

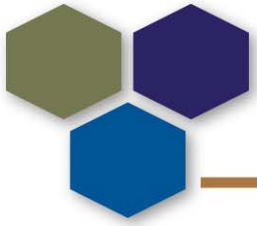


Actuary 101 – Some Basic Concepts

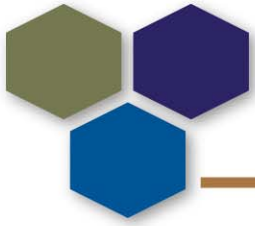
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Mark Randall



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Basic Actuarial Concepts



Basic Retirement Funding Equation

$$\mathbf{C + I = B + E}$$

Where

- C is Contributions
- I is Investment Income
- B is Benefits Paid
- E is Expenses

"Money In = Money Out"



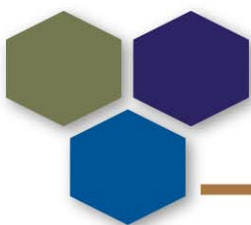
The Concept of Present Value

- ◆ Actuarial calculations almost always begin with the calculation of a present value based on the amount and timing of the benefit to be paid
- ◆ The present value of a benefit payable in the future is the amount of money that, if we had it today, would accumulate to the amount that will be payable in the future



Actuarial Cost Method

- ◆ The Actuarial Cost Method determines the allocation of cost between past and future
- ◆ It does not determine or alter the present value
- ◆ Next slide illustrates a simple case under the Entry Age Actuarial Cost Method



Funding a \$45,375 Annual Pension for an Active Member

Present Value of Benefits

At Retirement Date

\$600,000



At Valuation Date

\$277,916



Allocated to Past and Future Service

\$242,376

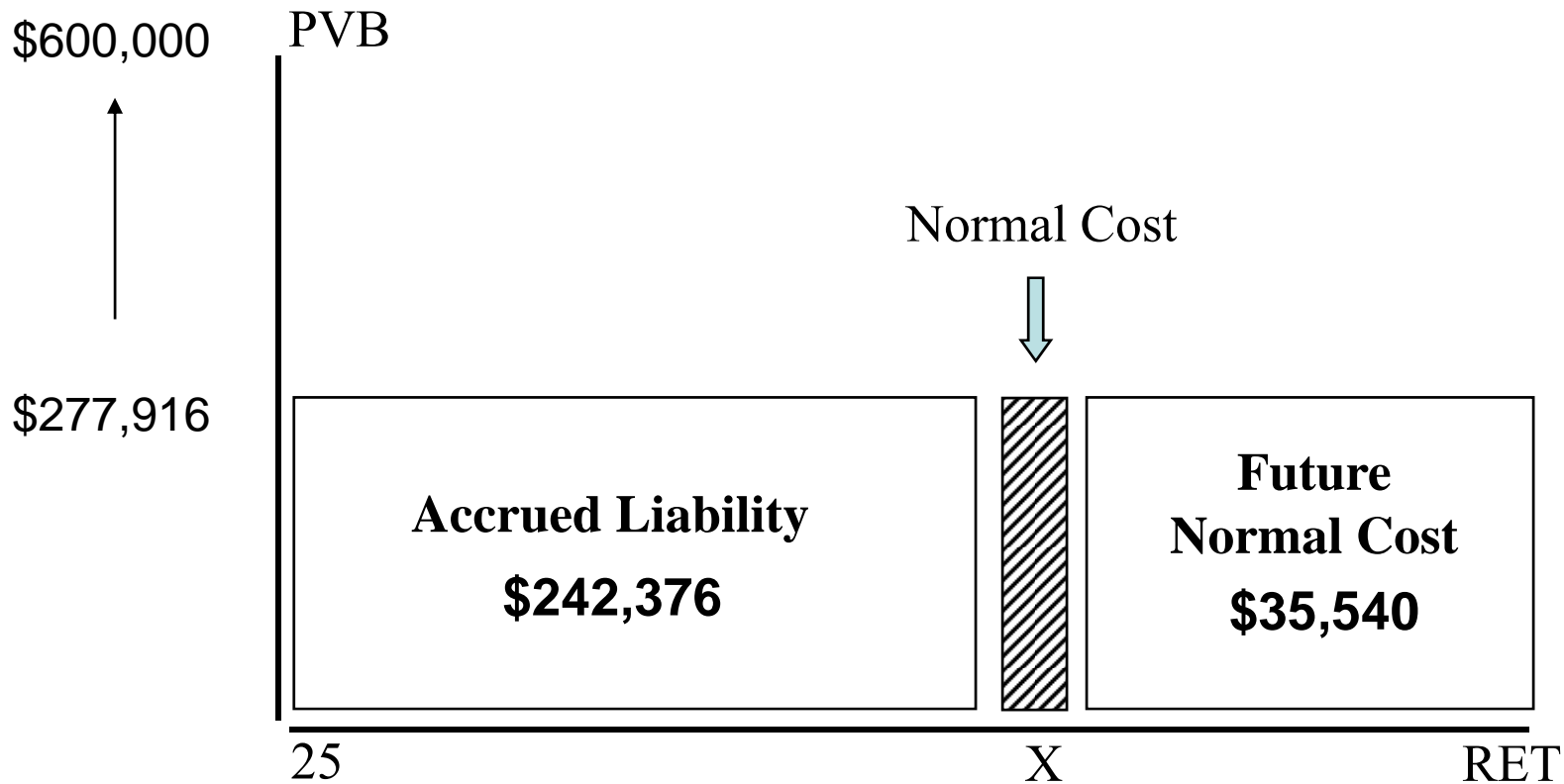
Actuarial Accrued Liability

\$35,540

Present Value of
Future Normal Costs

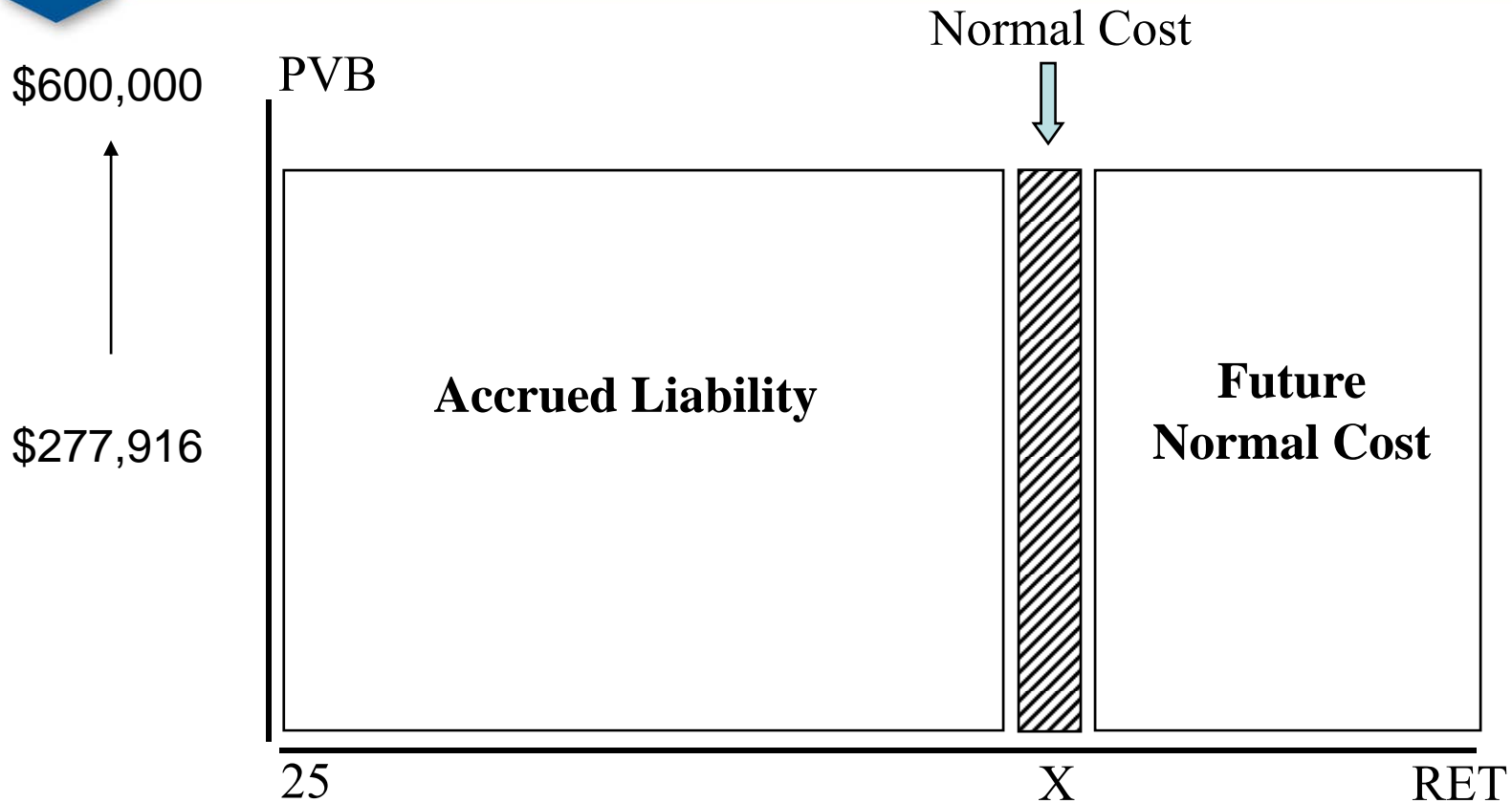
$$\begin{array}{r}
 \text{Actuarial Accrued Liabilities} \\
 - \text{Accrued Assets} \\
 \hline
 \text{Unfunded Actuarial Accrued Liabilities}
 \end{array}$$

Pension Funding Progression



As the person ages, the boxes grow Northward until the PVB becomes \$600,000. At the same time, the normal cost layer moves to the right. At retirement, there is one big square box; the accrued liability and the PVB are both \$600,000, and the Future Normal Cost is \$0.

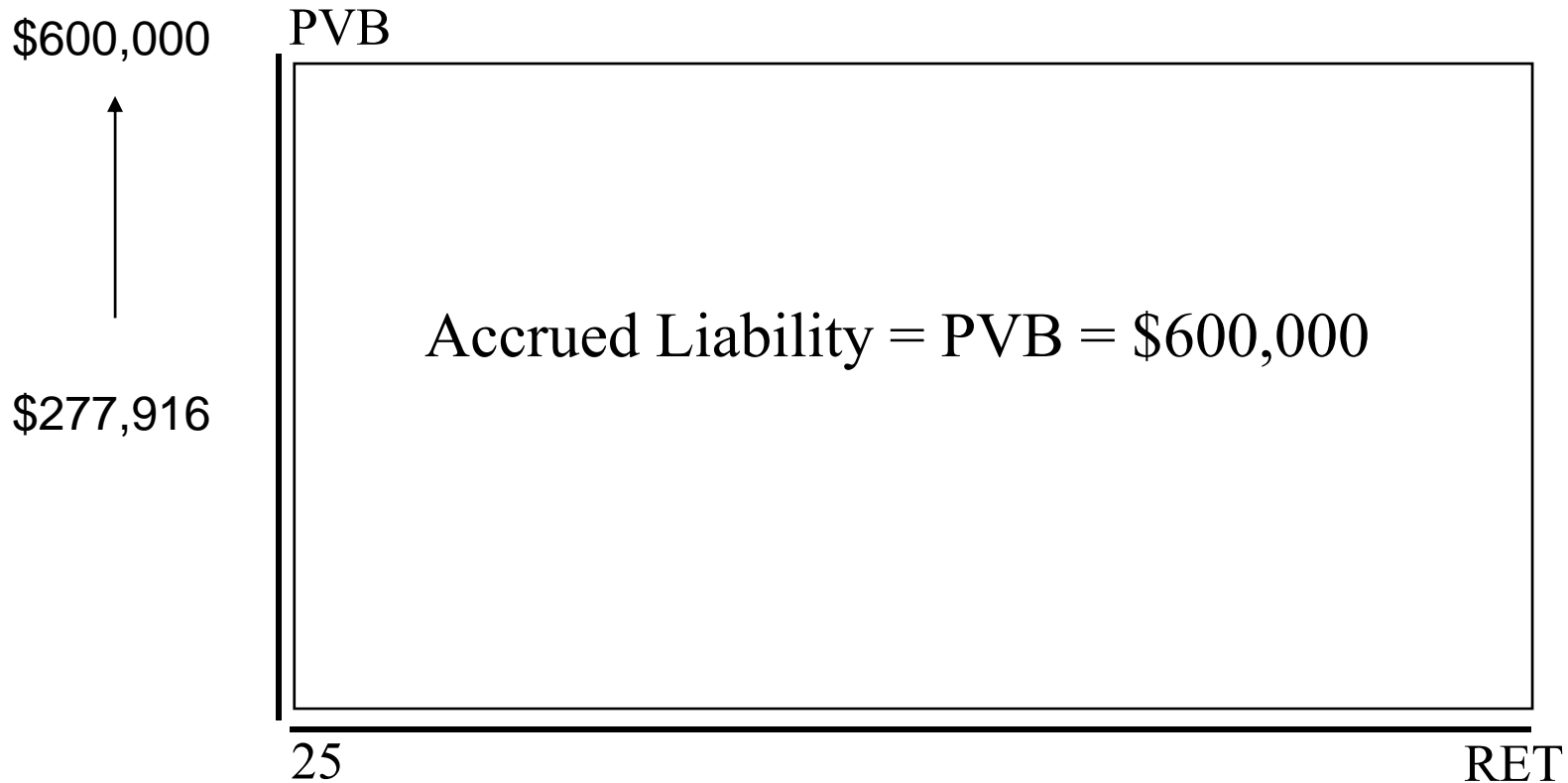
Pension Funding Progression



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Pension Funding Progression



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Measurement of Assets

- ◆ For assets that have to be used today, Market Value is the most sensible measure.
- ◆ In the long term, the Market is always right, but in the short term the Market is often volatile and subject to temporary conditions that distort the value.
- ◆ Commonly in pension funding, some type of smoothed market measurement is applied to the assets, and the result is called the "Actuarial Value of Assets" or the "Funding Value of Assets".
- ◆ Commonly, a "corridor" is applied, meaning that the funding value is not permitted to deviate by more than a certain percentage in either direction.



Development of Funded Ratio

Plan Totals (\$000)	
(1) Actuarial Accrued Liability	\$ 77,000
(2) Funding Value of Assets	<u>65,000</u>
(3) Unfunded Liability (1)-(2)	\$ 12,000
(4) Funded Ratio (2)/(1)*	84%

* The Funded Ratio is usually expressed based upon the funding value of assets as shown above. An alternate expression based upon the market value of assets can also be helpful.



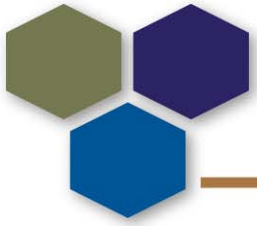
Discussion of Funded Ratios

- ◆ Difficult to compare from one system to another
- ◆ Actuarial assumptions not uniform
- ◆ Valuation dates and reporting schedules are different
- ◆ Different past history
- ◆ Trend in Funded Ratio is more important than the absolute level



Funding Unfunded Liabilities

- ◆ Usually funded as a level % of payroll
- ◆ Over closed (decreasing) periods of years, each year generating a new base(s)
- ◆ Usually amortized over 30 years
- ◆ This is another source of smoothing in addition to asset smoothing



Basic Actuarial Assumptions



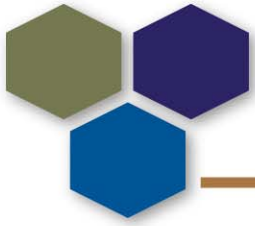
The Concept of Present Value

- ◆ Actuarial calculations almost always begin with the calculation of a present value.
- ◆ The present value of an amount of money payable in the future is the amount of money that, if we had it today, would accumulate to the amount that will be payable considering:
 - Investment return
 - Probability that money will be paid
- ◆ The calculation of the present value depends upon assumptions.



Investment Return

- ◆ Relates to Economic Assumptions
- ◆ 8.00% is most common



Probability that Money will be Paid

- ◆ Relates to Demographic Assumptions
 - ▶ Mortality, Turnover, etc.



Present Value Example

- ◆ The present value of \$1,000 payable 1 year from now to a bank at 8% interest is \$926.

$$\frac{\$1,000}{1.08} = \$926$$

- ◆ The present value of \$1,000 payable 1 year from now to a person who is 99 years old today, provided that the person is alive 1 year from now, is about half of that.



Selection of Assumptions

What

Economic

- ◆ Investment Return
- ◆ Payroll Growth Rate
- ◆ Population Growth Rate
(Usually, a constant population size is assumed)

Demographic

- ◆ Retirement Rates
- ◆ Promotional/Step Pay Increases
- ◆ Disability
- ◆ Turnover
- ◆ Mortality

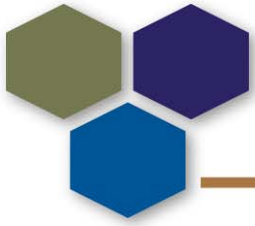
Who Selects

- ◆ Board Consultant, Actuary, Other Advisors
- ◆ Mostly Actuary



How do Economic Assumptions Compare? NASRA \ NCTR 2008 Public Fund Survey

- ◆ Released in November 2008
- ◆ Summary of Findings for FY 2007
- ◆ 101 public retirement systems with 125 plans, covering
 - ▶ 13.2 million active members
 - ▶ 6.5 million retirees
 - ▶ \$2.79 trillion in assets
 - Employees of state & local governments make up 12% of nation's workforce, and growing
- ◆ Represent approx 85% of public retirement plan membership and assets



How Do Economic Assumptions Compare?

Public Fund Survey for FY 2007

Prepared by Keith Brainard, NASRA

Assumption	Interest	Inflation*	Spread	Funded Ratio
High	8.5%	5.0%	5.5%	116%
Low	7.0%	2.3%	2.0%	45%
Most Common	8.0%	3.5%	4.5%	84% **

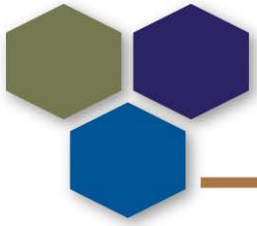
* Possible mix of payroll growth assumption and price inflation in survey

** The funded ratio of 84% is the median of the 121 Plans

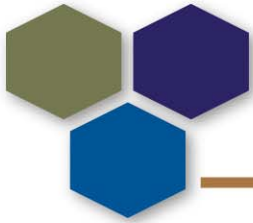


Outlook for Public Sector DB Plans

- ◆ Higher costs
- ◆ Fewer benefit enhancements
- ◆ New tiers for new hires
- ◆ More focus on actuarial assumptions
- ◆ DB Plans could be closed to new entrants
- ◆ Increased focus on Defined Contribution



Questions?



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