Agenda

- Typical actuarial calculations
- Relevant legislation
- Funding rules
- Actuarial valuations
- Why fund conservatively?
- Pension administration issues
- Questions?
Typical Actuarial Calculations

- Calculation of liabilities/reserves or contribution rates for pension or benefit plans:
  - Pension plans (defined benefit, target benefit, Multi-employer)
  - Health & Welfare Trusts (LTD)
  - Post-retirement benefits (dental, life insurance, medical)

- Legal evidence:
  - Criminal rates of interest
  - Loss of earnings
  - Split of pensions on marriage breakdown

- Early days:
  - Church of Scotland ministers set up a fund in 1744 to fund pensions for widows and orphans of deceased ministers
  - Today: Scottish Widows insurance company
Relevant Legislation: H&W Trusts

- H&W Trust funding:
  - Income Tax Act (impacts tax status of investment earnings)
  - No funding standards; Trusts set guidelines in Trust Agreement or funding policy
Relevant Legislation: Pension Plans

- **Income Tax Act**: Limits the maximum amount of tax deductible contributions and funding
- **Pension Standards Legislation**:
  - Registered pension plans cannot be funded on a pay-as-you-go basis (must be prefunded)
  - Must be funded in accordance with a method permitted by the legislation
  - Funding requirements depend on the plan
    - defined contribution plan
    - defined benefit plan
    - negotiated cost plan
Pension Plan Funding Legislation

Pension legislation requires two funding tests (every 3 years):

1. **Going concern**: value plan assets and liabilities assuming long-term continuation of Plan
   - Funding surplus/deficit = Plan assets - Going Concern liabilities for service to date
   - Normal cost = cost of benefits being earned over the next year; often expressed as % of payroll

2. **Solvency**: assumes Plan wind-up and payout of member earned benefits
   - Solvency surplus/deficit = Plan assets - Solvency liabilities for service to date
Target Benefit Plan Funding Rules

• Available in Alberta, coming to B.C.
• No solvency test
• Going concern “plus”:
  – Contribution rates – needed to fund benefits plus PFAD
  – PFAD: Provision for Adverse Deviations
  – PFAD increases with equity exposure in Plan assets; also increases if funding discount rate above a benchmark rate
  – Deficits amortized over 15 years (or average future service if shorter)
Pension Plan Funding Legislation

- Minimum Funding requirements: Plan normal cost + 15-year amortization of going concern deficits + 5-year amortization of solvency deficits
- Some jurisdictions allow solvency exemption or longer period to pay solvency deficits e.g. 15 years
- Going concern and solvency tests use different methods and assumptions: going concern are long-term and solvency are market-based
- Maximum funding allowed: Normal cost + lump sum payments to fund full solvency and funding deficits
- Income Tax Act does not allow contributions to continue when Plan’s funded ratio exceeds 125% (with a few exceptions)
Actuarial Valuation - Overview

Purpose:
- Adjust contribution rates on regular basis
- To provide funds sufficient to provide all Plan benefits
- Recognizing past actual and expected future experience

Contributions + Investment Earnings – Expenses = Benefits
## Sample Pension Valuation Results

### Going Concern Basis

<table>
<thead>
<tr>
<th></th>
<th>31-Dec-12</th>
<th>31-Dec-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial value of assets</td>
<td>72,249,000</td>
<td>79,618,000</td>
</tr>
<tr>
<td>Actuarial liability</td>
<td>88,747,000</td>
<td>91,768,000</td>
</tr>
<tr>
<td>Funding Surplus (deficiency)</td>
<td>(16,498,000)</td>
<td>(12,150,000)</td>
</tr>
<tr>
<td>Funded Ratio</td>
<td>81%</td>
<td>87%</td>
</tr>
</tbody>
</table>

### Solvency Basis

<table>
<thead>
<tr>
<th></th>
<th>31-Dec-12</th>
<th>31-Dec-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solvency Assets</td>
<td>79,132,000</td>
<td>87,965,000</td>
</tr>
<tr>
<td>Solvency Liabilities</td>
<td>115,263,000</td>
<td>102,999,000</td>
</tr>
<tr>
<td>Solvency Surplus (deficiency)</td>
<td>(36,131,000)</td>
<td>(15,034,000)</td>
</tr>
<tr>
<td>Solvency Ratio</td>
<td>69%</td>
<td>85%</td>
</tr>
</tbody>
</table>
### Sample Pension Valuation Results

<table>
<thead>
<tr>
<th>Contribution Requirements</th>
<th>31-Dec-12</th>
<th>31-Dec-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost of accruing benefits for next year</td>
<td>1,370,000</td>
<td>1,093,000</td>
</tr>
<tr>
<td>Members’ contributions</td>
<td>(541,000)</td>
<td>(466,000)</td>
</tr>
<tr>
<td>Employer current service cost</td>
<td>829,000</td>
<td>627,000</td>
</tr>
<tr>
<td>Employer’s current service cost as a % of member’s required contributions</td>
<td>153%</td>
<td>134%</td>
</tr>
<tr>
<td>Minimum special payments to amortize solvency deficit</td>
<td>3,900,000</td>
<td>3,760,000</td>
</tr>
<tr>
<td>Minimum employer contributions</td>
<td>4,729,000</td>
<td>4,387,000</td>
</tr>
</tbody>
</table>
# Key Risk Factors

<table>
<thead>
<tr>
<th>Economic Risks:</th>
<th>Pension Plans</th>
<th>H&amp;W Trusts</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Asset returns</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>- Interest Rates</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>- Inflation/salary increases</td>
<td>Medium</td>
<td>Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demographic Risks:</th>
<th>Pension Plans</th>
<th>H&amp;W Trusts</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Retirement rates</td>
<td>Medium</td>
<td>N/A</td>
</tr>
<tr>
<td>- Life Expectancy</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>- LTD Experience</td>
<td>N/A</td>
<td>High</td>
</tr>
</tbody>
</table>
Valuation Results

- Key factors impacting pension plan liabilities and normal cost
  - Data/member demographics (actives vs. retirees, age, service, salary)
  - Actuarial assumptions (discount rate, inflation, salary increases, retirement rates)
  - Actuarial methods (Projected unit credit, entry age, attained age)
  - Plan benefits (retirement, termination, early retirement, indexing)
  - Solvency test
Actuarial Methods

- Projected unit credit (PUC): normal cost for actives is increase in past service liability over the next year; past service liability is present value of expected future payments for past service.
- Unit credit (UC): same as PUC, with no salary projection.
- Attained Age (AA): normal cost for actives is average cost of all future service benefits; past service liability same as PUC.
- Entry Age (EA): normal cost is level % of payroll needed to fund past and future service benefits from date of entry; accrued liability = present value of all benefits – present value of future normal costs.
- Under all methods, liabilities for inactive members are present value of expected future payments.
Actuarial Methods

• Comparison of funding:
  – EA and AA funding cost is constant as % of payroll over whole working career; leads to earlier funding than PUC and UC
  – UC and PUC funding cost increases as member gets older

• Uses for methods:
  – EA and AA: closed plans or multi-employer plans
  – PUC: open single-employer plans
  – UC: multi-employer negotiated cost plans
Actuarial Assumptions

- Common going concern assumptions:

  **Economic:**
  - Discount rate: 5.0% (net of investment fees)
  - Inflation: 2.0%
  - Salary Increases: 2.5%
  - YMPE Increases: 2.5%
  - Admin Expenses: Based on Plan experience

- Demographic assumptions based on Plan experience, except for mortality table
Actuarial Assumptions

- Derivation of Discount Rate:

<table>
<thead>
<tr>
<th>Description</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation Rate</td>
<td>2.0%</td>
</tr>
<tr>
<td>Expected Gross Real Rate</td>
<td>4.0%</td>
</tr>
<tr>
<td>Expected Gross Nominal Rate</td>
<td>6.0%</td>
</tr>
<tr>
<td>Deduction for Expenses paid from Fund</td>
<td>(0.5%)</td>
</tr>
<tr>
<td>Expected Net Nominal Rate (best estimate)</td>
<td>5.5%</td>
</tr>
<tr>
<td>Provision for adverse deviations (PFAD)</td>
<td>(0.5%)</td>
</tr>
<tr>
<td>Valuation interest rate net of expenses</td>
<td>5.0%</td>
</tr>
</tbody>
</table>
Mortality Table

• In Feb 2014, the Canadian Institute of Actuaries (CIA) issued the first ever mortality tables and mortality improvement scales based on pensioner mortality experience in Canada
• Will impact a number of plans across Canada
• Previously, Canadian pension actuaries could access primarily U.S. based pension mortality tables (UP94 Table)
• New Mortality Table: CPM2014 (Private sector, Public sector and combined table)
• Impact on pension plan liabilities: typically 5% increase; differs by plan and public / private sector
Solvency Assumptions

- Common Solvency Assumptions:
  - Commuted Values in Dec 2014
    - Mortality: UP94 with Generational Mortality (likely changing in 2015)
    - Interest (non-indexed): 2.5% for 10 years, 3.8% thereafter
    - Interest (indexed): 1.3% for 10 years, 1.6% thereafter
  - Annuities in Dec 2014
    - Mortality: UP94 with Generational Mortality
    - Interest (non-indexed): 2.52%
    - Interest (indexed): -0.58% (not a typo!)
Solvency vs. Going Concern

- Contributions are designed to be driven by going concern
- Solvency applies if solvency test fails
- Today, solvency is driving, an example:
  - Final Average Earnings Plan (1% of FAE)
  - Individual entering at age 25
  - Earnings start at $50,000 and grow at 3% per year
Solvency vs. Going Concern

Final Average Earnings Pension Plan Liabilities - By Age Indexed

- Liability ($) vs. Age

- Green line: Going Concern Liability
- Red line: Solvency Liability

[Graph depicting the comparison of Going Concern and Solvency liabilities by age]
Why are Actuaries Conservative?

- Best estimate assumption: 50% chance of being too conservative
- Margins/PFAD: more likely to generate positive results in future e.g. lower discount rate, high inflation rate/salary increase rate
- Advisors like to deliver positive surprises
- Conservative funding:
  - Build up contingency reserve/cushion for bad times (e.g. 2008)
  - Results in less volatility of funding level and contribution rates
  - Last 20 years:
    - Surpluses in 90s
    - Surpluses disappeared in early 2000s
    - Large deficits post-2008
    - Getting back to full funding now
Pension Administration

- Actuarial equivalent: of equal value (no gain/loss to Plan)
- Impacts of actuarial calculations:
  - Different forms of pension at retirement
  - Lump sums offered to members on termination/death
  - Some early retirement reduction factors (6% per year reduction)
Questions