The Pension Crisis

and

Solutions
Pension Deficits

(Estimated)

Private Plans - $477 billion

Public Plans - $3.4 trillion

Sources: Credit Suisse
Prof. Robert Marx Novy, Joshua Rauh
December 9, 2009

Board of Trustees
New York City Employees' Retirement System
335 Adams Street, Suite 2300
Brooklyn, NY 11201-3751


Dear Members:

The financial objective of the New York City Employees' Retirement System (the "Plan") is to fund members' retirement benefits during their active service and to establish employer normal contribution rates that, expressed as a percentage of active member annualized covered payroll, would remain approximately level over the future working lifetimes of those active members and, together with member contributions and investment income, would ultimately be sufficient to accumulate assets to pay benefits when due.

An actuarial valuation of the Plan is performed annually as of the second June 30 preceding each fiscal year to determine the Employer Contributions to be paid for that fiscal year (i.e., June 30, 2007 (i.e.)) actuarial valuation to determine Fiscal Year 2009 Employer Contributions).

Under current law, Employers are required to contribute statutorily-required contributions ("Statutory Contributions") and these contributions are generally funded by Employers within the appropriate fiscal year.
NYCERS: Objective

The financial objective of NYCERS is to fund members retirement benefits and to establish employer normal contribution rates, that expressed as a percentage of active member annualized covered payroll would remain approximately level over the future…

… combined with employee contributions and investment income would be sufficient assets to pay benefits when due.
NYCERS: History of Contributions

<table>
<thead>
<tr>
<th>Fiscal Yr.</th>
<th>Statutory Contribution</th>
<th>% of Payroll</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/30/00</td>
<td>$68,619,745</td>
<td>0.915%</td>
</tr>
<tr>
<td>6/30/01</td>
<td>100,024,692</td>
<td>1.271</td>
</tr>
<tr>
<td>6/30/02</td>
<td>105,660,069</td>
<td>1.241</td>
</tr>
<tr>
<td>6/30/03</td>
<td>197,823,998</td>
<td>1.213</td>
</tr>
<tr>
<td>6/30/04</td>
<td>310,589,074</td>
<td>3.526</td>
</tr>
<tr>
<td>6/30/05</td>
<td>822,763,025</td>
<td>8.975</td>
</tr>
<tr>
<td>6/30/06</td>
<td>1,024,358,175</td>
<td>11.142</td>
</tr>
<tr>
<td>6/30/07</td>
<td>1,471,029,609</td>
<td>15.556</td>
</tr>
<tr>
<td>6/30/08</td>
<td>1,874,242,487</td>
<td>19.001</td>
</tr>
<tr>
<td>6/30/09</td>
<td>2,150,438,042</td>
<td>20.570</td>
</tr>
<tr>
<td>6/30/10</td>
<td>2,197,717,073</td>
<td>20.020</td>
</tr>
<tr>
<td>6/30/11</td>
<td>2,387,215,772</td>
<td>20.820</td>
</tr>
</tbody>
</table>

Growth Rate: 38.08% (Annual), 247.89% (Cumulative)
### NYCERS: Funded Ratio

<table>
<thead>
<tr>
<th>Fiscal Yr</th>
<th>AVA/AVABO</th>
<th>MVA/MVABO</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/30/00</td>
<td>169</td>
<td>136</td>
</tr>
<tr>
<td>6/30/01</td>
<td>146</td>
<td>120</td>
</tr>
<tr>
<td>6/30/02</td>
<td>143</td>
<td>97</td>
</tr>
<tr>
<td>6/30/03</td>
<td>135</td>
<td>80</td>
</tr>
<tr>
<td>6/30/04</td>
<td>124</td>
<td>64</td>
</tr>
<tr>
<td>6/30/05</td>
<td>116</td>
<td>75</td>
</tr>
<tr>
<td>6/30/06</td>
<td>109</td>
<td>64</td>
</tr>
<tr>
<td>6/30/07</td>
<td>101</td>
<td>75</td>
</tr>
<tr>
<td>6/30/08</td>
<td>97</td>
<td>79</td>
</tr>
<tr>
<td>6/30/09</td>
<td>96</td>
<td>65</td>
</tr>
<tr>
<td>6/30/10</td>
<td>93</td>
<td>48</td>
</tr>
</tbody>
</table>
Problem: Liability Valuation

Single Discount Rate

\[ \text{GASB, ASOP} = \text{ROA} \]

NOT market interest rates

\[ \text{PPA} = 3 \text{ segment, 2 year weighted average) } \]

Present Value calculated annually/triennially

\[ (\text{Months delinquent}) \]

Liability Payment Term Structure not transparent

\[ (\text{Short, Intermediate, Long, Very Long}) \]
Problem: ROA

Return On Asset assumption (ROA) = GASB Discount Rate
Significantly *undervalues* liabilities

ROA = 8%
Long Treasury = 3%
Yield Difference = 5%

PV $ Difference = Yield Difference x Duration
= 5% x 10–15 years
= 50% to 75% error
Problem: ROA

\[
ROA = \textit{Hurdle Rate for assets}
\]

Asset Allocation models used to validate ROA

AA Model = historical returns (except Bonds)

Bonds = \textit{Current Yields}

\textit{1990s}
Problem: Generic Indexes

Represent the market *not* client liability schedule

Generic Indexes do NOT represent clients’ true objective

Client liability schedule is unique to each client (snowflakes)

*Confucius: Given Wrong Index … Get Wrong Risk/Reward*
Pension Plan Objective

Fund Liabilities at the **Lowest Cost** to the Plan

**Lowest Cost** = Assets fully fund Liabilities
No Contributions
“Pension Holiday”

**Problem** = Assets do not know Liabilities
Assets are not managed vs. Liabilities
Accounting measures *distort* economic reality

Consistent ALM can only be achieved for Financial Objectives

Entities that focus on economic value tend to achieve their financial objectives

Entities who manage their assets based on accounting treatment end up mismatching liabilities

*Translation:* *ALM Requires Economic Books*
Custom Liability Index (CLI)

Economic Books
Ryan designed 1st CLI in 1991
Proper Benchmark for Liability Objectives
Ryan CLI are unique daily reports which calculate:

Present Value
Term Structure
Growth Rate (Returns)
Interest Rate Sensitivity (+/- 100 bps.)
Statistical Index Summary (Yield, Duration)
Delivered via Ryan web site (password protected)
Redefine Alpha

\[ \text{Alpha} = \text{Excess Return above Objective} \]

Objective = Outgrow Liabilities (Liability Index)

\[ \text{Liability Alpha} = \text{Excess Growth above Liability Growth} \]

Requires *Custom Liability Index* to Measure Alpha

Logic: Beat a Market Index… but Lose to Liabilities = You Lose!
True Alpha

Requires CLI to Measure Liability Growth (Returns)

Actual Return of Alpha Portfolios  5.00%
- Actual Return of Liabilities  -5.00%

------------------------------------------  ---------
                      True Alpha          10.00%
Redefine Beta

*Matches* Return of Objective

Pension Objective  =  Liability Driven

Beta  =  Asset / Liability *Matched* Portfolio

Liability Beta  =  Liability Index Fund

Requires *Custom Liability Index*
Redefine Risk

Tradition Volatility of Total Returns

Ryan ALM NOT Meeting the Client Objective (Uncertainty)

Objective Liability Driven

Sharpe Ratio Based on 3 month T-Bill
New Ratio Based on Objective (Information Ratio)

Logic: Requires CLI to measure Risk
Refocus Asset Allocation

Should be based on “Funded Ratio”

(Market Value of Assets / MV of Liabilities)

Requires Custom Liability Index to Measure MV of Liabilities

Large Deficit = Different Asset Allocation than Small Deficit

Should be Responsive (Dynamic or Tactical)
Contributions

Contributions = Asset growth – Liability growth (if negative)

Contributions = used to fund Liabilities

Current Assets fund net Liabilities

Enhances Funded Ratio
## ROA and Contributions

ROA = Growth rate used to calculate Contributions (ONLY value)
Contribution = Asset $ Growth – Liability $ Growth (if negative)

Example: Funded Ratio = 60% (40% Deficit)

<table>
<thead>
<tr>
<th>Year</th>
<th>Assets</th>
<th>$ Growth</th>
<th>Liabilities</th>
<th>$ Growth</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$</td>
<td></td>
<td></td>
<td>$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
<td></td>
<td></td>
<td>Increase</td>
</tr>
<tr>
<td>Year 1</td>
<td>$60.00</td>
<td>$4.80</td>
<td>$100.00</td>
<td>$8.00</td>
<td>$3.20</td>
</tr>
<tr>
<td>Year 2</td>
<td>64.80</td>
<td>5.18</td>
<td>108.00</td>
<td>8.64</td>
<td>3.46</td>
</tr>
<tr>
<td>Year 3</td>
<td>69.98</td>
<td>5.60</td>
<td>116.64</td>
<td>9.33</td>
<td>3.73</td>
</tr>
<tr>
<td>Year 4</td>
<td>75.58</td>
<td>6.05</td>
<td>125.97</td>
<td>10.07</td>
<td>4.02</td>
</tr>
<tr>
<td>Year 5</td>
<td>81.63</td>
<td>6.53</td>
<td>136.05</td>
<td>10.88</td>
<td>4.36</td>
</tr>
<tr>
<td>Year 6</td>
<td>88.16</td>
<td>7.05</td>
<td>146.93</td>
<td>11.72</td>
<td>4.67</td>
</tr>
</tbody>
</table>

Note: Requires an ROA = 13.33% to not increase Contribution costs
Assets > Liability growth by 5.33% per year (Level Contributions)
ROA and Contributions

ROA = Growth rate used to calculate Contributions (ONLY value)
Contribution = Asset $ Growth – Liability $ Growth (if negative)

Example: Funded Ratio = 140% (40% Surplus)

<table>
<thead>
<tr>
<th>Year</th>
<th>Assets</th>
<th>$ Growth</th>
<th>Liabilities</th>
<th>$ Growth</th>
<th>$ Cost</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>$100.00</td>
<td>$ 8.00</td>
<td>$ 71.43</td>
<td>$ 5.71</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td>108.00</td>
<td>8.64</td>
<td>77.14</td>
<td>6.18</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>116.64</td>
<td>9.33</td>
<td>83.32</td>
<td>6.66</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>125.97</td>
<td>10.07</td>
<td>89.98</td>
<td>7.20</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>136.05</td>
<td>10.88</td>
<td>97.18</td>
<td>7.77</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Year 6</td>
<td>146.93</td>
<td>11.72</td>
<td>104.95</td>
<td>8.40</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

Note: Requires an ROA = 5.72% for NO Contribution costs
Assets < Liability growth by -2.28% per year (NO Contribution)

Surplus Strategy: Immunize… Asset Growth = Liability Growth (NO Contribution)
1990s… did NOT immunize = $4 trillion error
Solution: Custom Liability Index

Create a set of *Economic Books* in harmony with SoA directive

Based on Market Value
Built as a Liability Index series

Provide a Proper *Benchmark* for the Asset side to function efficiently

Asset Allocation
Asset Management
Performance Measurement
Solution: Responsive Asset Allocation

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Market Value of Assets</td>
<td>$560,000,000</td>
</tr>
<tr>
<td>b. Market Value of Liabilities</td>
<td>$1,000,000,000</td>
</tr>
<tr>
<td>c. Funded Ratio</td>
<td>56.00%</td>
</tr>
<tr>
<td>d. Contributions (present value)</td>
<td>$200,000,000</td>
</tr>
<tr>
<td>e. Net Liabilities</td>
<td>$800,000,000</td>
</tr>
<tr>
<td>f. Net Funded Ratio</td>
<td>70.00%</td>
</tr>
<tr>
<td>g. Net Deficit</td>
<td>$240,000,000</td>
</tr>
<tr>
<td>h. Duration of Liabilities (years)</td>
<td>12 years</td>
</tr>
</tbody>
</table>

\[
\text{Annual \$ Deficit} = \frac{\text{Net \$ Deficit}}{\text{Duration of Liabilities}} \times \frac{\text{Size of Assets}}{\text{Net \$ Deficit}}
\]

\[
\text{Annual \$ Deficit} = \frac{-240,000,000}{12 \text{ years}} \times \frac{560,000,000}{-240,000,000} = 3.57\%
\]
Responsive Asset Allocation

i. Annual Target Alpha = 3.57%

j. YTM of Custom Liability Index (CLI) = 3.0%

k. ROA of Alpha assets = 8.00%

Annual Target Alpha / Estimated Annual Alpha = Alpha Allocation

\[
\text{Annual Target Alpha} / (\text{ROA} - \text{YTM of CLI})
\]

\[
3.57% / (8.00\% - 3.00\%) = 3.57\% / 5.00\% = 71.4\% \text{ Alpha Allocation}
\]

100% - Alpha Allocation = Beta Allocation = 28.6%
Risk Management

 Tradition  Reduce *Volatility* of Total Returns

 Ryan ALM  Increase *Certainty* of Meeting Objective

 Objective = Liability Driven
 Requires Objective Index

 Objective Index  *Custom* Liability Index
Solution: Liability Index (Beta) Fund

Mission Risk Management

Strategy *Liability Index Fund (Beta Portfolio)*

Match + Fund Liabilities *Chronologically*

Benefits Reduces *Cost* (Contributions)

Reduces *Risk* (Interest Rate Risk)

Reduces *Volatility* of Funded Ratio
Solution: Portable Alpha

Transfer (Port) Excess Returns above Objective Index

from Alpha Portfolio(s)
to Beta Portfolio

Requires Custom Liability Index = Liability Objective

Beta Portfolio = matches and funds Liabilities

Secures Victory! Reduces Funded Ratio Volatility!
Portable Alpha
(Benefits)

As Portable Alpha Transfers Excess Returns above Liability Index

Beta Portfolio grows and grows… creating 4 Major Benefits:

1. Reduces Contribution Costs  (Fully Funds Liabilities)

2. Reduces Interest Rate Risks  (Hedges Liabilities)

3. Increases Funded Ratio  (Client Objective)

4. Increases Certainty of Meeting Objective
### Solution: Rates Go Up (5 Years)

**Liabilities:** Interest Rates go up (+80 bps per year)  
30-yr U.S. Treasury = 3.00% >> 7.00%  
Growth Rate = (5.00%) Annual  
*Note: Liabilities behave like long bonds*

<table>
<thead>
<tr>
<th>Annual Growth Rate</th>
<th>Assets</th>
<th>Liabilities</th>
<th>Alpha (Annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>6%</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>-5%</td>
<td>-5%</td>
<td>-5%</td>
<td>-5%</td>
</tr>
<tr>
<td>10%</td>
<td>11%</td>
<td>12%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Funding Ratio = 50%  
89%  
94%  
98%  
103%  
60%  
101%  
109%  
115%  
120%
Performance Measurement

Compares Assets vs. Objective

Objective = Custom Liability Index

Requires CLI to measure RISK and ALPHA

Requires CLI to Measure Performance vs. Liabilities