Actuarial Concepts 101

Presented By:
Jason L. Franken, FSA, EA, MAAA
ROLE OF THE ACTUARY

- Determine the Timing and Pattern of Annual Contributions
  - Help Maintain the Health of the Pension Fund
  - Ensure that Future Benefits Can Be Paid
- Communicate to Key Decision Makers
  - Actuarial Recommended Contribution Delivery
  - Implications of the Decisions Made to Determine the Actuarial Recommended Contribution
FUNDING BASICS

The Fundamental Truth of Pension Funds…

Benefits + Expenses = Contributions + Investment Earnings
**FUNDING BASICS**

- **Assets:** 
  *At Valuation Date*

- **Unfunded Actuarial Accrued Liability**

- **Actuarial Accrued Liability:** 
  *Includes Service Earned to Date*

- **Present Value of Future Benefits:** 
  *Includes All Future Pay and Service*

- **Present Value of Future Normal Costs**

- **Amortization Payment**

- **Normal Cost**
**FUNDING BASICS**

**GLOSSARY OF TERMS**

- **Present Value of Future Benefits**
  - The single sum value at the valuation date of all future benefits to be paid to current Members, Retirees, Beneficiaries, Disability Retirees, and Vested Terminations.

- **Normal Cost**
  - The current year's cost for benefits yet to be funded.

- **Actuarial Accrued Liability**
  - Determined according to the plan’s actuarial cost method. This amount represents the portion of the anticipated benefit allocated to years prior to the valuation date.


**FUNDING BASICS**

**GLOSSARY OF TERMS**

- **Actuarial Value of Assets**
  - The value of assets determined after smoothing investment gains and losses over a defined time period (e.g. five years).

- **Unfunded Actuarial Accrued Liability (UAAL)**
  - The excess of the Accrued Actuarial Liability over the Actuarial Value of Assets.
FUNDING BASICS

ANNUAL PENSION CONTRIBUTION

• The annual pension contribution consists of two pieces:
  • Normal cost
    • The amount of benefits that are earned by the active workforce each year, reflecting increases in pay and service earned during the year
    • Includes administrative expenses paid out of the pension trust
  • Amortization payment
    • The amount paid each year to eliminate the unfunded liabilities of the plan
• The contribution needs to reflect the timing of the payment so it should include interest from the valuation date to the estimated payment date
OVERVIEW OF ACTUARIAL PROCESS

• Data Collection
  • Member Data
  • Asset Information
  • Plan Provisions

• Method Selection
  • Cost Allocation Methods
  • Asset Smoothing
  • Amortization Methods

• Assumption Setting

• Liability Calculations and Contribution Determination

• Delivery of Recommended Actuarial Contribution
DATA COLLECTION

• Member Data
  • Collected at a snapshot date in time
  • Includes indicative data such as gender, birth date, and hire date
  • Current Status in the fund
  • Pay or benefit information

• Asset Information
  • Ideally final audited assets

• Plan Provisions
  • Local ordinance or State statutes
Asset smoothing is standard actuarial practice.
- Most funds smooth investment gains and losses over a period up to five years.
- Reduces impact of year over year fund volatility, which can help to achieve a more level funding pattern.
- The actuarial value of assets (smoothed assets) is used in determining the funded ratio, unfunded liability and contribution requirement.
**Method Selection**

**Asset Smoothing**

- If unrecognized investment gains exist, the market value of assets will be larger than the actuarial value.

<table>
<thead>
<tr>
<th>Plan Year Ending</th>
<th>Gain/(Loss)</th>
<th>Amounts Not Yet Recognized by Valuation Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2018</td>
<td>2019</td>
</tr>
<tr>
<td>12/31/2014</td>
<td>(50,000)</td>
<td></td>
</tr>
<tr>
<td>12/31/2015</td>
<td>200,000</td>
<td>80,000</td>
</tr>
<tr>
<td>12/31/2016</td>
<td>2,000,000</td>
<td>1,200,000</td>
</tr>
<tr>
<td>12/31/2017</td>
<td>(270,625)</td>
<td>(216,500)</td>
</tr>
<tr>
<td>Total</td>
<td>1,053,500</td>
<td>677,625</td>
</tr>
</tbody>
</table>

**Development of Investment Gain/Loss**

- Market Value of Assets, 12/31/2016: 20,000,000
- Contributions Less Benefit Payments & Administrative Expenses: (125,000)
- Expected Investment Earnings \(^1\): 1,395,625
- Actual Net Investment Earnings: 1,125,000
- 2017 Actuarial Investment Gain/(Loss): (270,625)

\(^1\) Expected Investment Earnings = 7.00% x (20,000,000 + 0.5 x -125,000)

**Development of Actuarial Value of Assets**

- Market Value of Assets, 12/31/2017: 21,000,000
- (Gains)/Losses Not Yet Recognized: (1,053,500)
- Actuarial Value of Assets, 12/31/2017: 19,946,500

\(\text{MVA} > \text{AVA}\)
**METHOD SELECTION**

**ASSET SMOOTHING**

- If unrecognized investment losses exist, the actuarial value of assets will be larger than the market value.

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<tbody>
<tr>
<td></td>
<td></td>
<td>2018</td>
</tr>
<tr>
<td>12/31/2014</td>
<td>100,000</td>
<td>20,000</td>
</tr>
<tr>
<td>12/31/2015</td>
<td>(150,000)</td>
<td>(60,000)</td>
</tr>
<tr>
<td>12/31/2016</td>
<td>(800,000)</td>
<td>(480,000)</td>
</tr>
<tr>
<td>12/31/2017</td>
<td>(270,625)</td>
<td>(216,500)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(736,500)</td>
</tr>
</tbody>
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- Actuarial Value of Assets, 12/31/2017: 21,736,500

AVA > MVA
**METHOD SELECTION**

*ACTUARIAL COST METHOD*

- An actuarial cost method is a budgeting mechanism used to accumulate money over a member’s working career so that there is enough money to pay their pension benefits in retirement.

- The actuarial cost method determines the normal cost and the actuarial accrued liability.

- The characteristics of each method are different.

- There is not one cost method that is “correct.”
**METHOD SELECTION**

**ACTUARIAL COST METHOD**

- **Entry Age Normal Cost Method**
  - Creates a level contribution pattern during a member’s career.
  - Used by over 90% of public pension funds since it produces a more predictable contribution pattern.

- **Projected Unit Credit Cost Method**
  - Contributions are based on the value of the benefits that accrue each year.
  - Benefits accruing near retirement are much more valuable than those early in a member’s career.
  - Contribution pattern is back-loaded.
METHOD SELECTION

ACTUARIAL COST METHOD

• Entry Age Normal vs. Projected Unit Credit:

New Member: Entry Age 25

% of Payroll

0% 10% 20%

25 29 33 37 41 45 49 53

EANC PUC
METHOD SELECTION

AMORTIZATION OF UNFUNDED LIABILITIES

• The actuarial cost method determines the actuarial accrued liability.

• In the actuarial valuation, the accrued liability is compared to the actuarial value of assets.

• If the accrued liability is larger, unfunded liabilities exist and need to be paid down, similar to a mortgage.
METHOD SELECTION

AMORTIZATION OF UNFUNDED LIABILITIES

• Many considerations when selecting an amortization method:
  • Length of the amortization period?
  • Open (rolling) or closed amortization?
  • Level dollar or level percentage of payroll basis?
    • If level percentage basis, what is the payroll growth assumption?
METHOD SELECTION

AMORTIZATION OF UNFUNDED LIABILITIES

• Length of amortization period?
  • Historically, funds have amortized unfunded liabilities over varying periods
    • 30 years used to be the “maximum” period
  • Some states amortize to a fixed date
  • Amortization periods that end at an arbitrary date can be dangerous.
    • The plan is going to be around for a lot longer than this “end date.”
    • This date is often pushed back without any consideration of the effect on the plan or the municipality.
• Increasing contributions and volatility as you approach the end of the amortization period will be difficult for the municipality to manage.
METHOD SELECTION
AMORTIZATION OF UNFUNDED LIABILITIES

• Open (rolling) or closed amortization?
  • An amortization with a finite period is called a closed amortization.
    • 30 year layered amortization is a closed amortization
    • 2040 is a closed amortization.
    • Fixed date amortizations are subject to political changes.
  • An open amortization is one that always uses the same number of years.
    • Opponents do not like it because it does not designed to reach a funded ratio of 100% by any specific date.
METHOD SELECTION

AMORTIZATION OF UNFUNDED LIABILITIES

• Level dollar or level percentage of payroll basis?
  • The level dollar approach produces an amortization payment that is always the same amount.
    • Becomes a smaller percentage of payroll over time.
  • The level percentage of payroll produces a payment stream that is designed to increase based on the expected growth in payroll.
    • Payments start out small and increase over time.
    • The actuary uses a payroll growth assumption to determine the payment pattern; the higher the assumption, the more the payment will increase over time.
    • The current payment is less than the level dollar approach since future payments get larger each year.
    • The level dollar method is the same as the level percentage approach with a 0% payroll growth assumption.
METHOD SELECTION

AMORTIZATION OF UNFUNDED LIABILITIES

• The payroll growth assumption determines how unfunded liabilities are paid off.

• Example – 30-Year Amortization
  • Unfunded Actuarial Liability = $10,000,000
  • Interest Rate = 6.50%

<table>
<thead>
<tr>
<th>Payroll Growth Rate</th>
<th>UAL Payment (1st year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% (Level $)</td>
<td>$719,037</td>
</tr>
<tr>
<td>1%</td>
<td>$648,601</td>
</tr>
<tr>
<td>2%</td>
<td>$581,886</td>
</tr>
<tr>
<td>3%</td>
<td>$519,150</td>
</tr>
<tr>
<td>4%</td>
<td>$460,600</td>
</tr>
</tbody>
</table>
METHOD SELECTION

AMORTIZATION OF UNFUNDED LIABILITIES

• How do the amortization payments change over the 30-year period with various payroll growth assumptions?
**METHOD SELECTION**

*Amortization of Unfunded Liabilities*

- What happens to the unfunded liabilities under various payroll growth assumptions?

![Graph showing amortization of unfunded liabilities under different growth assumptions.](image-url)
METHOD SELECTION

AMORTIZATION OF UNFUNDED LIABILITIES

• Each plan should select its own amortization approach.
• Need to consider how all of the factors work together and select those that will help you succeed.
  • Cannot cherry pick the “cheapest” approach from each category.
• Once you have made a selection, stick with it and do not change the rules along the way.
  • Changing the rules will set you up for failure.
ASSUMPTION SETTING

• Assumptions Used by the Actuary to Determine Liabilities:
  • Investment Return
  • Salary Increase
  • Payroll Growth
  • Mortality
  • Retirement
  • Turnover
  • Disability
  • Others
LIABILITY CALCULATIONS AND CONTRIBUTION DETERMINATION

• After collecting all of the necessary data and making all of the decisions about methods and assumptions, an actuary will determine the results.
  • Typically use special actuarial valuation software to determine the liabilities and normal cost.
  • Results are generally calculated in excel, where assets are brought together with liabilities to determine the actuarial recommended contribution.

• The resulting contribution will be:

\[
\text{Normal Cost, including expenses} + \text{Amortization of Unfunded Liability} - \text{Expected Member Contributions} = \text{Actuarial Recommended Contribution}
\]
## LIABILITY CALCULATIONS AND CONTRIBUTION DETERMINATION

- **Sample calculation**

<table>
<thead>
<tr>
<th>Valuation Date</th>
<th>1/1/2018</th>
<th>12/31/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable to Fiscal Year Ending</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal Cost (with interest)</td>
<td>$1,050,000</td>
<td>28.4</td>
</tr>
<tr>
<td>Administrative Expenses (with interest)</td>
<td>50,000</td>
<td>1.4</td>
</tr>
<tr>
<td>Payment Required to Amortize Unfunded Actuarial Accrued Liability over 22 years (as of 1/1/2018, with interest)</td>
<td>2,000,000</td>
<td>54.0</td>
</tr>
<tr>
<td>Total Actuarial Recommended Contribution</td>
<td>3,100,000</td>
<td>83.7</td>
</tr>
<tr>
<td>Expected Member Contributions</td>
<td>(350,000)</td>
<td>(9.5)</td>
</tr>
<tr>
<td>Actuarial Recommended Contribution</td>
<td>2,750,000</td>
<td>74.3</td>
</tr>
</tbody>
</table>
DELIVERY OF RESULTS

• Actuarial calculations are complicated, and key decision makers should meet with their actuary to walk through results

• Meeting should cover:
  • Data included as of the valuation date
  • Basics of the calculation procedures
  • Actuarial Recommended Contribution
  • Assumptions used to determine the results
  • Discussion of future considerations regarding assumptions and methods
Questions?

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(630) 620-0200