Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

Actuarial Methods and Valuations

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Basic Principles

Present Value (Discounted Value)

- The value today of a guaranteed payment(s) to be made in the future.
- The value today of $1 to be paid one year from now equals 91 cents assuming a 10% annual rate of interest

$$\frac{\$1}{(1+10\%)} = \$0.91$$

Actuarial Present Value

- Includes the probability that the future payment is received
- The value today of $1 that is 50% likely to be paid one year from now equals 46 cents assuming a 10% annual rate of interest

$$\frac{\$1}{(1+10\%)} \text{ X } 50\% = \$0.46$$

Actuarial Present Value

Example: You owe $1,000 to 100 people one year from now. Each person is 70 years old and without an heir. You expect the same return (8%) and chance each person will be alive in one year (98%). What is the present value of the debt?

$$100 \times \frac{\$1{,}000}{(1+ 8\%)} \times 98\% = \$90{,}741$$

Observation: Under what circumstances will you have exactly enough money to pay the debt?

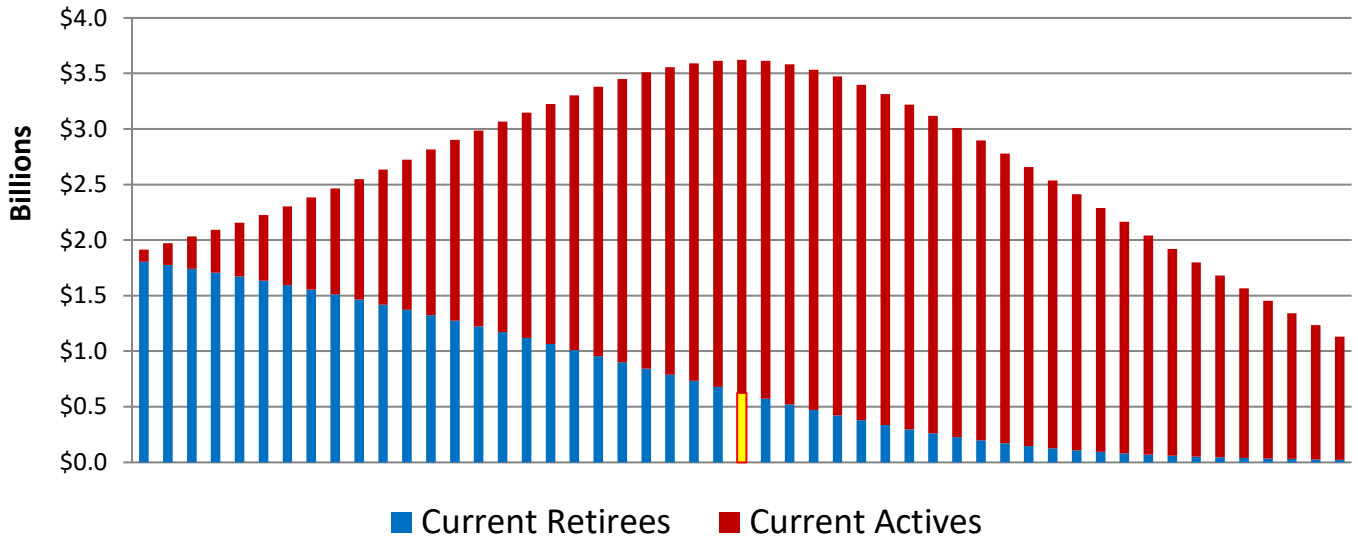
Application to Pensions

Events to Consider in Actuarial Present Value

- Mortality
- Interest Rate
- Retirement
- Withdrawal
- Disability
- Salary Increases
- Cost of Living Adjustments

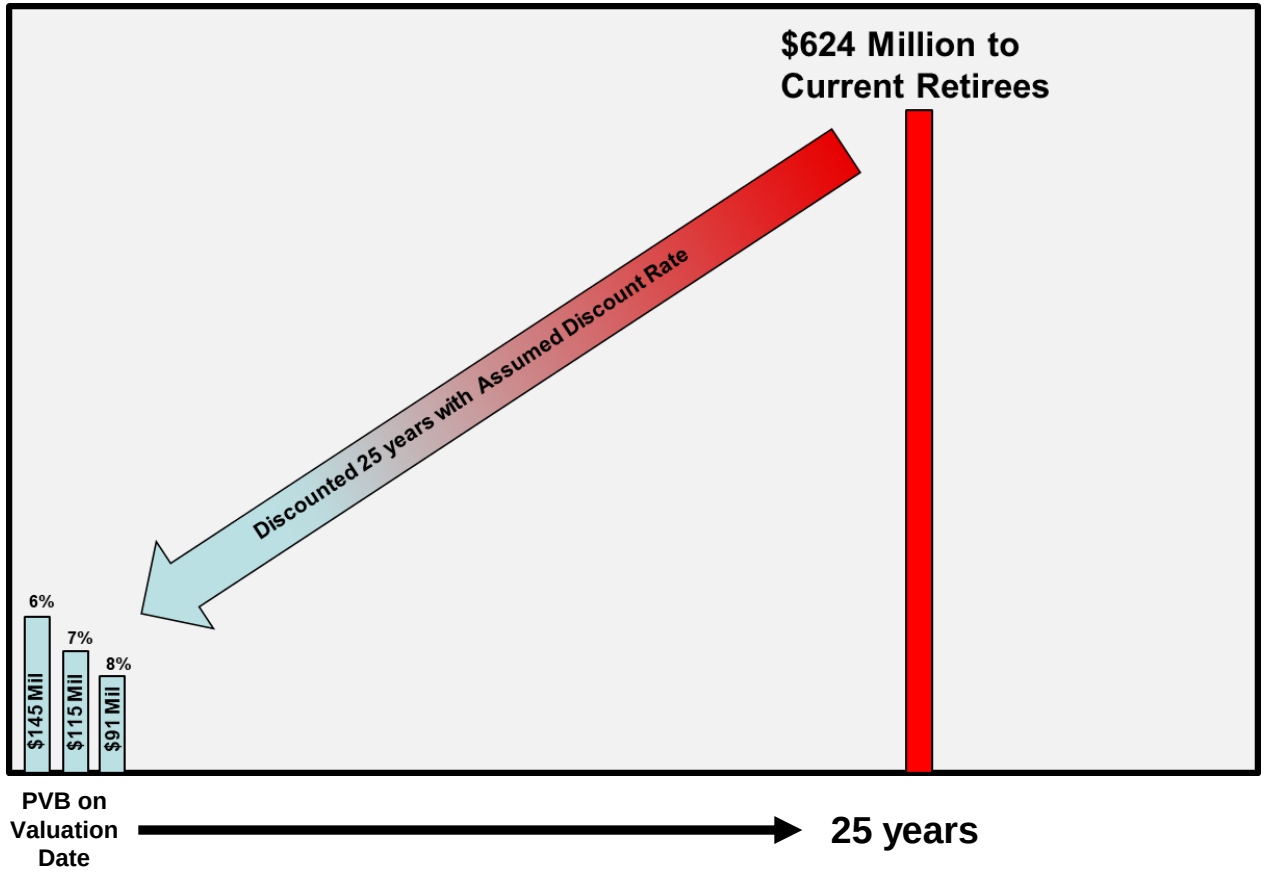
Present Value of Future Benefits

Expected Total Benefit Payments of Current Members in Next 50 Years

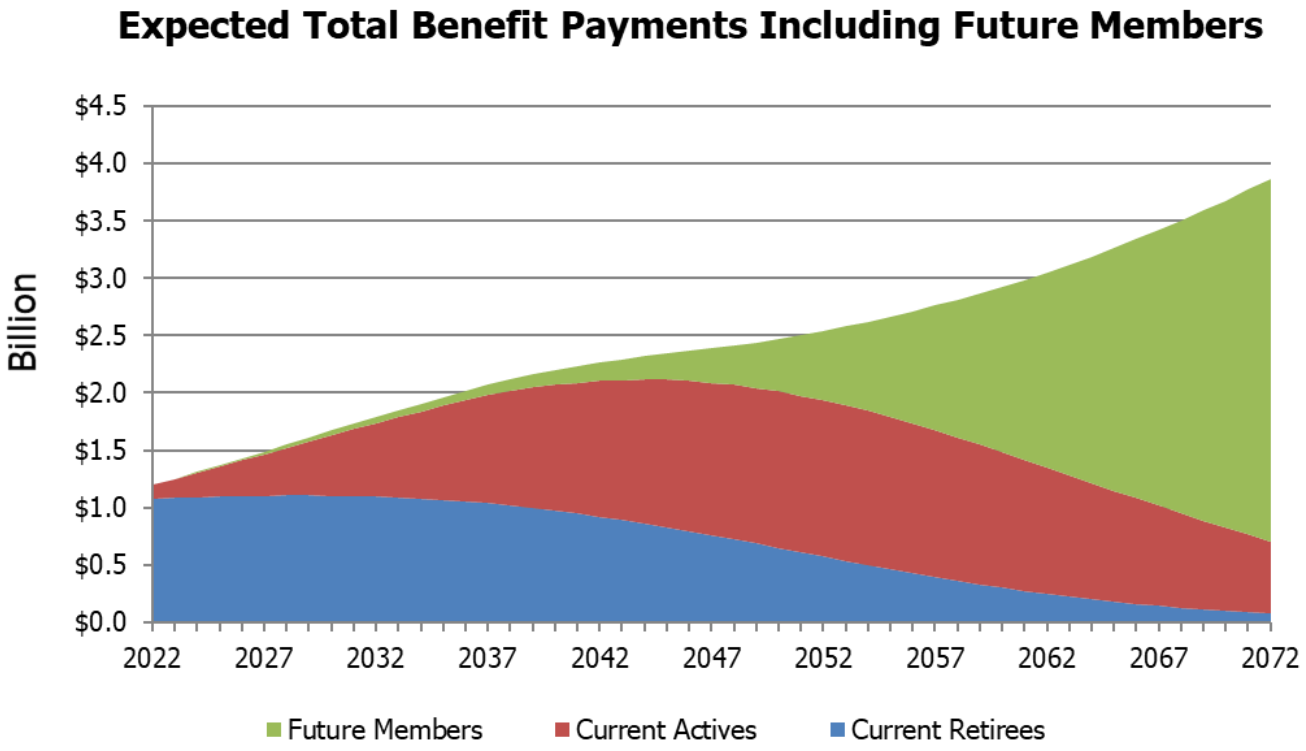


- *Each Annual Amount of Expected Benefits Discounted to the valuation date and summed is the Total Actuarial Present Value of Benefits*

Present Value of Future Benefits

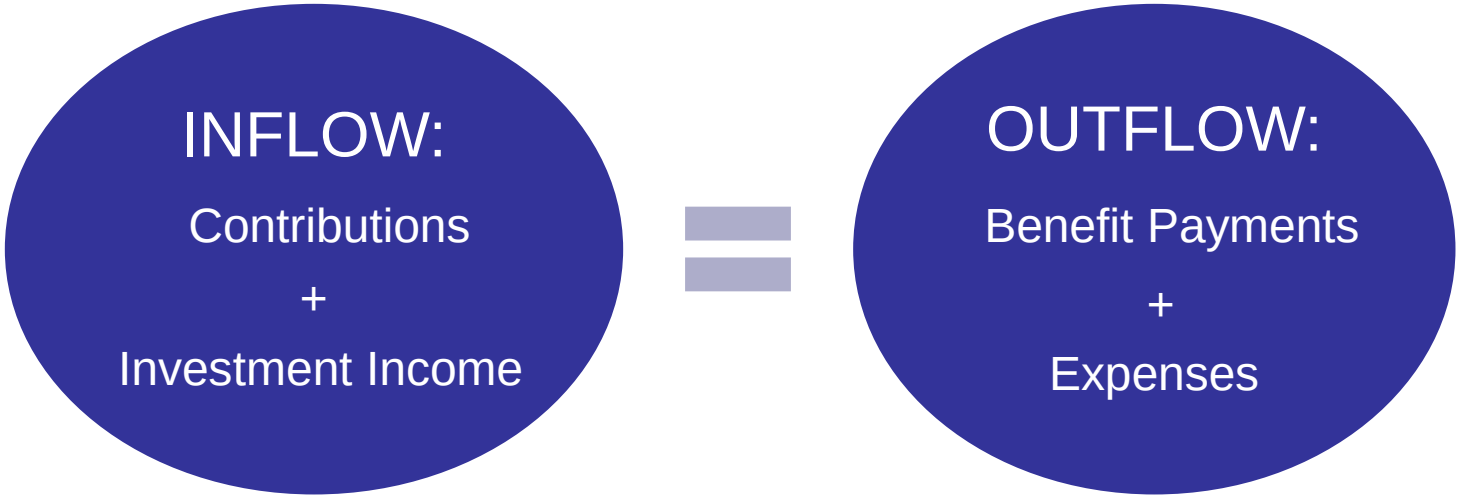


Present Value of Future Benefits



- Present Value of Future Benefits in a valuation covers only current active (red) and retired (blue) members. Projections can add expected future members.

Funding Equation: C + I = B + E



Pay as you go funding accomplishes this in each year

Actuarial funding accomplishes this over the expected life of the plan

Actuarial Funding Definitions

Present Value of Benefits

- Value of benefits expected to be paid to all current participants (active and retired)
- Includes past service and expected future service

Actuarial Accrued Liability

- Present Value of Benefits allocated to past service
  - Includes all benefits for members in pay status
  - Includes the portion of active members' benefits allocated to service performed up to the valuation

Actuarial Funding Definitions

Normal Cost

- Present value of active member's benefits allocated to the upcoming year of service
- Sometimes called service cost – the additional cost resulting from an additional year of service

Simple Example of Normal Cost:
An employee earns a $10,000 lump sum payment after 10-years of service. If we assume the employee does not terminate and the amounts are not invested, the normal cost is $1,000 per year.

Actual Normal Cost Rate is determined at each active member's entry age as the expected actuarial value of future benefits divided by the expected present value of future salary. Uses assumptions for each year of future service. The individual's Normal Cost Rate applied to expected salary for the upcoming year is that individual's dollar amount of Normal Cost.

Actuarial Funding Definitions

Present Value of Future Normal Costs

- Value of all future annual normal costs
- Present Value of Benefits allocated to future service

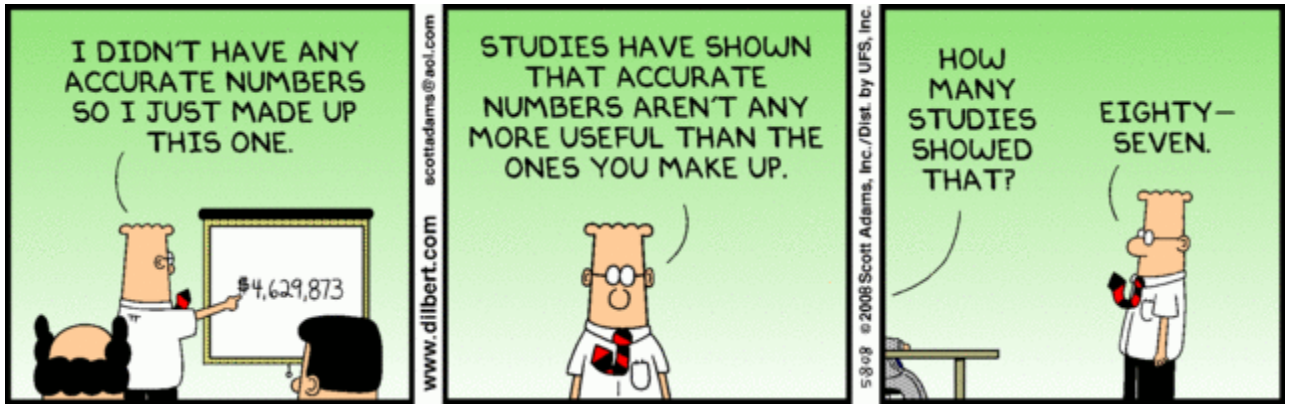
Actuarial Cost Method

- A method used to allocate the Present Value of Benefits between past service (Actuarial Accrued Liability) and future service (Present Value of Future Normal Costs)
- All cost methods maintain the following relationship:

Actuarial Funding Definitions

Actuarial Value of Assets	• Typically utilizes a smoothing method to dampen the effect that market value fluctuations have on funding requirements • TRS smoothes market returns over 4 years
Funded Ratio	• The ratio of the Actuarial Value of Assets to the Actuarial Accrued Liability • Commonly used to monitor the progress toward funding objectives
Unfunded Actuarial Accrued Liability (UAAL)	• The difference between the Actuarial Accrued Liability and the Actuarial Value of Assets • Liability allocated to past service in excess of assets • Also reflects the cumulative effect of experience gains and losses
Funding Period	• The number of years to fully amortize the Unfunded Actuarial Accrued Liability – also called Amortization Period

Actuarial Methods



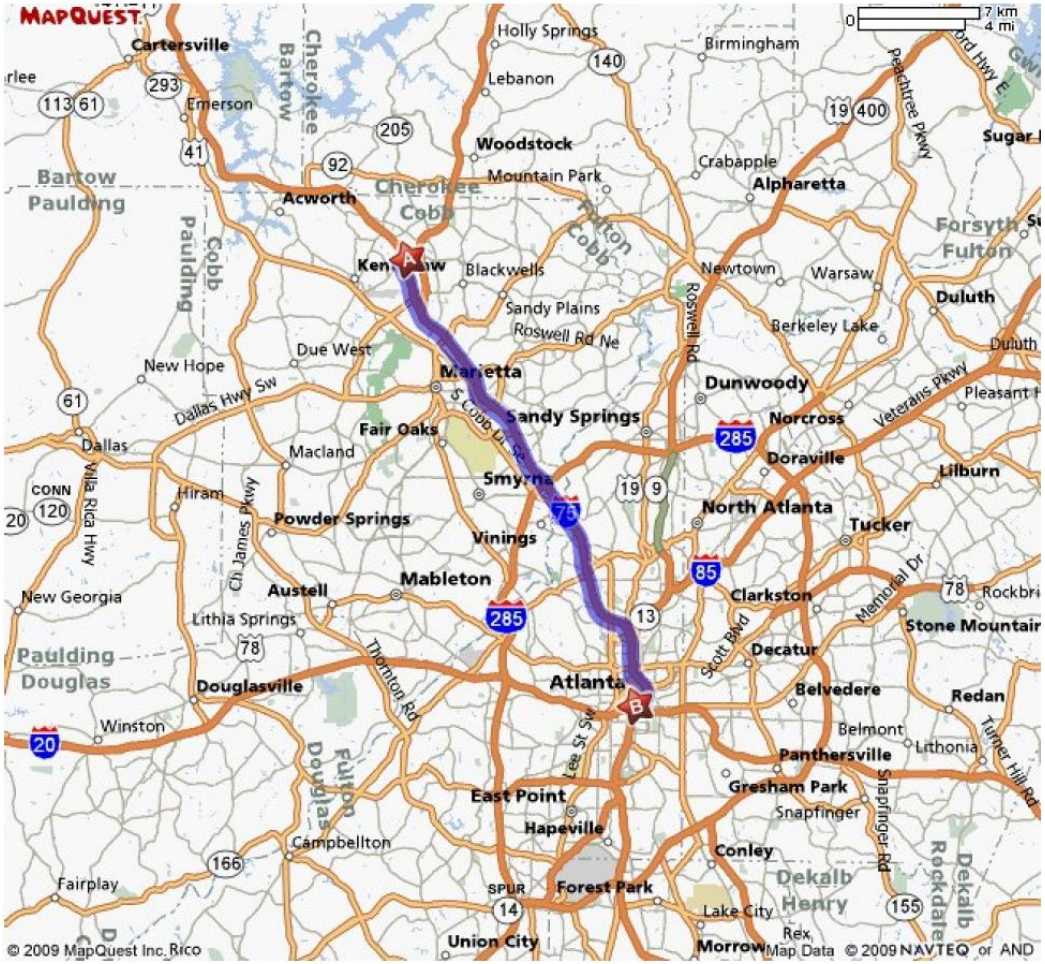
TRS Actuarial Methods

Actuarial Cost Methods	• Allocation of Present Value of Benefits • Entry Age Normal Cost Method
Asset Smoothing Method	• 4-year Smoothing Period • Recognition of market value gains and losses • Reduces contribution volatility
Amortization Method	• Layered approach • 25-yr Amortization Periods • Closed Period for each layer • Transitioning to Level Dollar Method (2025) • Payroll Growth Rate for Level Percent Method

Actuarial Valuations

- Measurement of Present Value of Benefits (PVB)
  - Using actual data and benefit provisions
  - Assuming future events
- Allocation of PVB using actuarial cost method
  - Normal Cost Rate
    - Funded by Employee and Employer
  - Actuarial Accrued Liability (AAL)
- Calculation of UAAL
  - AAL less the Actuarial Value of Assets
- Determination of UAAL Amortization Cost
  - Using amortization method
- Actuarially Required Contribution
  - Employer's Share of Normal Cost plus Amortization Cost

Valuation Analogy: The Objective



Valuation Analogy: The Basis

☑ Shortest Time ☐ Shortest Distance

Avoid

- ☐ Highways
- ☐ Toll Roads
- ☐ Seasonally Closed Roads

Speeds

Interstate Hwy	65 mph
Highways	55 mph
Major Roads	45 mph
Minor Roads	35 mph

Valuation Analogy: The Calculation

Total Time: 29 minutes **Total Distance: 24.85 miles**

A: 3550 Busbee Dr NW, Kennesaw, GA 30144-5511

START	1: Start out going SOUTH on BUSBEE DR NW toward TOWNPARK LN NW.	0.3 mi
	2: Turn RIGHT onto CHASTAIN RD NW.	0.2 mi
SOUTH 75	3: Merge onto I-75 S/GA-401 S via the ramp on the LEFT.	23.9 mi
248A EXIT	4: Take the M L KING JR DR exit, EXIT 248A, toward STATE CAPITOL/TURNER FIELD.	0.3 mi
	5: Keep LEFT at the fork in the ramp.	0.1 mi
	6: Turn SLIGHT RIGHT onto MARTIN LUTHER KING JR DR SE.	0.2 mi
	7: Turn LEFT onto WASHINGTON ST SW.	0.1 mi
END	8: End at [191-365] State Capitol SW Atlanta, GA 30334	

B: [191-365] State Capitol SW, Atlanta, GA 30334

Total Time: 29 minutes **Total Distance: 24.85 miles**

Valuation Analogy: The Experience

Valuation Analogy: The Update

Valuation Analogy: Conclusion

Valuations are limited to a point in time measurement based upon several assumptions

Gain and Loss information provides insight on the validity of the assumptions

Comparison with prior valuations will provide insight on the trend of actuarial funding

Gains and Losses on Investments

Investment gains and losses directly affect the determination of:

- The Actuarial Value of Assets

And therefore affect the determination of:

- Unfunded Actuarial Accrued Liability
- Funded Ratio

But do not impact the calculation of:

- The Present Value of Benefits
- The Normal Cost or Present Value of Future Normal Costs
- The Actuarial Accrued Liability

Gains and Losses
Non-Investment

A non-investment gain or loss occurs when actual experience varies from expected experience under the following assumptions:

- Salary growth
- COLA
- Mortality
- Turnover
- Retirement
- Disability
- Payroll growth
- Other (less material) assumptions

Gains and Losses
Non-Investment

Non-investment gains and losses affect the calculation of:

- Present Value of Benefits
- Normal Cost and Present Value of Future Normal Costs
- Actuarial Accrued Liability

And therefore affect the determination of:

- Unfunded Actuarial Accrued Liability
- Funded Ratio

But do not impact the determination of the :

- Actuarial Value of Assets

Questions