Pensions & OPEB Projections Model

Summary: The following document expounds the methodologies used to calculate the projections of a given city. The city of Boston's other post-employment benefits (OPEB) fund is used as a case study to further illustrate these calculations.

I. OPEB Assets Fund

Data and Source:

- Current Value of Fund: For the city of Boston, it was **$204,567,000** in 2013.

  (**Source**: Boston 2014 CAFR → Notes to the basic Financial Statement → 12. OPEB → d. Funded Status and Funding Progress of the Plan)

- Inflation Rate: For the city of Boston, it was **2%** (0.02).

  (**Source**: OPEB_6_cities.xlsx → Fund Projections → Cell E4)

- Assets Rate of Return: For the city of Boston, it was **3%** (0.03).

  (**Source**: OPEB_6_cities.xlsx → Fund Projections → Cell E3)

- Employer and Employee Contributions: The city of Boston pledged to contribute **$40 million** per year to the fund. There were no employee contributions.

  (**Source**: opeb_paper_20160405.pdf → page 6)

Methodology:

The following formula is used to get the value of the fund in the next period or year:

$$\text{Fund}_{t+1} = Fund_t * (1 + Assets\ Rate\ of\ Return) + Employer\ Contribution_t + Employee\ Contribution_t$$

The following formulas are used to get the value of the employer and employee contributions in the next period:

$$\text{Employer Contribution}_{t+1} = Employer\ Contribution_t * (1 + Inflation\ Rate)$$

$$\text{Employee Contribution}_{t+1} = Employee\ Contribution_t * (1 + Inflation\ Rate)$$

Results:

Using the data and the methodology presented above, we will show the projections of the city of Boston's OPEB Fund from 2014 to 2025 in Table 1.

Year	City of Boston Fund Value	Employer Contribution
2014	250704	40000
2015	298225	40800
2016	347972	41616
2017	400027	42448
2018	454476	43297
2019	511407	44163
2020	570912	45046
2021	633085	45947
2022	698025	46866
2023	765832	47803
2024	836610	48759
2025	910467	49734

Table 1. City of Boston Fund Projections (2014 to 2025)

II. OPEB Liabilities Projection Model

Data and Source:

- Accrued Actuarial Liability (AAL): It is the present value of benefits accrued in past years, i.e years of employment prior to the valuation date. For the city of Boston it was **$2,257,699,000** in 2013.

  (**Source:** Boston 2014 CAFR → Notes to the basic Financial Statement → 12. OPEB → d. Funded Status and Funding Progress of the Plan)

- Discount Rate: It refers to the interest rate used to determine the present value of future OPEB benefit payments. It plays a pivotal role in assessing how much should be contributed now to ensure that an adequate level of resources is available in the future. In fact, the higher the discount rate, the lower the present value, and vice versa. The City of Boston used a discount rate of **7.5%** (0.075) in 2013.

  (**Source:** Boston 2014 CAFR → Notes to the basic Financial Statement → 12. OPEB → e. Actuarial Methods and Assumptions)

Methodology:

The following formula is used to get the OPEB Actuarial Accrued Liability using a discount different from the one used by the city officials.

$$\mathrm{AA}L_{\text{new rate}} = \frac{\mathrm{AA}L_{\text{city rate}} * (1 + city\ rate)^n}{(1 + new\ rate)^n}$$

Where *city rate*, *new rate* and *n*are the discount rate used by the city, the new discount rate and the number of periods (or years) respectively.

As an illustration, we will evaluate the AAL for the city of Boston using a more realistic discount rate of 3% over a period of 15 years.

$$\mathrm{AA}L_{3\%} = \frac{2257699000 * (1.075)^{15}}{(1.03)^{15}} = \$4,287,801,000$$

III. OPEB Unfunded Actuarial Accrued Liability/ Funded Ratio

The Unfunded Actuarial Accrued Liability (UAAL) is the difference between the AAL and the present value of the OPEB Asset Fund. Therefore the UAAL is the amount that is still "owed" to the fund for past obligations.