VIRGINIA RETIREMENT SYSTEM

Actuarial Aspects of a Defined Benefit Retirement System (Actuary 101)

July 20, 2004

GRS

Topics

- What a pension plan is
- Actuarial calculations
- The valuation process
- Making actuarial issues more understandable

Basic Types of Retirement Plans

- Defined contribution plans (DC plans)
  - 401(k) plans
  - 457 deferred compensation plans
  - 403(b) tax deferred annuities
  - 401(a) money purchase plans
- Defined benefit plans (DB plans)
  - Traditional defined benefit plans
  - Cash Balance plans (a hybrid plan)
  - Pension Equity plans (a hybrid plan)
  - Deferred Retirement Option Programs (a modified benefit accrual pattern and benefit payment option)
- Difference is who assumes the investment risk

Characteristics of a DC Plan

- Employer's contribution is defined by the DC plan
- Employee's benefit depends on investment performance
- Employee assumes the investment risk
- The more the fund earns, the greater the employee's benefit
- The less the fund earns, the smaller the employee's benefit
- Employer's obligation is fulfilled when it makes its contribution

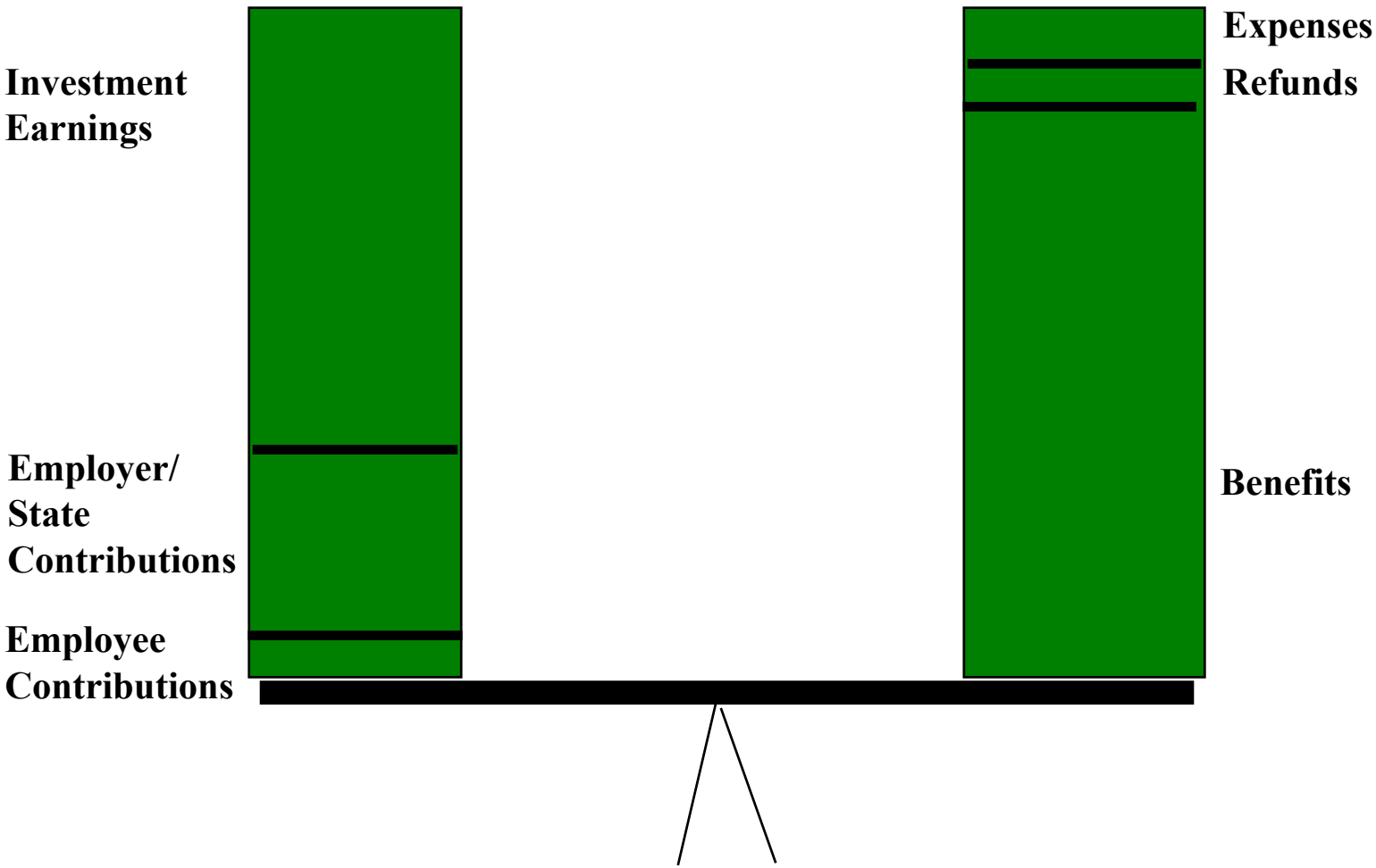
Characteristics of a DB Plan

- Employer promises the amount of the ultimate benefit
- Employer must contribute amount sufficient to deliver that promise

Characteristics of a DB Plan

- Employer assumes the investment risk
- The more the fund earns, the less the Employer must contribute
- The less the fund earns, the more the Employer must contribute
- Employer's obligation not fulfilled until last benefit recipient dies

What a DB Plan Costs



How a Defined Benefit Plan Works

- Benefit is defined by the System
  - 1.7% per year of service times 3-year average pay
  - Full benefit payable at age 65 with five years of service, or at age 50 with 30 years of service
  - Reduced benefit payable as early as age 55 with at least five years of service, or age 50 with 10 years of service
    - Reduced for early retirement
    - Reduction is usually a function of age and service

How a Defined Benefit Plan Works

- Employee must leave contributions on deposit to be eligible to draw a benefit at age 65 (or earlier, if eligible)
  - Five years of service
  - Vested employee
- Benefit is typically paid as a monthly income
  - Various payment options are available

How a Defined Benefit Plan Works

- Plan provides other ancillary benefits
  - Death benefit before retirement
  - Disability retirement benefit (commences after LTD benefit ceases for VSDP participants)
  - Cost of Living Adjustments (COLAs)

The Plan's Time Horizon

- Benefits are payable for life after retirement
  - Retiree may elect to have benefits paid as long as either retiree or spouse is alive
- Consider 65-year-old retiree without a spouse
  - Benefit could be paid for next 15-30 years or more

The Plan's Time Horizon

- Consider 25-year-old employee who will retire at age 60 with a spouse
  - 35 years until benefits begin
  - Benefits could be paid for 30-40 years after the member retires
  - Last dollar paid from plan on behalf of the employee may be 65-75 years from now

Actuarial Liabilities

- Created by a promise to pay if certain events occur or certain conditions are met
- For accounting liability, only question may be "when"
- For actuarial liability, question is "when", "if", and "how much"
  - These liabilities are "contingent"

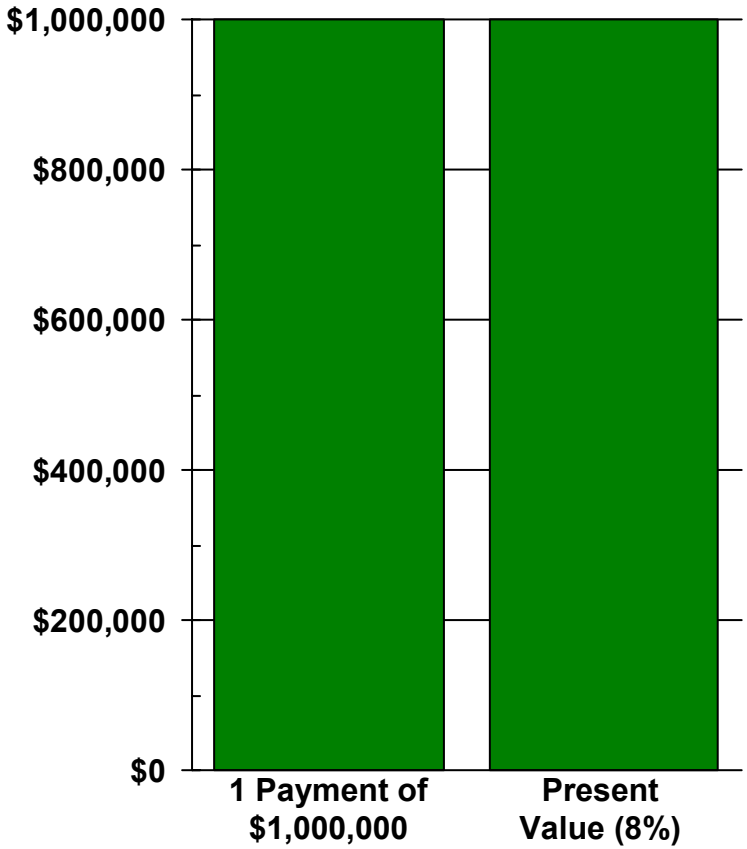
Value of Contingent Benefits

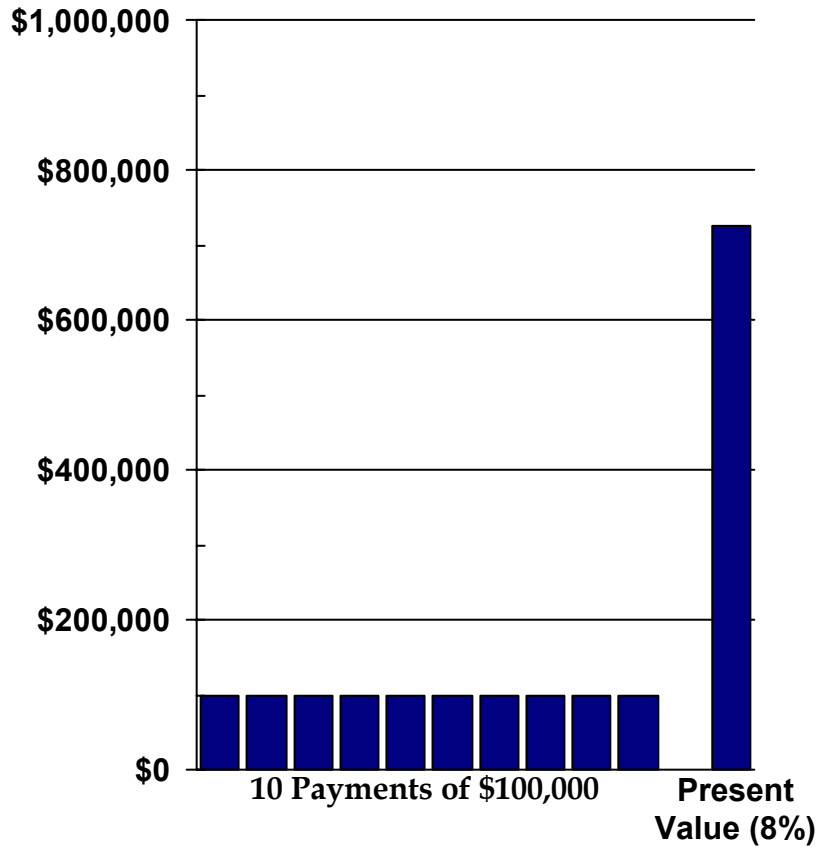
- Actuary must estimate likelihood that benefit will become payable
  - The probability or chance it becomes payable
- Present value must be calculated
  - Benefits are payable at different times in future
  - So current value differs
  - Should evaluate them on a time-equivalent basis (Same point in time – the valuation date)
  - Take into account time value of money

Present Value and Investment Return

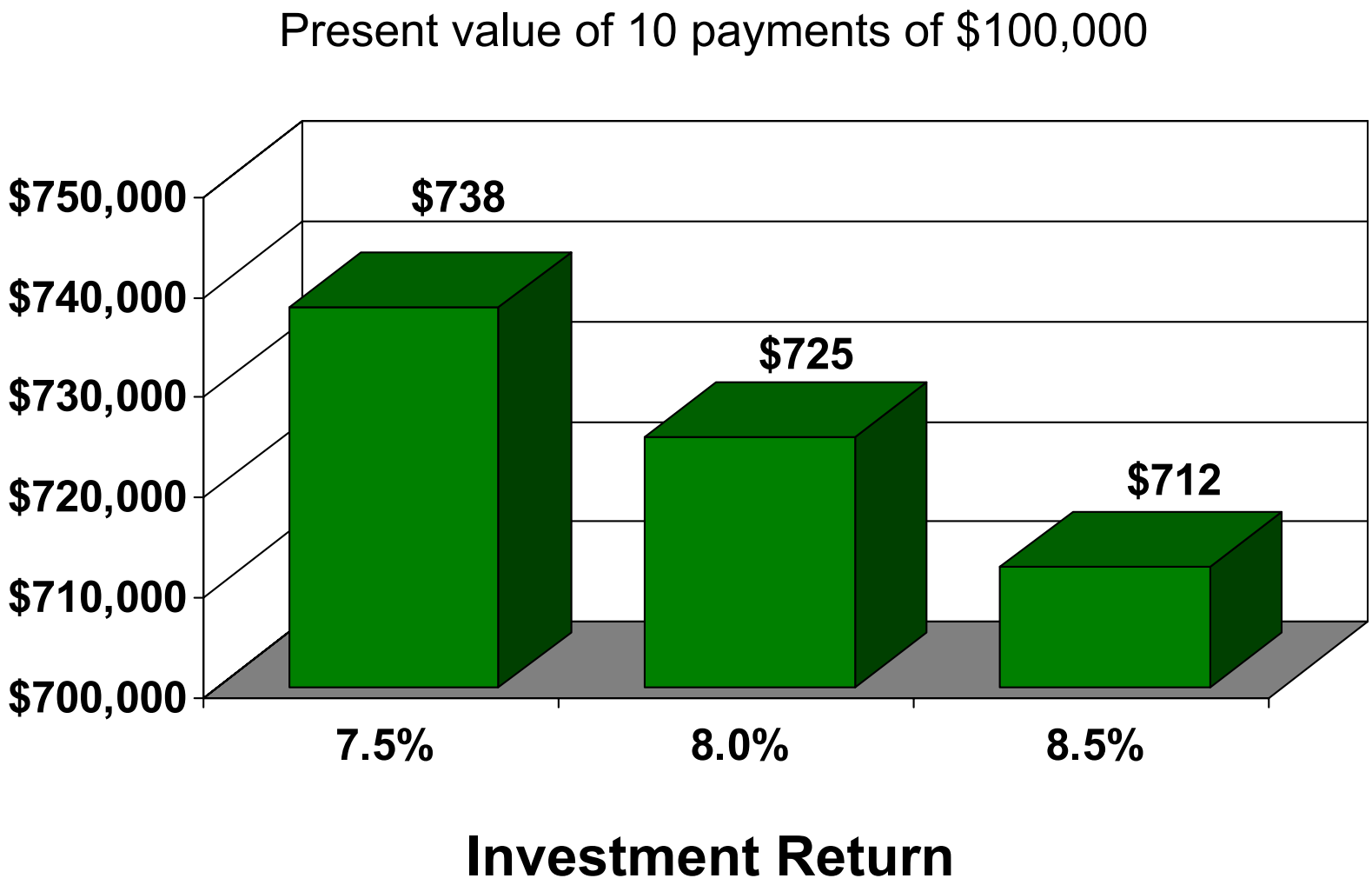
- Present value
  - How much you need now to make a series of payments in future
    - Assuming you can earn investment income until making the payment
  - The more you can earn while you have the money, the less you need to start with

Concept of Present Value





Present Value and Investment Return



Actuarial Assumptions

- Actuarial calculations are based on assumptions as to future occurrences of certain events
- Service today potentially creates liabilities that will not be fully paid until many years in the future
  - It may be 20-35 years before some of those potential benefits even start being paid, and they may be paid for 20-30 or more years after they start

Actuarial Assumptions

- To evaluate the potential liability, the actuary must make three estimates
  - If a benefit will start
  - When that benefit will begin
  - What the benefit amount will be
- Money is paid out of the Plan
  - On employment termination
  - On death of active or retired member
  - On disability
  - On retirement

Actuarial Assumptions

- Amount of benefit depends on current and future service and on the extent of future pay increases
- While the System awaits paying benefits, it invests funds and earns investment income to supplement contributions
- To evaluate potential liabilities, the actuary studies the System's experience and recommends assumptions to the Board

Types of Actuarial Assumptions

- Demographic or non-economic assumptions
  - Active members
    - Death
    - Termination
    - Disability
    - Retirement
  - Retired members and survivors
    - Death
  - Disabled members
    - Death or recovery
  - Terminated Members
    - Percentage who elect refund of contributions

Types of Actuarial Assumptions

- Economic assumptions
  - Inflation
  - “Real” rate of return on assets
  - “Nominal” rate of return on assets
    - “Nominal” rate = Inflation + “Real” rate of return
  - Salary scale
    - Comprised of several pieces including inflation
  - Payroll growth

The Valuation Process

- Valuation steps
  - Receive employee and retiree data
  - Receive asset data
  - Use actuarial assumptions to calculate future liabilities
    - Incorporate any plan changes
  - Compare those liabilities with the assets to determine funded status
  - Calculate required contribution rates
  - Report results to the Board

Implications of Measurement Process

- Assumption setting
  - Actuary's role is to study and recommend
  - Trustees accept, reject, or modify recommendations
  - A fiduciary decision
- If too optimistic
  - Long-term ability to meet the liabilities may be impaired

Implications of Measurement Process

- If you assume System will earn 9.5%, but only average 8%
  - True value of liabilities is greater than assumed
    - Since actual return is less
  - More money required than planned on
  - System may have problems paying benefits in future
- You assume members will retire at 63, but they actually retire at 60
  - Benefit may be less, but is payable for more years
  - System has lost 3 years of contributions it was counting on

Components of Actuarial Cost

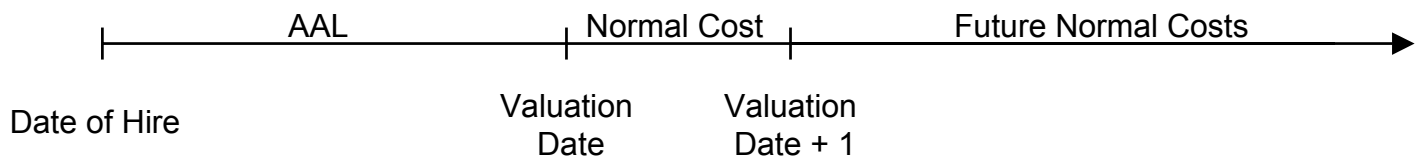
- There are two pieces to actuarial cost of an existing benefit structure or of adding a benefit enhancement
  - Normal cost
  - Amortization charge for unfunded liability (UAAL)
- Normal cost
  - On-going cost of the System
  - What the annual cost is for the benefits that will be earned by the average new entrant over his/her career
    - And assumptions are exactly met

Components of Actuarial Cost

- Unfunded liability (UAAL)
  - Liability created by giving retroactive credit for a benefit change
  - A change in the benefit multiplier or an improvement in unreduced retirement are examples
- Amortization charge is the annual rate at which the unfunded liability is paid off
  - While Plan is overfunded, this is a credit

Nature of Actuarial Cost Methods

- UAAL depends on actuarial cost method
- Different cost methods assign different parts of total liability for all future benefits to
  - Past years (Actuarial Accrued Liability)
  - Current year (Normal cost)
  - Future years (Future normal costs)



- Like different inventory valuation methods in accounting (LIFO or FIFO)

Nature of Actuarial Cost Methods

- Different actuarial cost methods spread incidence of costs in different ways
  - Based on benefit formula
  - Based on costs ($)
  - Based on costs (% of pay)
  - One method does not create UAAL
- Entry Age Actuarial Cost Method most common for public plans
  - Level costs (% of pay)
  - Fair to different generations of taxpayers

Unfunded Actuarial Accrued Liability

- Actuarial Accrued Liability (AAL) less actuarial assets
  - May be positive or negative
- What it is **not**
  - Accounting liability
    - UAAL is always off balance sheet
  - Liability if plan is terminated
  - Liability if plan is frozen

Unfunded Actuarial Accrued Liability

- What it is
  - Liability associated with prior years
  - Assumes plan continues
  - Reflects expected future pay increases and expected future service

Normal Cost, AAL, and UAAL

- Most difficult concepts to understand
- Meanings differ depending on valuation method
- Normal cost is current annual cost if no unfunded or overfunded liability
  - The “base-line” cost
- Sources of unfunded liability
  - Actual experience differs from assumed
  - Granting benefit credit for service before system created
  - Granting retroactive credit for benefit enhancements

Normal Cost, AAL, and UAAL

- Watch trends in normal cost and unfunded liability
  - Increasing or decreasing funded ratio?
  - Increasing or decreasing relative to payroll?
  - Contribution rates decreasing, remaining level, or increasing?

Actuarial Cost Methods

- Function of an actuarial cost method
  - Determine the appropriate year-to-year incidence of employer/state contributions
    - Using an appropriate set of actuarial assumptions
- Goal of an actuarial cost method
  - Produce a pattern of contributions that is equitable to successive generations of taxpayers

Viewing the Unfunded Liability

- Nothing wrong or bad about having an unfunded liability
  - If systematic progress is being made in amortizing it over a reasonable time period
- Nothing wrong with a benefit enhancement that increases unfunded liability
  - If it is funded properly to begin with

Viewing the Unfunded Liability

- Consistent patterns of actuarial experience losses
  - System needs to have actuary do an experience study
- Consistent patterns of deterioration in funding levels
  - Trustees need to begin educating legislators and members of potential dangers

Purpose of Actuarial Valuation

- Primary purpose of valuation
  - Determine the required employer contribution rates
- Other purposes
  - Determine funded status
  - Trace change in funding cost from beginning of year to end of year
  - Calculate gains and losses for year
  - Provide annual snapshot of status of System

What Actuary Looks For

- Valuation results are analyzed
- Funding progress, if any, is evaluated
  - Is System better off or worse off than in previous valuation?
- Determine what caused changes in funding status
- Analyze trends that might warrant a recommendation for changes in assumptions

Costing a Benefit Enhancement

- Actuary receives and studies suggested change
- Analyzes whether the proposed enhancement would change any existing assumptions
  - Change from 50 and 30 retirement to 25 and out would be expected to change pattern of retirements
  - Develop new assumptions to reflect incidence of expected changes
- Calculate new normal cost and unfunded liability
- Determine the increased contribution rates needed to support change

Observations About Cost Studies

- When new benefits are being considered, be aware of potential assumption changes that may be needed to reflect fully the total effect of a proposal on cost of the System
- Many changes may have dramatic impact on not only amount of the benefit but also on the probability of when it will be paid

Observations About Cost Studies

- To ignore potential assumption modifications can materially understate true actuarial impact of the change
  - May even hide an actuarially unsound proposition until it is too late to bring about a reasonable corrective action

Making Actuarial Issues More Understandable

- To put actuarial results in perspective, look at trends and comparisons
  - How does funded ratio change
    - Increasing or decreasing from year to year?
  - Is unfunded liability growing or declining as percent of payroll?
    - Dollar growth may be because of membership growth
  - Look at pattern of actuarial gains and losses
    - Can changes in unfunded liability be explained by benefit enhancements or assumption changes?

The Home Mortgage Analogy

Retirement System	Home Mortgage
Unfunded liability	Outstanding loan balance
Normal cost	Taxes and insurance payment
Amortization charge to fund the unfunded liability	Principal and interest portion of loan payment
Change in contribution rate due to assumption changes	Refinancing an existing mortgage
Experience loss creates increase in unfunded liability and therefore in contribution rate	Take out a second mortgage to pay for a new roof
Benefit change increases normal cost, unfunded liability, and contribution rate	Addition to home increases taxes and insurance, second mortgage increases principal and interest payments

Summary

- The VRS plans are defined benefit plans
  - Employer (and employees) must contribute enough to provide promised benefits
  - Employer assumes the investment risk
  - Employees may also share some investment risk but retirees do not
- Actuary's role is to evaluate funding strength of the System and determine the required contribution rates
- Evaluation process is the actuarial valuation

Summary

- Actuary recommends assumptions on likelihood of occurrence of future events to evaluate liabilities, contribution requirements, and funded status
- Based on valuation results, actuary determines if funding progress is being made, if System can absorb cost of enhancements, and what contribution rates need to be

Summary

- Two pieces of actuarial cost for actuary to look at
  - Normal cost
    - The on-going cost of the System
  - Amortization charge for unfunded liability
    - The cost to pay off liability for any benefit credit due to service before the enhancement

3009/2004/Con/Actuary 101 VRS.ppt