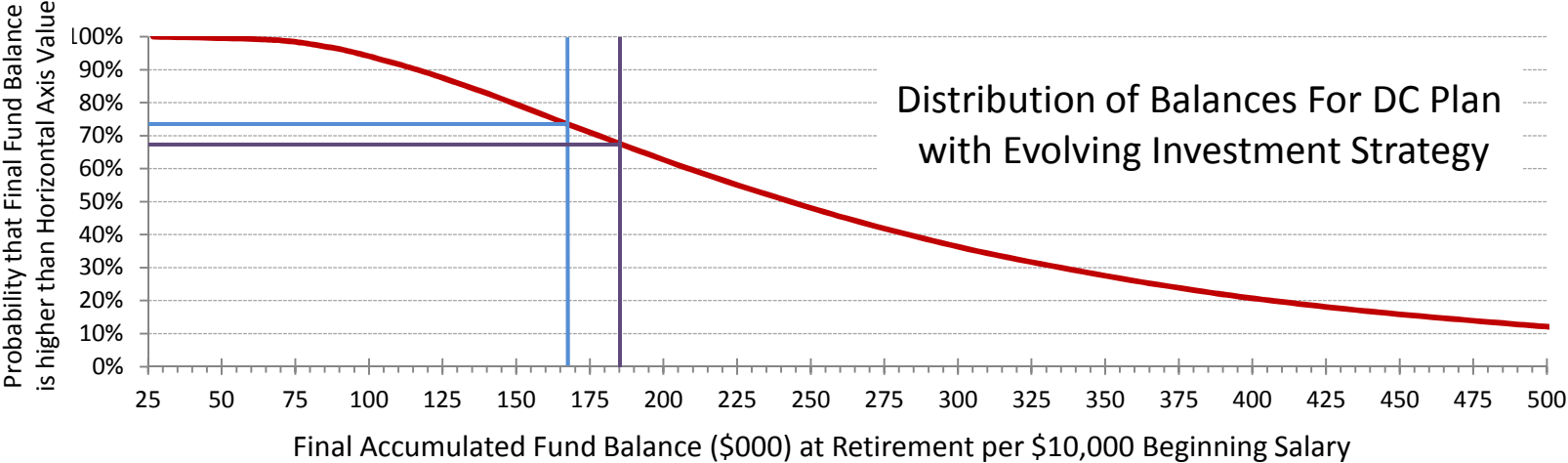
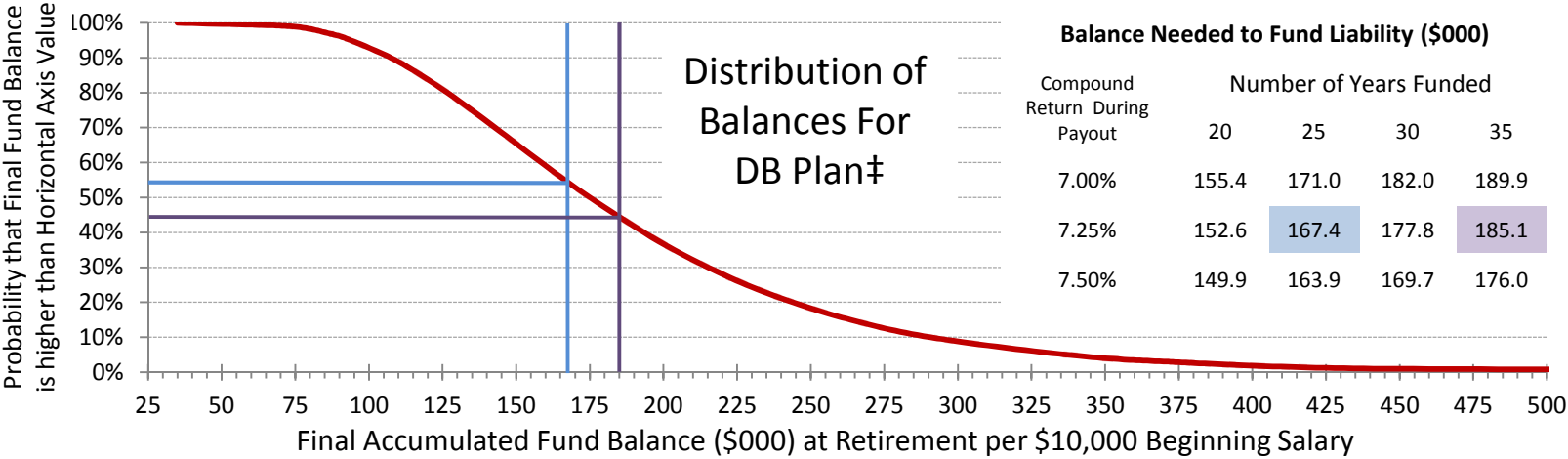
Attributes of Defined Contribution Plans (Continued)

An individually-owned Defined Contribution Plan has at least two significant advantages over a Defined Benefit Plan:

- 1) From an investment perspective (continued):
 - b) because each participant has his/her own portfolio, the employee benefits from up-side investment performance and results

- 2) From a portability perspective: the employee has an asset which they do not forfeit in the case of change of employment and death:
 - a) The employee can take the fund balance with them if they change employers
 - b) The heirs of the employee inherit the fund balance when the individual dies

Likelihood of Funding Pension Liability†



† Results of 100,000 simulations of 35-year employee

‡ Assumes 7.5% expected annual non-compounded investment return

Conclusions of Analysis of Current KPERS Plan

- Plan is likely to be underfunded retirement liabilities for a large cohort of employees, especially given current bond market yields and prospective returns
- Defined Contribution Plan design offers high likelihood of delivering higher accumulated fund balances by utilizing more aggressive - yet prudent - personalized investment strategies
- Defined Contribution Plan design could enable the State to be more competitive with other employers by offering retirement fund portability and inheritability

A Possible Way Forward for KPERs

➤ “Tie Off” Current Defined Benefit Plan

- 1) Do not create any new retirement liabilities under current plan/terms
- 2) Discontinue salary-based contributions to fund
- 3) Determine current unfunded liabilities (current assets less PV of current retirement benefits)

→ Issue debt at current low interest rates to fully fund Plan

➤ Create Blended DB/DC Plan

For Defined Benefit Component:

- 1) Modify benefit earned by year of employment to produce adequate funding at target likelihood of success

→ Benefit rate will decline for each year of employment as employee’s age increases (years to retirement decreases), such as the following:

Age	25	30	35	40	45	50	55	60	64
Annual Retirement Benefit as % of Year’s Salary	4.33%	3.49%	2.82%	2.27%	1.83%	1.48%	1.19%	0.96%	0.81%
Benefit Factor for Early Retirement					5 Years Early		10 Years Early		
					74.5% of Full Benefit		57.0% of Full Benefit		

- 2) Apply DB Component to a percentage of salary or to the first \$X,000 of salary

A Possible Way Forward for KPERS (Continued)

➤ Create Blended DB/DC Plan (Continued)

For Defined Contribution Component:

- 1) Create DC Plan Component
- 2) Make DC Plan option available for 100% of salary at time of Plan revision and for all future new hires
- 3) Provide education and targeted-mix funds for employees to address tendency to “sub-optimize” asset allocation of investments
- 4) Arrange for annuitization/immediate-annuity option for DC plan balance at retirement to create fixed income stream for retiring employees (to be provided by State or by third-party provider)

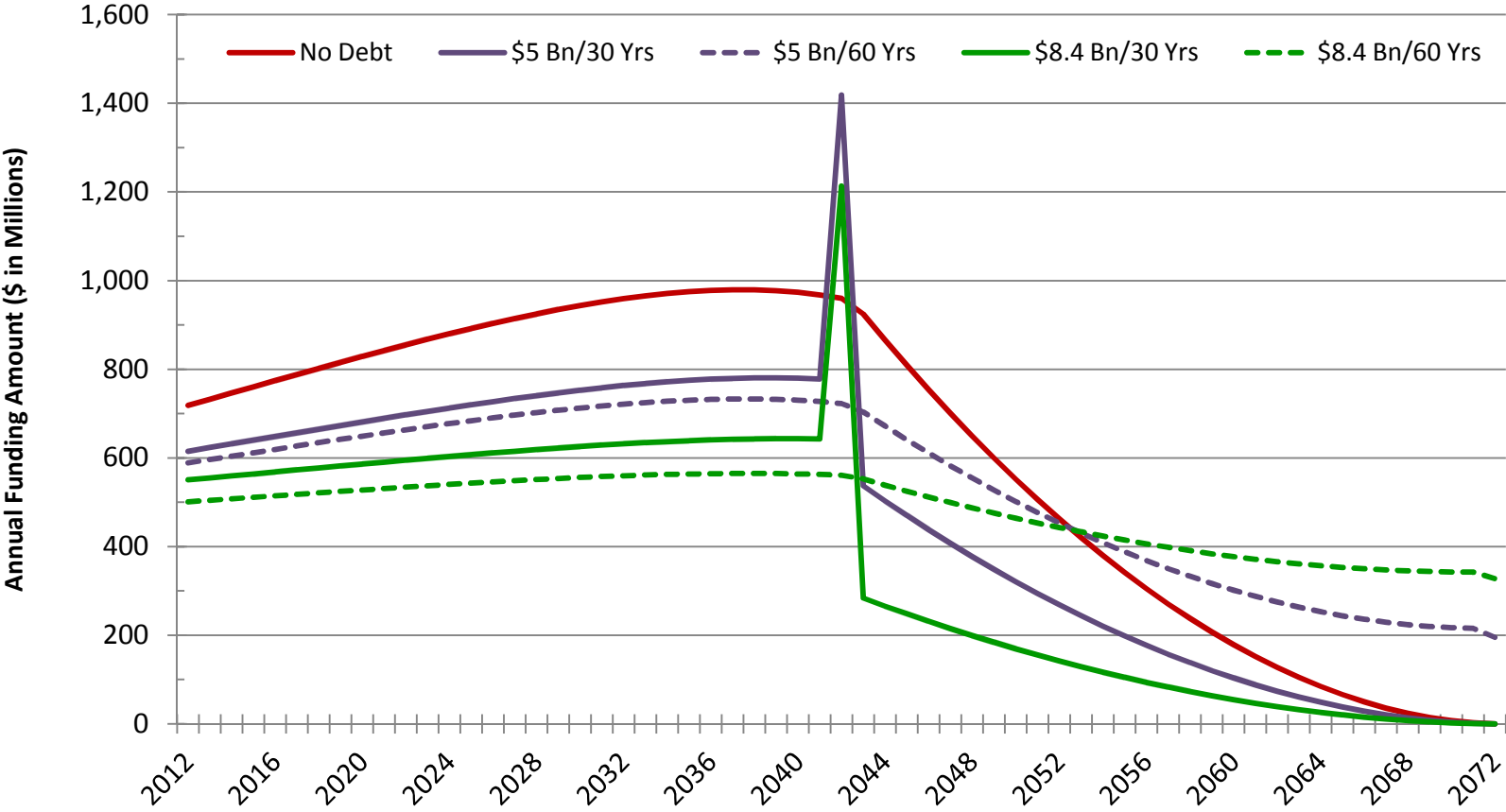
or

➤ Create 100% Defined Contribution Plan

- With features 1), 3) and 4) above

Using Debt to Reduce Funding of Existing Shortfall

KPERS Funding Required – Illustration*



* Based upon estimated liabilities and straight-line increasing funded percentage

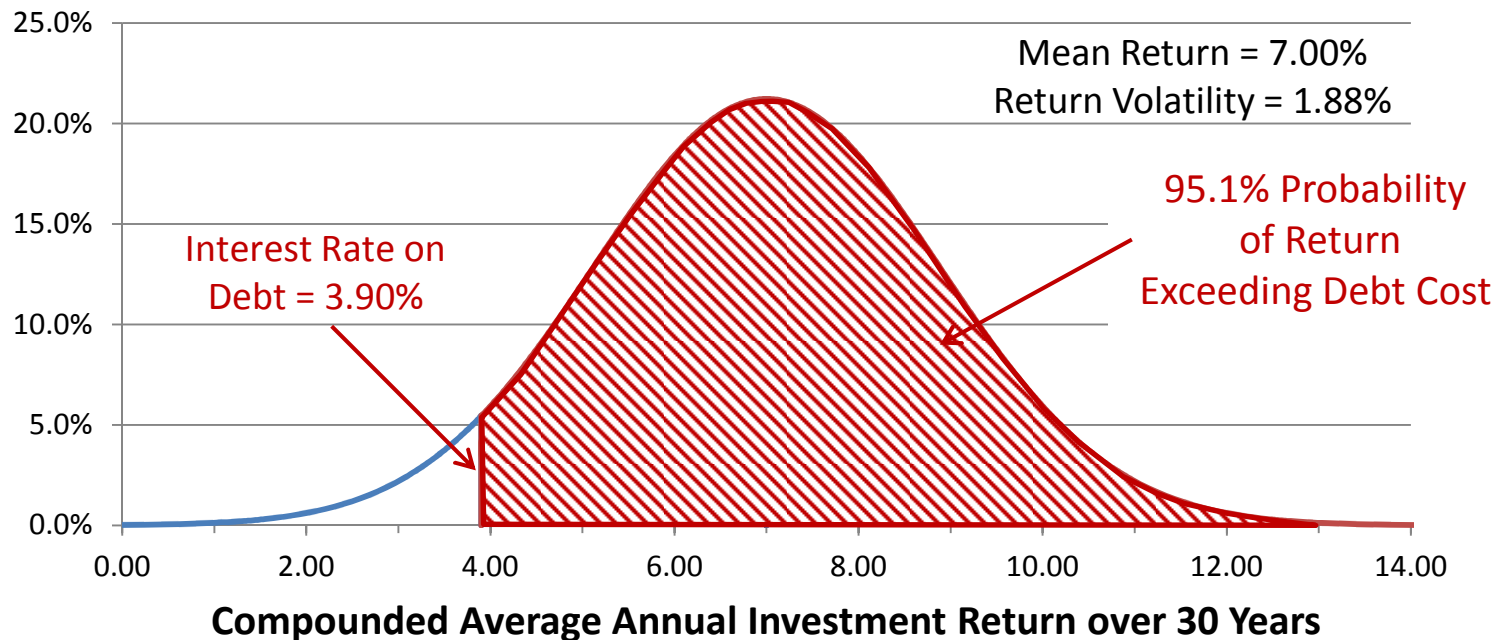
Using Debt to Reduce Funding of Existing Shortfall

Funding Options		Dollars in Billions			
		Total Contributions Less Debt Proceeds		Net Present Value of Total Contributions Less Debt Proceeds	
		Amount	Change from No Debt	Amount	Change from No Debt
No Debt		37.4	NA	10.9	NA
\$5 Billion Of Debt	30 Years	23.7	(13.7)	3.9	(7.0)
	60 Years	27.7	(9.7)	3.7	(7.2)
\$8.4 Billion Of Debt	30 Years	14.1	(23.3)	(0.9)	(11.8)
	60 Years	20.8	(16.6)	(1.3)	(12.2)

Implications:

- Use of debt decreases overall future funding needs both in total amount and in present value
 - Borrowing for 60 years vs 30 years does not appear to provide significant benefit
- Although there are many different debt and investment strategies and annual funding patterns which should be studied

Likelihood of Success Using Debt



- There is a very high likelihood that the proceeds from a 30-year debt issuance invested in the KPERS fund will earn a return in excess of the debt cost (3.9% estimated currently)
- But there are many permutations of debt-issuance and investment strategies to boost the KPERS fund returns, each will have different levels of returns and risks

Likelihood of Success Using Debt

Terms of Debt		Investment Mix (Stks/Bnds)	Expected Annual Return		Volatility of Annual Return		Prob of Rtn > Debt Rate
Years to Mat	Int Rate		Stated	Compound	1 Year	Over Term	
30	3.90%	KPERS Fund	7.50%	7.00%	10.29%	1.88%	95.1%
		30%/70%	6.91%	6.58%	8.43%	1.54%	95.9%
		0%/100%†	5.65%	NA	6.48%	NA	≈100%
10	2.65%	30%/70%	6.91%	6.58%	8.43%	2.66%	92.9%
		0%/100%‡	4.75%	NA	4.55%	NA	≈100%

† Bond Portfolio with 90% A-Rated 30-year Corporates and 10% Low-Grades

‡ Bond Portfolio with 90% A-Rated 10-year Corporates and 10% Low-Grades

Summary of KPERS Plan Analysis

- Stop “Digging”! The current plan has a significant likelihood of underfunding a large cohort of employees: Tie it off to discontinue the creation of new retirement liabilities and fund the current shortfall with debt
- Implement a new plan which has a targeted likelihood (hopefully greater than 50%) of producing adequate funding, by either:
 - Creating a blended DB/DC plan with revised guaranteed retirement benefits (lower than those of the current plan and adjusted for early retirees) for the DB component and a low-cost DC component, or
 - Implementing a 100% DC plan with low costs, employee education and annuitization options for retirees