14th Annual
EMERGING
ISSUES
FORUM

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- Kathleen Riley, Sr. Vice President & Actuary | Segal Consulting
- James Lamenzo, Actuary | PERAC

Hogan Conference Center

College of the Holy Cross, Worcester, MA

September 13, 2018

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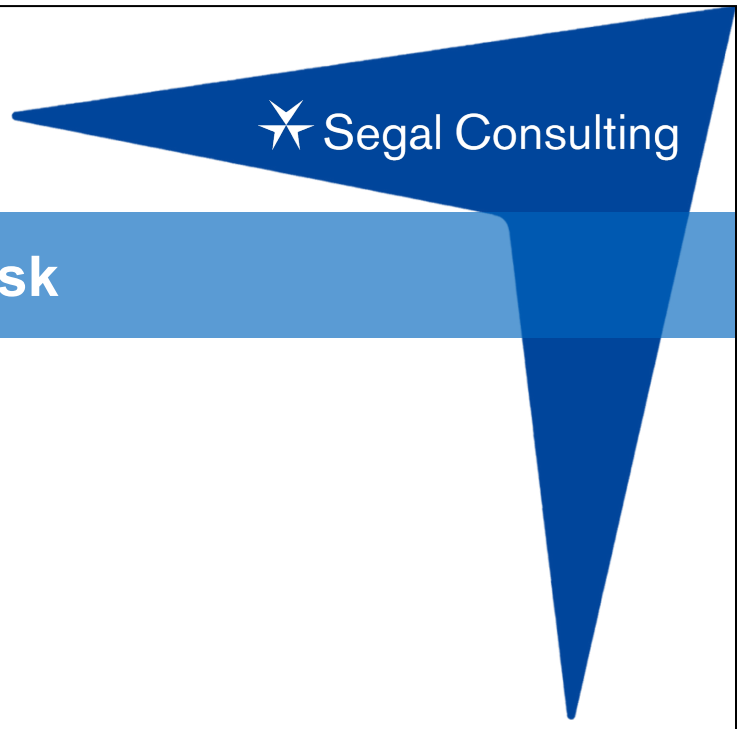

Retirement Funds and Risk

PERAC Emerging Issues Forum

September 13, 2018

Kathleen A. Riley, FSA, MAAA, EA

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Introduction

- Risk is one of the biggest concerns facing public sector pension plan sponsors, boards and stakeholders.
- To identify and address risk requires an understanding of what the risks are and what information is needed to take action.
- Certain tools identify and quantify the types of risk and their magnitude.
- Plan sponsors and boards can then make more informed and better decisions for the long term.

In this presentation, we will discuss the risks we see today and unfolding in the future

Understanding Pension Risk

- Important for Boards to understand risk when
  - plans mature
  - investments are volatile
  - workforce declines
- Actuarial valuation report uses a single set of assumptions
- Risk evaluation requires an analysis of potential future outcomes under different scenarios
- A new Actuarial Standard of Practice (ASOP) Number 51 requires that the actuaries help users of our actuarial reports gain a better understanding of the risks inherent in the measurement of pension plan obligations.
- Actuarial reports will include a discussion of pension risks, report certain risk metrics, and recommend a more detailed risk assessment, if deemed to be significantly beneficial.

NOTES:

Risks Facing Public Sector Pension Plans

Risks related to economic variables

- **Investment return**
- Inflation
  - Price inflation
  - Wage inflation
- **Contributions**

Risks related to demographic events

- Mortality
- Payroll growth
- Population decline
- Retirement, disability, termination
- Plan maturity

Risks related to external forces

- Budgets
- Regulatory risk
- Litigation risk
- Political risk

These risks are challenging to manage effectively

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Risk is Very Much in the Eye of the Beholder

Investment Returns and Volatility

- **Plan Sponsor:** Costs will fluctuate and may increase to unsustainable levels
- **Member:** Benefits levels may change or contributions may increase

Mortality/Longevity

- **Plan Sponsor:** Longer life expectancies translate to higher contributions
- **Member:** Benefits may not retain purchasing power

Changing Workforce Demographics

- **Plan Sponsor:** Aging population may result in cost increases
- **Member:** Benefit levels may change or contributions may increase

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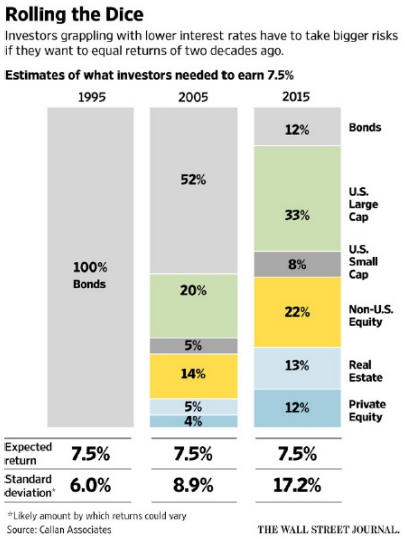
NOTES:

Investment Risk

Creating a 7.5% Return Portfolio



- Reduced inflation expectation has reduced investment returns
- More risk is needed now to achieve 7.5% expected return
- 7.5% portfolio has standard deviation of 17% now vs. 6% twenty years ago

Investment Returns

Capital Market – Expected Long-Term Returns

Asset Class (%)	2014	2016	2018
Domestic Equity (41%)	9.20%	8.75%	8.40%
Intl. Equity (22%)	9.70%	9.45%	9.40%
Core Fixed (12%)	4.80%	3.75%	3.75%
Core Real Estate (13%)	7.00%	6.55%	7.10%
Private Equity (12%)	14.30%	13.50%	12.70%

Sample Portfolio Returns

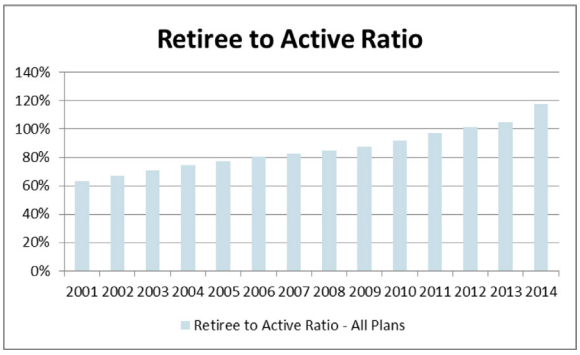
Year	20-Year Geometric	Standard Deviation
2014	8.18%	14.32%
2016	7.61%	14.72%
2018	7.57%	13.66%
4-Year Change	-0.61%	-0.66%

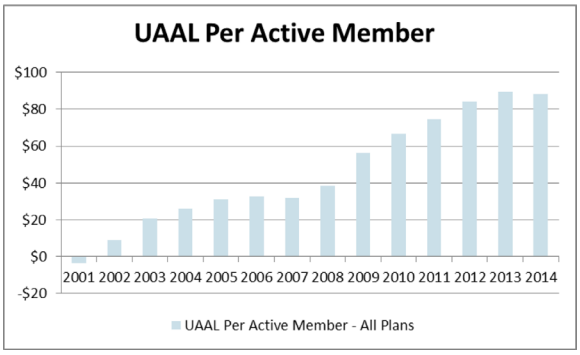
Expected return for same portfolio drifts down over time

NOTES:

Demographic Risks

Public Sector pension plans have aging populations…

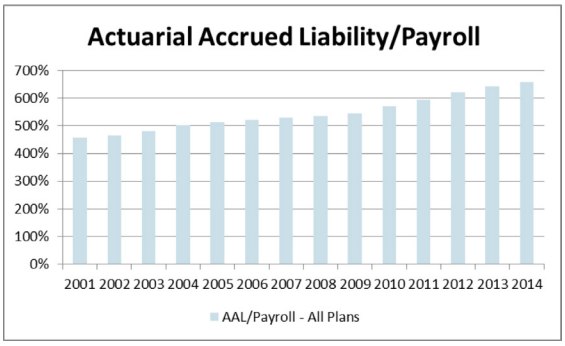


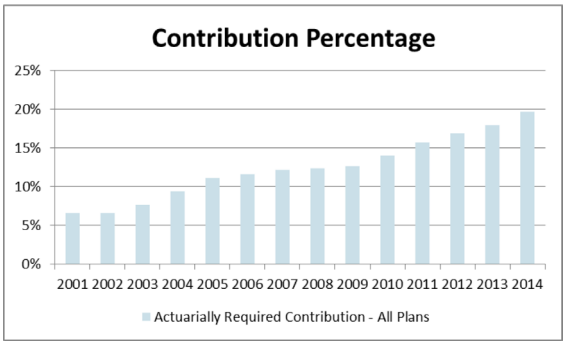


Source: Center for Retirement Research at Boston College Public Plan Database

Demographic and External Risks

…and are getting larger with respect to their sponsoring entities





Source: Center for Retirement Research at Boston College Public Plan Database

NOTES:

Workforce Demographic Risk

- Baby boomers aging
- Older participants are closer to payment and generally more expensive than those that are younger
- Higher ratios of actuarial accrued liability to payroll and market value of assets to payroll exacerbates the impact of investment losses on contributions
- Ratio of non-actives to actives
  - Sign of Plan maturity
  - More pressure on investments
  - Difficult to restore financial health after losses
    - Less contributions to increase

Plan Maturity

- How much will Plan mature over time?
  - Consider different scenarios for future active population, etc.
- As Plan matures, it will become more sensitive to investment volatility
  - In other words, it will be harder to recover from investment losses with increases in contributions, reductions in benefit accruals, or both
- Examples of Maturity Measures:
  - Inactive Liability/Total Liability
  - Ratio of Benefit Payments to Contributions

NOTES:

Plan Maturity

- How should investment strategy change as Plan matures?
  - Should the Plan de-risk investments?
  - It may important to align assets and liabilities
  - Will need to coordinate analysis with Plan investment consultant
- What is the impact of changing investment strategy?
  - Contributions + Investment earnings = Benefits + Expenses
  - Lower assumed returns result in higher budgeted contributions

Mortality/Longevity Risk

Continued improvements in mortality = longer periods of payment and higher costs

83.3	Life expectancy of a male retiree at age 65		
Age at July 1, 2018	65	45	25
RP-2000 Healthy Annuitant w/Scale BB from 2009	85.0	82.8	82.1
RP-2014 Blue Collar Healthy Annuitant w/Scale MP-2017	85.3	82.5	82.5
RP-2014 Healthy Annuitant w/Scale MP-2017	86.3	83.7	83.7

- New tables can increase liability by 3% to 5%
- Has your mortality assumption been updated and does it include a sufficient margin for mortality improvement?
  - If not, losses will be created

NOTES:

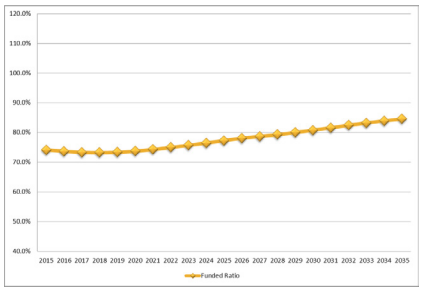
Measuring Risk

- Deterministic projections
  - Scenario test
    - Determine impact of varying investment returns
  - Stress test
    - What investment return would increase contributions by a specified amount (e.g. 10%)?
    - What investment return would lower funded ratio below a specified level (e.g. 50%)
  - Sensitivity test
- Stochastic modeling
  - What funding metrics are most important to the Board?
  - What is the likelihood, or probability, of achieving a defined goal (e.g. funded level, contribution level, etc.)?

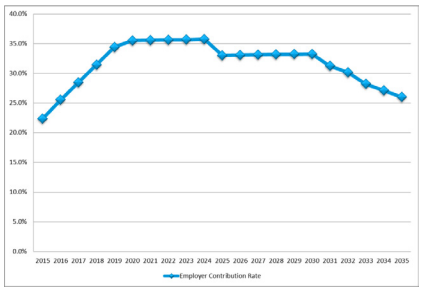
Deterministic Projections

- Projections provide a meaningful way to assess the long-term health of a pension plan
  - Not only provides information on what future funding measures might look like, but also their value relative to the current valuation date
- Deterministic projections are based on a defined set of inputs
  - "If this happens, then this is the result"
  - Often inputs are based on all assumptions being met, with perhaps one or two deviations to demonstrate sensitivity

FUNDED RATIO



EMPLOYER CONTRIBUTION RATE



NOTES:

Deterministic Tests – Case Study

- Scenario tests
  - Determine impact of varying investment returns
  - Baseline - actuarial assumption is met in each future year
  - Other scenarios evaluate short-term lower returns and possible volatility
  - Develop a stress/sensitivity analysis of the client's asset allocation at the 25th or 10th percentile return for 1, 5 or 10 years
- Stress tests
  - Measure impact of large, one-time loss in 2018
    - Loss could also be measured over a number of years

Analysis of Expected Investment Returns

Hypothetical Plan | Target Allocation

Review of Expected Investment Returns

2017 Horizon Survey* Average Assumptions

Asset Classes	Plan Allocation	*Average Arithmetic Returns* 10-Year Outlook	20-Year Outlook	Standard Deviation
Domestic Equity	40.0%	8.02%	9.42%	17.49%
International Developed Equity	7.0%	8.66%	9.42%	18.86%
Emerging Markets Equity	3.0%	10.99%	11.83%	25.42%
Core Fixed Income	14.0%	3.40%	4.59%	5.50%
High Yield Fixed Income	5.0%	5.61%	6.80%	10.61%
Core Real Estate	10.0%	7.28%	7.82%	14.52%
Commodities	5.0%	5.60%	6.53%	17.89%
Short-Term Money Market	4.0%	2.34%	3.25%	2.97%
Hedge Funds, GTAA, Risk Parity, Etc.	7.0%	5.26%	6.33%	8.00%
Private Equity	5.0%	11.33%	12.59%	21.98%
Total Plan Assets	100.0%	6.94%	8.08%	11.37%

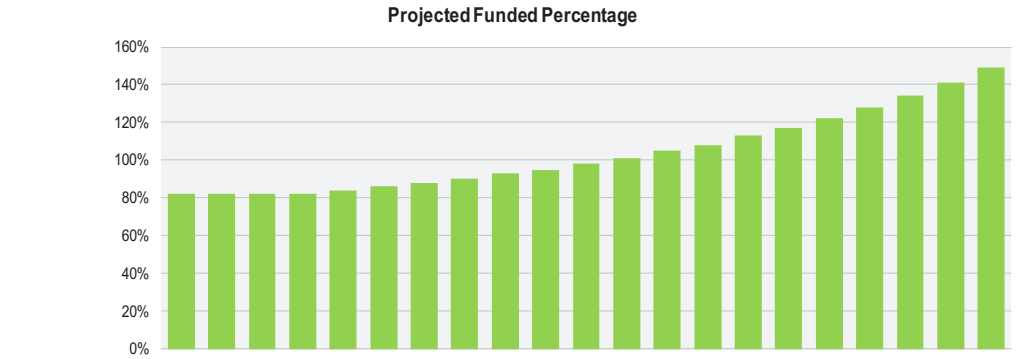
Annualized Geometric Returns	10-Year Outlook	20-Year Outlook
90th Percentile	10.94%	10.74%
75th Percentile	8.76%	9.19%
50th Percentile (Median)	**6.33%**	**7.48%**
25th Percentile	3.90%	5.76%
10th Percentile	1.72%	4.22%

* Survey of Capital Market Assumptions from 35 Investment Advisors by Horizon Actuarial Services, LLC, 2017 Edition

NOTES:

Deterministic Scenario Tests

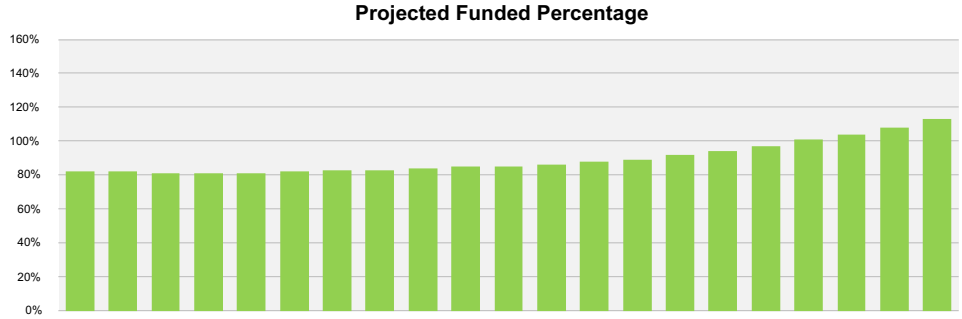
- Scenario 1: baseline returns
  - Investment returns = 7.5% in all future years



Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Assumed Return	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Funded Percentage	82%	82%	82%	82%	84%	86%	88%	90%	93%	95%	98%	101%	105%	108%	113%	117%	122%	128%	134%	141%	149%

Deterministic Scenario Tests *continued*

- Scenario 2: median expected returns
  - Investment returns = 6.3% for next 10 years, 7.5% per year thereafter



Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Assumed Return	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	6.3%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Funded Percentage	82%	82%	81%	81%	81%	82%	83%	83%	84%	85%	85%	86%	88%	89%	92%	94%	97%	101%	104%	108%	113%

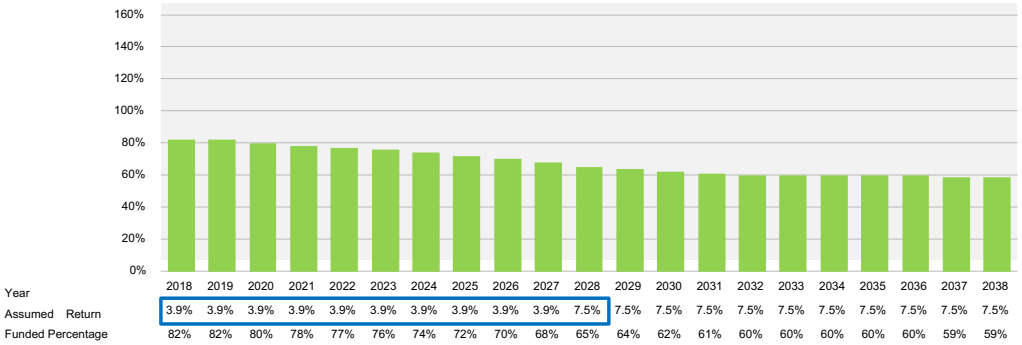
There is a 50% chance annualized returns over the next 10 years will be below 6.3%.

NOTES:

Deterministic Scenario Tests *continued*

- Scenario 3: 25th percentile returns
  - Investment returns = 3.9% for next 10 years, 7.5% per year thereafter

Projected Funded Percentage



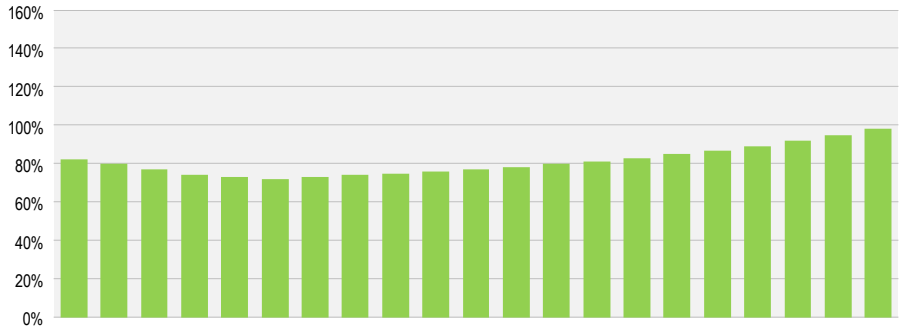
Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Assumed Return	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Funded Percentage	82%	82%	80%	78%	77%	76%	74%	72%	70%	68%	65%	64%	62%	61%	60%	60%	60%	60%	60%	59%	59%

There is a 25% chance annualized returns over the next 10 years will be below 3.9%.

Deterministic Stress Tests *continued*

- Scenario 4: one-time loss
  - Investment returns = 0% return in 2018, 7.5% per year thereafter

Projected Funded Percentage

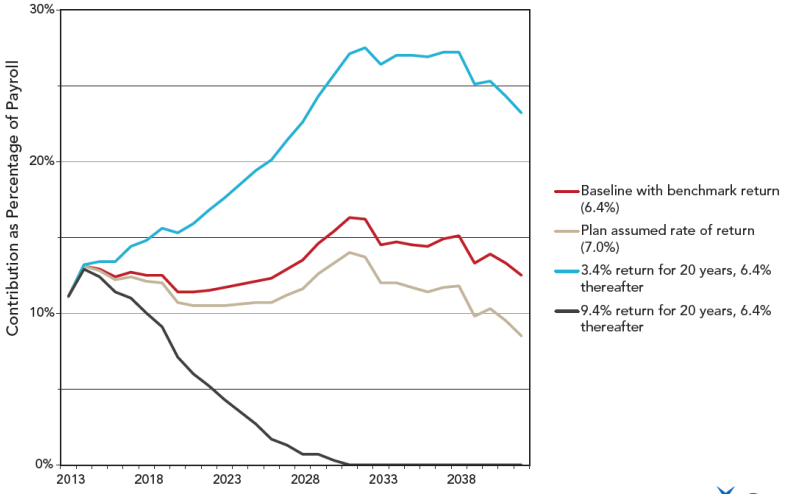


Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Assumed Return	-6.0%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Funded Percentage	82%	80%	77%	74%	73%	72%	73%	74%	75%	76%	77%	78%	80%	81%	83%	85%	87%	89%	92%	95%	98%

NOTES:

Scenario Test Comparisons

Figure 14
Sample Plan: Projected Employer Contributions,
With Investment Return Stress Tests



Stochastic Modeling

- Given a certain set of assumptions:
  - What is the range of possible results?
  - What is the probability of reaching certain metrics (e.g. funded percentage)?
  - What is the likelihood of long-term "success?"
- What are metrics for success?
  - Probability of achieving full funding by stated target date?
  - Probability of remaining fully funded?
  - Probability of contributions remaining below a stated level?
- Monitor risk
  - Evaluate range of possible funded ratios in future years, assuming no changes to contributions
  - Evaluate range of possible contributions in future years to meet funding targets

NOTES:

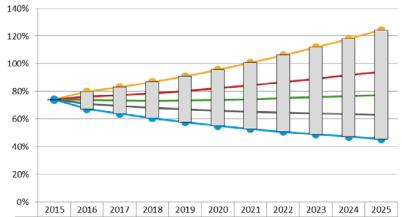
Stochastic Projections

- Portfolio investment returns are simulated using capital market assumptions and the results of thousands of "projections" are tabulated into percentiles
  - **95th percentile**—5% chance of exceeding this value, 95% chance of falling below
  - **75th percentile**—25% chance of exceeding this value, 75% chance of falling below
  - **50th percentile (i.e., median value)**—50/50 chance of exceeding or falling below this value
  - **25th percentile**—75% chance of exceeding this value, 25% chance of falling below
  - **5th percentile**—95% chance of exceeding this value, 5% chance of falling below
- Most deterministic projections show 50/50 results
- Items that can be modeled using stochastic projections:
  - Expected investment return
  - Employer contributions
  - Funded percentage

Stochastic Projections

- Stochastic projections provide a view of expected outcomes with an element of probability attached

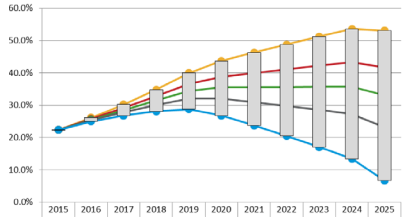
FUNDED RATIO



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
95th	74%	80%	83%	87%	91%	96%	101%	106%	112%	118%	124%
75th	74%	76%	77%	79%	80%	82%	84%	87%	89%	92%	94%
50th	74%	74%	73%	73%	73%	74%	74%	75%	76%	76%	77%
25th	74%	71%	70%	68%	67%	66%	65%	65%	64%	64%	63%
5th	74%	67%	64%	61%	58%	55%	53%	51%	49%	47%	46%

95th 75th 50th 25th 5th

EMPLOYER CONTRIBUTION RATE



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
95th	22.4%	26.1%	30.2%	34.8%	39.9%	43.7%	46.3%	48.8%	51.2%	53.6%	53.0%
75th	22.4%	25.7%	29.1%	32.8%	36.6%	38.8%	39.9%	41.1%	42.2%	43.3%	41.6%
50th	22.4%	25.5%	28.5%	31.4%	34.4%	35.5%	35.6%	35.6%	35.7%	35.7%	33.0%
25th	22.4%	25.3%	27.8%	30.1%	32.1%	32.0%	30.9%	29.7%	28.5%	27.3%	23.2%
5th	22.4%	25.0%	26.8%	28.1%	28.7%	26.8%	23.7%	20.4%	17.0%	13.4%	6.7%

95th 75th 50th 25th 5th

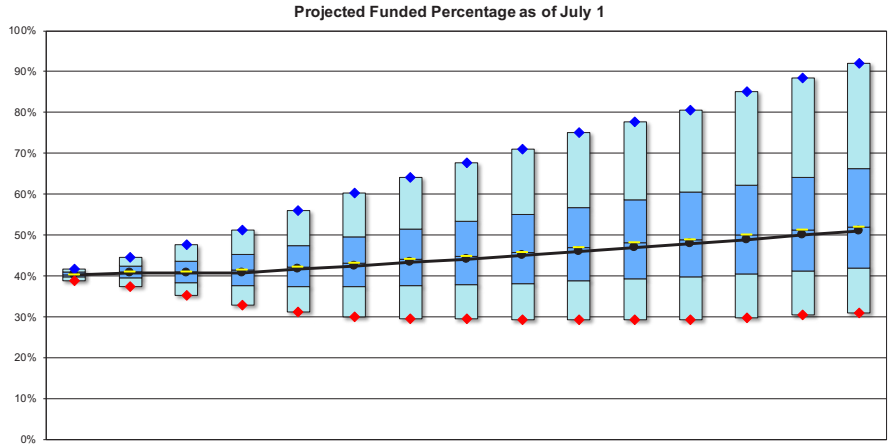
- For example, the sample tables above illustrate that there is a 25% probability of being less than 63% funded by 2025 and the contribution rate exceeding 41.6%

Stochastic modeling can be used to establish and assess parameters for monitoring the health and direction of a System

NOTES:

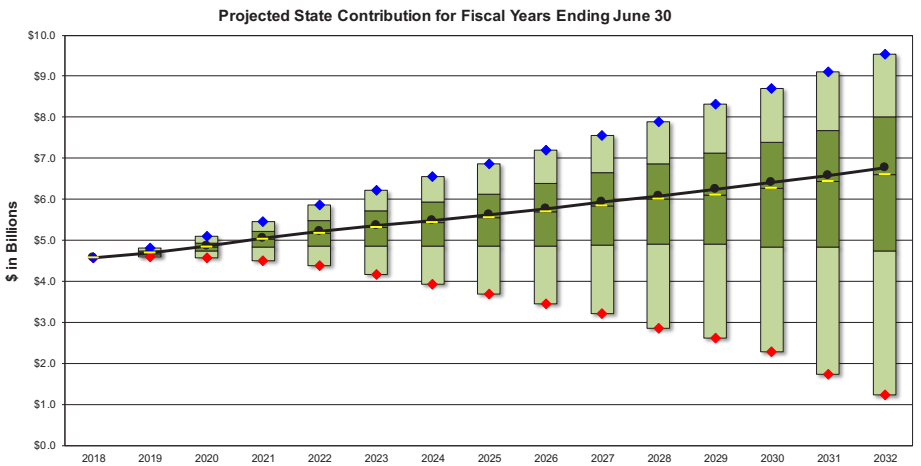
Stochastic Modeling
Case Study

Projection of Funded Ratio to 2031



NOTES:

Projection of Employer Contributions to 2032



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
95th	4.6	4.8	5.1	5.5	5.9	6.2	6.6	6.9	7.2	7.6	7.9	8.3	8.7	9.1	9.5
75th	4.6	4.7	4.9	5.2	5.5	5.7	5.9	6.1	6.4	6.6	6.9	7.1	7.4	7.7	8.0
50th	4.6	4.7	4.8	5.0	5.2	5.3	5.4	5.5	5.7	5.8	6.0	6.1	6.3	6.4	6.6
25th	4.6	4.7	4.7	4.8	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.8	4.7
5th	4.6	4.6	4.6	4.5	4.4	4.2	3.9	3.7	3.5	3.2	2.9	2.6	2.3	1.7	1.2
●	4.6	4.7	4.8	5.0	5.2	5.4	5.5	5.6	5.8	5.9	6.1	6.2	6.4	6.6	6.8

● Baseline deterministic projection using current 7.00% investment return assumption

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Summary of Results

Probability of various events based on stochastic projections:

Benchmark	Probability
At least 90% funded in 2045	61%
At least 120% funded in 2045	15%
Less than 50% funded in 2045	<1%
At least 50% funded in 2031	55%
Less than 25% funded any time	3%
Employer contribution exceeding $15B any time	44%
Employer contribution exceeding $25B any time	17%
Employer contribution exceeding $6B by 2032	68%
Employer contribution exceeding $8B by 2032	26%

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NOTES:

Stochastic Projections to Analyze Alternative Asset Allocations

Asset Class	Current Portfolio	Portfolio A	Portfolio B	Portfolio D
Average Annual Return	6.86%	7.05%	7.26%	7.53%
Valuation Interest Rate	6.75%	7.00%	7.25%	7.50%
Funded Percentage in 10 Years				
75th Percentile	104.6%	111.9%	119.6%	125.5%
50th Percentile	**87.4%**	**92.1%**	**97.1%**	**101.6%**
25th Percentile	69.2%	71.1%	72.7%	76.6%

Limitations of Stochastic Projections

- Current tools allow only one variable to be modeled stochastically: year-by-year actual return on market value of assets
- Simulated investment returns will include improbable scenarios
  - 5th and 95th percentile results may be substantially unreliable

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Trial 17	-44%	29%	21%	-32%	-2%	18%	29%	18%	-16%	21%
Trial 412	59%	66%	12%	9%	10%	-2%	8%	-16%	21%	-5%
Trial 2319	2%	5%	-24%	34%	38%	12%	1%	0%	63%	18%
Trial 2843	-8%	5%	-55%	-8%	13%	29%	17%	18%	4%	16%
Trial 2881	16%	21%	23%	21%	51%	10%	6%	1%	21%	7%
Trial 3433	-8%	15%	4%	-19%	-40%	-10%	-14%	23%	26%	6%
Trial 3841	-11%	15%	61%	-9%	45%	-4%	62%	-14%	25%	22%
Trial 3908	-6%	-11%	-39%	26%	39%	12%	21%	6%	18%	13%
Trial 4212	15%	-6%	12%	32%	65%	12%	31%	10%	-16%	15%
Trial 4597	9%	-7%	10%	42%	54%	-9%	-3%	15%	4%	14%

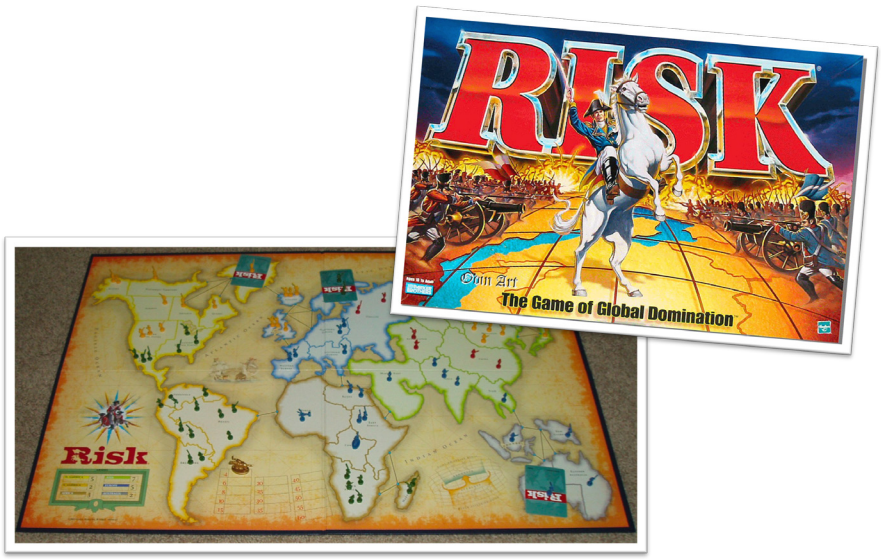
NOTES:

Thank You

Segal Consulting 31

NOTES:


EMERGING
ISSUES
FORUM
PERAC
PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION COMMISSION
Risk
James Lamenzo, Actuary
PERAC
September 13, 2018



Risk*

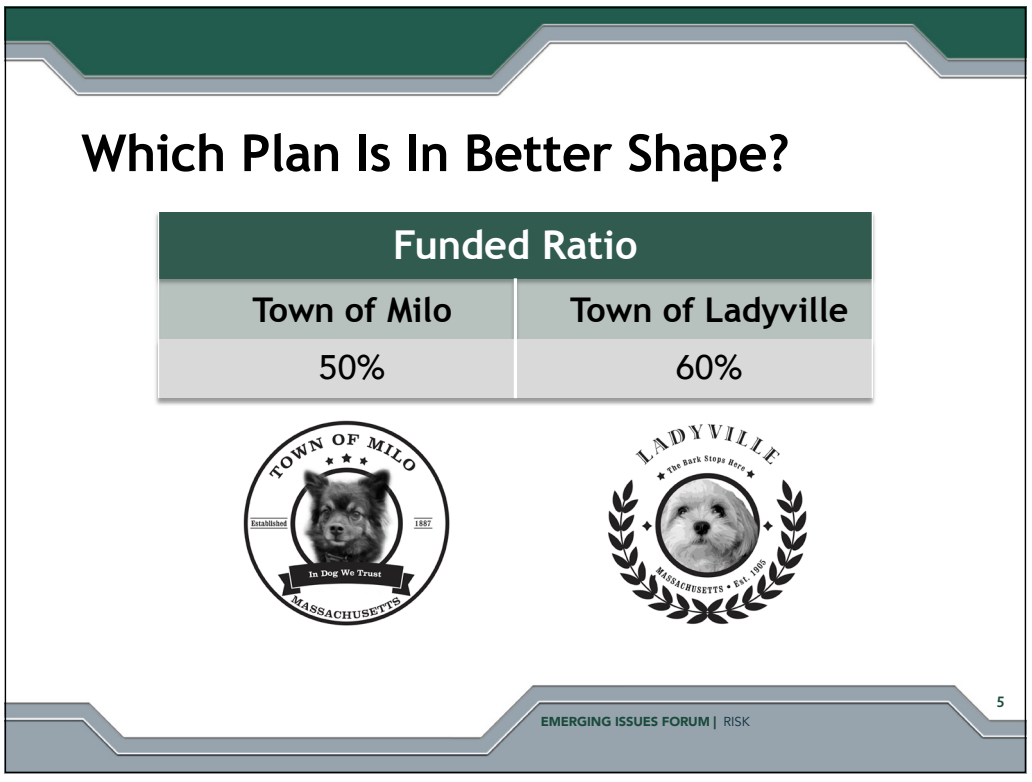
"exposure to the chance of … loss;
a hazard or dangerous chance"

- Negative connotation
- A bad outcome
- Preparing for the worst

***dictionary.com**

NOTES:


TOWN OF MILO
Established
1887
In Dog We Trust
MASSACHUSETTS
LADYVILLE
The Bark Stops Here
MASSACHUSETTS • Est. 1905
4
EMERGING ISSUES FORUM | RISK


Which Plan Is In Better Shape?
Funded Ratio
Town of Milo
Town of Ladyville
50%
60%
TOWN OF MILO
Established
1887
In Dog We Trust
MASSACHUSETTS
LADYVILLE
The Bark Stops Here
MASSACHUSETTS • Est. 1905
5
EMERGING ISSUES FORUM | RISK

NOTES:

Valuation Results

	Milo	Ladyville
1. Actuarial Liability	1,000	100
2. Assets	500	65
3. Unfunded Actuarial Liability (UAL) (1) – (2)	500	35
4. Funded Ratio (2)/(1)	50%	65%

6

EMERGING ISSUES FORUM | RISK

Actuarial Assumptions

	Milo	Ladyville
Investment Return	7.0%	8.0%
Mortality (Generational)	RP2014 White Collar	RP2014

7

EMERGING ISSUES FORUM | RISK

NOTES:

Valuation Results
With Ladyville Using Milo Assumptions

	Milo	Ladyville
Actuarial Liability	1,000	**115**
Assets	500	65
UAL	500	**50**
Funded Ratio	50%	**56.5%**

8

EMERGING ISSUES FORUM | RISK

Valuation Date

Town of Milo	Town of Ladyville
1/17	1/18

9

EMERGING ISSUES FORUM | RISK

NOTES:

Assets

- Both systems in PRIT
- 2017 return for both systems 17.7%
- Milo — 5-year smoothing
- Ladyville — market value

Valuation Results
With Ladyville Using Milo Assumptions;
Milo Results updated to 1/18 Using Market Value

	Milo	Ladyville
Actuarial Liability	**1,040**	**115**
Assets	**580**	65
UAL	**460**	**50**
Funded Ratio	**55.8%**	**56.5%**

1/17 Milo MVA= 495 (AVA 101% of MVA)

NOTES:

- Funded ratio is important but it's not the only factor to consider!
- The 80% Myth
  - Funded ratio of 80% = low risk/well funded
    - Not necessarily
    - Is appropriation "affordable"?

Valuation Results	
	Town of Quabbin
Actuarial Liability	1,000
Assets	800
UAL	200
Funded Ratio	80%

NOTES:

Town of Quabbin Funding Schedule

Total Appropriation Increasing 8.0% per year (7.5% investment return assumption)

	Normal Cost	Amortization of UAL	Appropriation	UAL
2018	8.0	10.0	18.0	200.0
2019	8.4	11.0	19.4	204.3
2020	8.7	12.3	21.0	207.5
⋯				
2022	**9.5**	**15.0**	**24.5**	**210.9**
⋯				
2026	11.3	22.1	33.4	198.6
⋯				
2030	13.5	31.9	45.4	143.5
⋯				
2034	16.0	45.7	61.7	16.7

Town of Quabbin Funding Schedule *(Continued)*

- Despite 80% funded ratio
  - Negative amortization continues to FY22
  - Amortization of UAL not completed until FY35
  - 2018 normal cost is 45% of appropriation
    - Most plans less than 40%; 2/3 less than 30%
    - Not enough can go toward UAL

NOTES:

Funding Strength (Risk) Measures

- Funded ratio
- Actuarial assumptions
- Cash flow — for most systems benefits exceed contributions
- Plan maturity/volatility/cost ratios

Funding Strength (Risk) Measures *(Continued)*

- Funding Schedule (Amortization of UAL)
  - Normal cost % of total appropriation
  - Normal cost + interest on UAL vs appropriation
    - 25% of systems not covering NC + interest
      - Usually schedules to FY35 or later
    - Negative amortization — level and duration
    - Are increases in appropriation sustainable?

NOTES:

Funding Schedule Parameters

- Length of schedule
- Level dollar or increasing amortization (traditional)
  - Pays off exactly at a given date
  - Percent increase in UAL amortization payment

Funding Schedule Parameters *(Continued)*

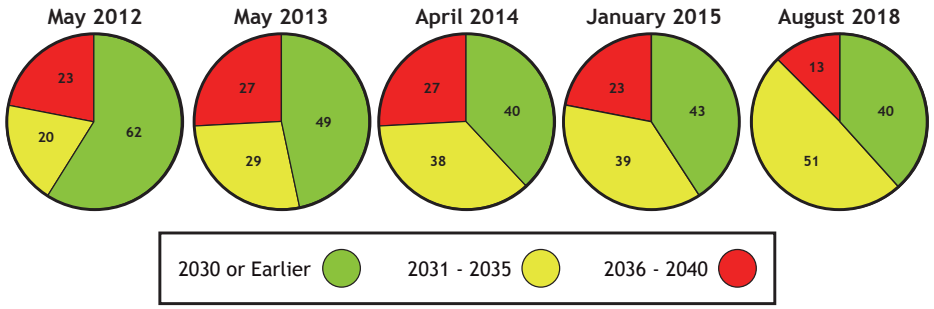
- Total appropriation increasing
  - Percent increase in total appropriation
    - 5.0% increasing to FY32 with a final amortization payment in FY33
    - Pays off when it pays off, unlike traditional
  - How does traditional schedule compare?
    - 4.0% increasing amortization to FY40
    - 4.0% increasing amortization to FY35

NOTES:

Current Funding Schedules (August 2018)

Current Funding Schedules (Aug. 2018)	
Traditional	27
Traditional Phase-In	11
Total Increasing (same percent)	59
Total Increasing (varies)	7

Funding Schedules Adopted (Aug. 2018)



NOTES:

Traditional Funding Schedules

Amortization Completed	By FY25	FY26-FY30	FY31-FY35	After FY35
Annual Percent Increasing				
0% - 3%	2	3	1	1
3.1% - 4.0%		2	9	3
4.5%	2	3	1	
Phase-in	1	3	5	2
TOTAL	**5**	**11**	**16**	**6**

Total Increasing Schedules

Amortization Completed	By FY25	FY26-FY30	FY31-FY35	After FY35
Annual Percent Increasing				
0%		1		
2.5% - 4.9%		7	5	
5.0% - 7.9%	2	11	22	2
8.0%			3	1
8.1% - 10.0%	2	1	2	2
Varies (not negligible)			3	2
TOTAL	**4**	**20**	**35**	**7**

NOTES:

Funding Schedule Observations

- Traditional has narrower percent range (naturally)
  - Maximum increase 4.5% if completion by FY30
  - Maximum increase 4.0% if extend beyond FY30

Funding Schedule Observations *(Continued)*

- 8.0% reflects maximum annual **required** increase under Chapter 176
- Systems with annual increases of 8.0% (or more) not necessarily in worst shape
  - Some **by choice**, could have lower increases with extended period
  - Some **need** 8.0% increases to complete amortization
    - Two of these have funded ratios in excess of 80%

NOTES:

Funding Schedule Observations
(Continued)

- Much variability

Traditional	
Phase-In Period Range	FY19 - FY30
Initial Percent Increase Range	6.5% - 21%
Total Increasing	
Variable Period Range	FY19 – FY21
Percent Increase Range	3.1% - 10%

Funding Schedule Observations
(Continued)

- Not one size fits all
- Board preference
  - Total 4.0% to FY33 vs. Total 6.0% to FY28

NOTES:

Complete Amortization of UAL by FY35

- PERAC recommendation since **2015**
- Conference of Consulting Actuaries White Paper
  - Amendments 10 – 15 years
  - Gains/Losses 15 – 20 years
  - Assumption Changes 15 – 25 years
  - Approximate Average 20 years

Types of Risk

- **Investment Risk** — potential that investment returns are different than expected
- **Interest Rate Risk** — potential that interest rates will be different than expected
- **Longevity and Demographic Risk** — potential that mortality or other experience will be different than expected
- **Contribution Risk** — potential that employer contributions to the plan will not be made, *or will not be made at the assumed level*

NOTES:

Lamenzo Corollary to Contribution Risk

Potential that employer contributions to the plan will not be made, or will not be made at the assumed level, *or will not be made at the level to maintain budgeted amounts from the most recent funding schedule.*

Maintaining Funding Schedule Amounts

- Generally, the most significant impact on long term funding
  - More than actual investment returns
  - More than assumption changes
  - More than benefit changes
- Requires long term fiscal discipline
  - Administrations/boards change

NOTES:

"It is what it is."

Looking Forward

- Prior policy and decisions cannot be changed
  - Learn from past mistakes
- Risk Assessment
  - Both common sense and sophisticated tools

NOTES:

Emerging Issues Forum

MEASURING AND MANAGING RISK
CHAPTER 32 RETIREMENT SYSTEMS

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Introduction

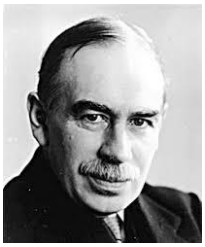
1

- Effects of risk in the short term
- Risk profile
  - Who should be setting it?
  - What's wrong with risk?
- So you have measured the risk – what do you do?

2

The Short Term

- Why be concerned about the short-term?
  - Aren't we long-term investors?
- Quote from John Maynard Keynes:
  "Long run is a misleading guide to current affairs. In the long run we are all dead."



NOTES:

3

Short-term Returns

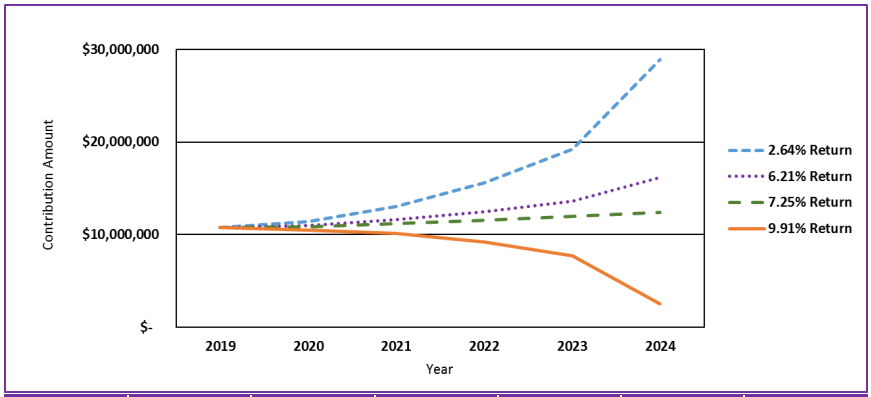
- 3.6% expected return on US large cap equities over 5-7 years
  - Per BlackRock, the world's largest asset manager
- Looking at range of returns

Percentile	5- year Market Return
25th	2.64%
50th	6.21%
Return Assumption	7.25%
75th	9.91%

- Half the time returns fall <u>outside</u> this range (2.64% to 9.91%)

Effect on Funding Contributions

4



Fiscal Year	2019	2020	2021	2022	2023	2024
2.64% Return	$10.7 M	$11.4 M	$13.0 M	$15.6 M	$19.2 M	$28.9 M
6.21% Return	$10.7 M	$11.0 M	$11.6 M	$12.5 M	$13.6 M	$16.2 M
7.25% Return	$10.7 M	$10.8 M	$11.2 M	$11.6 M	$12.0 M	$12.4 M
9.91% Return	$10.7 M	$10.5 M	$10.1 M	$9.2 M	$7.7 M	$2.5 M

NOTES:

Unrecognized Asset Gain/Loss

5

Amount Unrecognized in FY 2024	
9.91%	$19.6M
7.25%	$0M
6.21%	($6.7M)
2.64%	($26.1M)

- Amount of unrecognized Gain/(Loss) due to use of five-year asset smoothing method

6

MANAGING RISK AND VOLATILITY

NOTES:

7

Asset Risk

- Changing actuarial discount rate assumption is NOT managing risk
  - Might be a good thing to do

10% loss in first year and 7.25% for 74 years

=

7.00% for 75 years

- Asset allocation is key
  - Is it acceptable to exchange possible investment return for less risk?
  - PRIT – one size fits all?
- Other possible approaches
  - Trying to match cash flow
  - Annuities - more feasible as rates go up

8

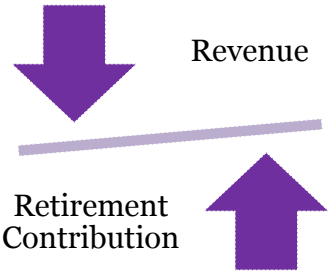
Why Should You Care about Risk?

- Is RISK bad?
  - Not necessarily – nothing ventured, nothing gained

危機

"Crisis is a combination of danger and opportunity" – mistranslation of Chinese ideogram

- How about volatility?
  - Depends on situation
  - Difficult for many municipalities
  - In economic downturn:

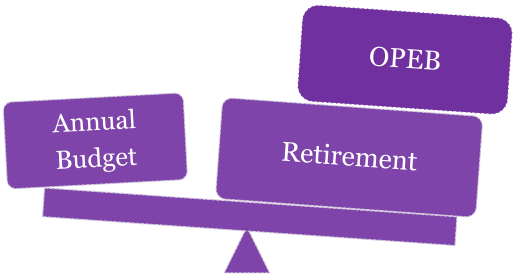


NOTES:

9

Risk Management

- Full-funding means more risk not less
- Enterprise risk
  - Look at WHOLE entity not just retirement board
  - Fiduciary to members but doesn't preclude working with Employer
  - Board is communicating effectively but still independent
  - Better for members



10

Enterprise Risk (Continued)

- Effect of salary changes on liabilities and contributions
- Effect on bond rating
- OPEB funding and OPEB trust allocation in conjunction with Retirement System
- Retirement policies (eligibility and service) affect OPEB

NOTES:

Managing Risk for Many Boards

11

Easier to Manage	Harder to Manage
• Base pay, no overtime • No air time • Average pay not final pay • Requirement to make contributions • PERAC oversight • Independence of Board	• Constitutional guarantee to not reduce benefits • Proposition 2½ • Limited population growth • Limited tax levy growth • Relatively mature systems • Chasing yield to limit contributions • Hard deadline for funding (Fiscal 2040)

12

Longevity and Maturity

- Longevity risk
  - Do not recommend attempting to shorten retirees' life span
  - Adopt up-to-date mortality tables
    - Preliminary public sector mortality table just released
    - Getting behind the curve on mortality tables can result in an unpleasant uptick in contribution levels eventually
- Monitor maturity risks
  - Many measures such as:

    Retiree liability/Total liability
    - Seen systems going from 50% to 60% retiree liability
    - Focus more on short-term results

NOTES:

13

Risk Management

- Succession planning
  - Employer responsibility but related to Retirement Board
  - Top two people or more in a department retiring
    - Loss of institutional knowledge
    - Increase in liability if retiring early
- Effects of early retirement
  - Dealing with maturing of System
  - Retirement after eligibility for 2.5% age factor results in actuarial gain
    - Possible legislative solutions
      - Phased retirements / well-designed DROP plan
  - Early retirement incentives
  - Pension reform already encourages later retirement
- Review policies. For example:
  - 18 hours/week to be in retirement plan
  - 20 hours/week to be eligible for health insurance
  - Eligible for OPEB benefit?

14

Professional Expertise

- Things actuaries can help with:
  - Measuring risk
  - Experience studies – particularly for larger systems
  - Projection
    - Deterministic or stochastic
    - Project retirement patterns – Baby Boomer Wave
  - Work with your other professionals
- Investment consultants
  - Discuss asset allocation and risk tolerance
  - Asset allocation should NOT be based on trying to meet an actuarial assumption
    - Based on risk tolerance
    - Actuarial assumption is <u>then</u> based on investment policy and asset allocation

NOTES:

15

Summary

- Review and measure
- Articulate risk tolerance
- Use risk tolerance to develop investment goals and policies
- Broader perspective
  - No silo mentality but still independent
  - Work with employer to coordinate retirement board decisions/policies with the whole entity
- Work with professionals to achieve goals

NOTES:

NOTES:

14th Annual EMERGING ISSUES FORUM

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