Risk Management: Analytics & Better Methods for Public Safety Pension Sustainability

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Introduction

- Risk is a major concern facing public sector pension plan sponsors, boards and stakeholders.
- Identifying and addressing risk appropriately 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.
Fundamental Risk

- Fundamental risk for a pension plan is not being able to make benefit payments with a sustainable contribution.
- Basic equation being managed is the same for all plans:

\[ C + I = B + E \]

- Contributions + Investment Income equals Benefit Payments + Expenses
Plan Risks

Public Sector pension plans have aging populations...

Retiree to Active Ratio

UAAL Per Active Member

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

…and are getting larger with respect to their sponsoring entities

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

Risks related to economic variables
- Investment return
- Inflation
  - Price inflation
  - Wage inflation

Risks related to demographic events
- Mortality
- Payroll and/or population growth
- Retirement, disability, termination

Risks related to external forces
- Governance risk
- Regulatory risk
- Litigation risk
- Political risk

These risks are challenging to manage effectively
Interest Cost

- Compare actual contribution made to normal cost + interest on unfunded actuarial liability (UAL)
  - Interest on UAL = discount rate \( \times \) (AL – MVA) / Payroll
  - Highlights negative amortization

- Interest cost correlates generally with funded status as smaller balance to pay interest on if better funded

- Negative amortization is not inherently wrong, but needs to be understood
  - Potential PR risk should be considered
GASB 67/68 PR Risk

Sample GASB Impact
Projected Contribution or Expense as a % of Salary

Contribution %

Sample ARC: 11% 14% 14% 14% 14% 14% 14% 12% 11% 10% 8% 7% 7% 8% 8% 9% 9% 9% 10% 17% 16%
Sample Expense: 11% 15% 12% 11% 11% 11% 11% 8% 2% -5% -15% -16% -7% 10% 29% 30% 22% 17% 6% 12% 27% 27%
## Risk is Very Much in the Eye of the Beholder

<table>
<thead>
<tr>
<th>Investment Returns and Volatility</th>
<th>Mortality/Longevity</th>
<th>Changing Workforce Demographics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plan Sponsor:</strong> Costs will fluctuate and may increase to unsustainable levels</td>
<td><strong>Plan Sponsor:</strong> Longer life expectancies translate to higher contributions</td>
<td><strong>Plan Sponsor:</strong> Aging population may result in cost increases</td>
</tr>
<tr>
<td><strong>Member:</strong> Benefits levels may change or contributions may increase</td>
<td><strong>Member:</strong> Benefits may not retain purchasing power</td>
<td><strong>Member:</strong> Benefits levels may change or contributions may increase</td>
</tr>
</tbody>
</table>

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**Risk**

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Segal Consulting
Creating a 7.5% Return Portfolio

Rolling the Dice
Investors grappling with lower interest rates have to take bigger risks if they want to equal returns of two decades ago.

Estimates of what investors needed to earn 7.5%

- 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

<table>
<thead>
<tr>
<th></th>
<th>1995</th>
<th>2005</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonds</td>
<td>100%</td>
<td>52%</td>
<td>12%</td>
</tr>
<tr>
<td>U.S. Large Cap</td>
<td></td>
<td>20%</td>
<td>33%</td>
</tr>
<tr>
<td>U.S. Small Cap</td>
<td></td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>Non-U.S. Equity</td>
<td>14%</td>
<td></td>
<td>22%</td>
</tr>
<tr>
<td>Real Estate</td>
<td>4%</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>Private Equity</td>
<td>5%</td>
<td>12%</td>
<td>12%</td>
</tr>
</tbody>
</table>

- Expected return: 7.5% 7.5% 7.5%
- Standard deviation*: 6.0% 8.9% 17.2%

* Likely amount by which returns could vary
Source: Callan Associates

THE WALL STREET JOURNAL.
Mortality/Longevity Risk

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

- New table increases liability by 3% to 5%
- Lump sum payment = increased chances of retirees outliving their benefits
- Is the actuary accurately projecting the future increases in lifespan?
  - If not, losses will be created

<table>
<thead>
<tr>
<th>Age at July 1, 2015</th>
<th>65</th>
<th>45</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP-2000 Healthy Annuitant w/Scale AA</td>
<td>84.7</td>
<td>86.1</td>
<td>87.4</td>
</tr>
<tr>
<td>RP-2014 Healthy Annuitant w/Scale MP-2015</td>
<td>86.6</td>
<td>88.2</td>
<td>89.9</td>
</tr>
</tbody>
</table>
Workforce Demographic Risk

➢ Pension plan populations are getting older
  - 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 future benefits to reduce
    – Less contributions to increase
Analytic Method Approaches

Looking at just a valuation is not enough

<table>
<thead>
<tr>
<th>Summary of Principal Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Participant Counts</strong></td>
</tr>
<tr>
<td>Active</td>
</tr>
<tr>
<td>Terminated vested</td>
</tr>
<tr>
<td>Retiree</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Payroll for Valuation (annualized)</td>
</tr>
<tr>
<td><strong>Financial Information</strong></td>
</tr>
<tr>
<td>Actuarial Value of Assets</td>
</tr>
<tr>
<td>Market Value of Assets</td>
</tr>
<tr>
<td>Regular Base Plan Nominal Contribution Rate</td>
</tr>
<tr>
<td>Present Value of Total Liabilities</td>
</tr>
<tr>
<td>Surplus/(Unfunded) Liability at Market Value</td>
</tr>
<tr>
<td>Funded Ratio</td>
</tr>
<tr>
<td>Present Value of Projected Pay Liabilities</td>
</tr>
<tr>
<td>Surplus/(Unfunded) Liability at Market Value</td>
</tr>
<tr>
<td>Funded Ratio</td>
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<tr>
<td>Present Value of Accrued Benefits</td>
</tr>
<tr>
<td>Surplus/(Unfunded) Liability at Market Value</td>
</tr>
<tr>
<td>Funded Ratio</td>
</tr>
<tr>
<td>Present Value of Vested Benefits</td>
</tr>
<tr>
<td>Surplus/(Unfunded) Liability at Market Value</td>
</tr>
<tr>
<td>Funded Ratio</td>
</tr>
</tbody>
</table>
Analytic Method Approaches

- Need to consider past, present, and future
Risk Management Process

- Identify the key risks threatening the plan
- Decide metric to use to evaluate the risk
  - Maturity examples: liability distribution by active and inactive, membership ratios, etc.
  - Funding examples: funded ratio, amortization period, unfunded per member, etc.
- Consider if you want to look at historic metrics, projected metrics, or both for each metric
- Develop policies to manage risks based on identified metrics
- Evaluate selected metrics
- Respond as required
- Revise policies in response to experience and changing circumstances
## Risk Identification

- **Example of risk identification from STRS Ohio**

<table>
<thead>
<tr>
<th>PROBABILITY</th>
<th>IMPACT</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

### High Impact
- **Not earning the 7-3/4% actuarial return over the long term**
- **Long-term sovereign deficit and debt issues**
- **Actual experience varies from actuarial assumptions long term**
- **Pension imbalance (C+I=B+E)**
- **Legislative action with negative impact**

### Medium Impact
- **Actual experience varies from actuarial assumptions short term**
- **Global financial stress related to low economic growth**
- **Shortfall of health care funds**
- **Vulnerability to attack/mass loss of confidential member data**
- **Contracting membership base**

### Low Impact
- **Not earning at least a 7-3/4% return in a fiscal year**

- **Investment diversification ineffective**
- **Increased migration to DC/ARP plan**
- **Business continuity and disaster preparedness**
- **Ethics issues**

**Managed at senior staff and department level**

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*Segal Consulting*
Metric Selection

➤ There are many possible metrics

➤ Typically no single “right” answer

➤ Instead need to select metric appropriate for the specific plan
  • Consider characteristics such as maturity and net cash flows
  • Also consider characteristics of sponsor

➤ Have to balance cost and benefit in selecting options
  • “Cost” is primarily the time and expenses to develop an option
  • “Benefit” is the additional information obtained to assist decision makers
  • Generally projections cost more than historical measures
  • Developing a multi-year history generally low-cost if done on a prospective basis

➤ As such, we show a few metrics as examples
Historic Maturity Metrics

- Currently, maturity metrics typically only developed for historic period
- However, relatively low cost to develop these if have projections

![Graph showing actuarial liability and counts from 1997 to 2016. The graph includes bars for actives, terminated vested, in-pay members, and payroll. The data points are as follows:

- **1997**: Active 2.1, Terminated Vested 2.1, In-Pay Members 2.0, Payroll 1.9
- **1999**: Active 2.0, Terminated Vested 2.0, In-Pay Members 1.8, Payroll 1.7
- **2001**: Active 1.9, Terminated Vested 1.8, In-Pay Members 1.7, Payroll 1.6
- **2003**: Active 1.7, Terminated Vested 1.7, In-Pay Members 1.6, Payroll 1.5
- **2005**: Active 1.6, Terminated Vested 1.6, In-Pay Members 1.5, Payroll 1.4
- **2007**: Active 1.5, Terminated Vested 1.5, In-Pay Members 1.4, Payroll 1.3
- **2009**: Active 1.4, Terminated Vested 1.4, In-Pay Members 1.3, Payroll 1.2
- **2011**: Active 1.3, Terminated Vested 1.3, In-Pay Members 1.2, Payroll 1.1
- **2013**: Active 1.2, Terminated Vested 1.2, In-Pay Members 1.1, Payroll 1.1
- **2015**: Active 1.1, Terminated Vested 1.1, In-Pay Members 1.0, Payroll 1.0

The graph shows the trend from 1997 to 2016, with the y-axis representing counts in thousands and the x-axis representing years from 1997 to 2016. The graph also includes a pie chart for actuarial liability in 2004 and 2014, indicating Actives 67%, Deferred 2%, Vested 2%, and In Pay Status 32%. The graph is created by Segal Consulting.]
Historic Funding and Contribution Metrics

- These should be considered over historic periods longer than just two years
- Should also consider projections
Projected Funding and Contribution Metrics

- Deterministic projections should be completed at a minimum, including potential membership and asset changes.
- Should consider value of stochastic projections.
Historic Assumption Risk Metrics

- Look at gain/loss historical experience – macro
- Consider stress testing projections for key assumptions such as return and mortality
Projected Assumption Risk Metrics

- Rate of return assumption most commonly tested
- In addition to deterministic testing, can also examine stochastic results
Metric Implementation

- Risk metrics provide important information, but can be challenging to implement.

- One solution is to develop a “scorecard” based on the identified metrics for your system.

![Funding Policy Dashboard - July 1, 2015 (preliminary)](image)

- **Funded Ratio**
  - Actual
  - Current year: 71.8%  
  - Prior year: 73.8%
  - Advisory Level
  - Current year: 100.0%  
  - Prior year: 100.0%
  - Contribution to Summary Score
  - Current year: 65.0%  
  - Prior year: 65.0%
  - Range
  - Current year: -3 to +3  
  - Prior year: -2 to +2

- **Funding Period**
  - Current year: 28.4 years  
  - Prior year: 29.5 years
  - Advisory Level
  - Current year: 0 years  
  - Prior year: 0 years
  - Contribution to Summary Score
  - Current year: 0  
  - Prior year: 0
  - Range
  - Current year: -2 to +2  
  - Prior year: -1 to +1

- **Chance of a Major Negative Event***
  - Funded Ratio under 50%
    - Current year: 39.2%  
    - 2.5%  
    - 10.0%
    - Contribution to Summary Score
    - Current year: -1  
    - Prior year: -1
    - Range
    - Current year: -1 to +1  
    - Prior year: -1 to +1
  - Funding Period over 100 yrs
    - Current year: 26.1%  
    - 2.5%  
    - 10.0%
    - Contribution to Summary Score
    - Current year: -1  
    - Prior year: -1
    - Range
    - Current year: -1 to +1  
    - Prior year: -1 to +1

- **Economic Considerations****
  - 10-year returns
    - Current year: 6.9%  
    - 3.0%  
    - 12.5%
    - Contribution to Summary Score
    - Current year: 0  
    - Prior year: -1 to +1

**Summary Score**: -4

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*Estimated chance that the result is worse than some catastrophic threshold (>50% for funded ratio, >100 years for funding period) on any valuation date in the next 10 years

**Rolling average 10-year return for a portfolio of 70% equity and 30% bonds, rebalanced quarterly.
Questions