

Public Pension Risk Dynamics

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EFI Actuaries

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### The Model Plan

- The Model Plan
- The Model Economy
- Simulated Benefits, Cost, and Funding
- The Operating Region
- An Initial Result: Return Distributions Don't Matter



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### The Model Plan

- All members are the same
  - Hired at 37, retire at 60
  - Mortality and termination decrements only
- Stable member population
- Simple benefits
  - 50% FAP at retirement, with 2% COLA
  - No ancillary benefits
- Simple funding
  - Entry Age Normal
  - 8% return, 3.5% inflation, 2% merit pay increase
  - All demographic assumptions met exactly
  - Start at 100% funded (at market value) at time 0
- Simple accounting
  - All transactions take place at the beginning of each year

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### The Model Economy

- Simple and benign economic model
  - Asset returns are normally distributed
    - Mean 8% (compound), standard deviation 11% (annual)
    - Equivalent to a 50% equity/50% fixed income mix from Ibbotson (2007)
  - Inflation is normally distributed
    - Independent of returns
    - Mean 3.5% (compound), standard deviation 1.5% (annual)
- Model Economy is **not** realistic
  - Real returns are not normally distributed
  - Returns and inflation are correlated
  - Actuarial assumptions are met exactly
- Actuarial wind tunnel
  - A controlled experimental environment for testing pension plans
  - If we don't understand pension behavior in this simple environment, we don't understand it anywhere

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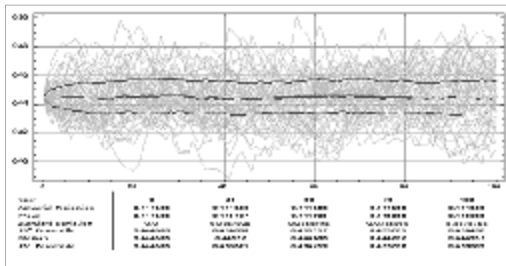
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### Simulated Benefits



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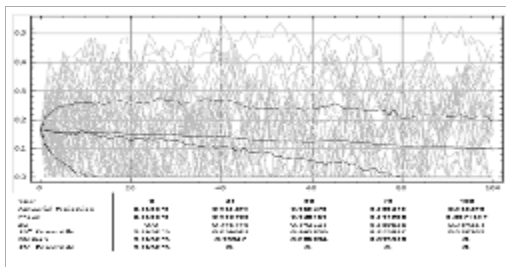
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### Simulated Actuarial Cost



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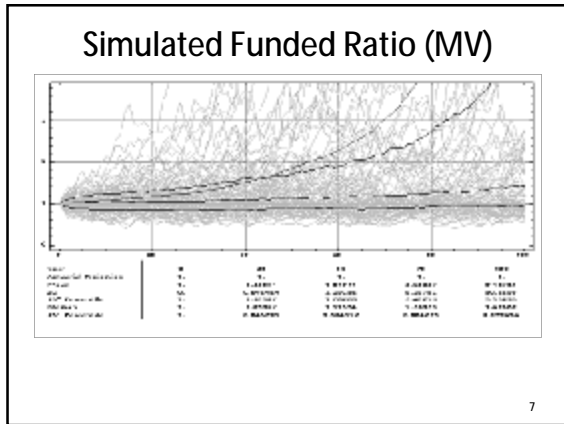
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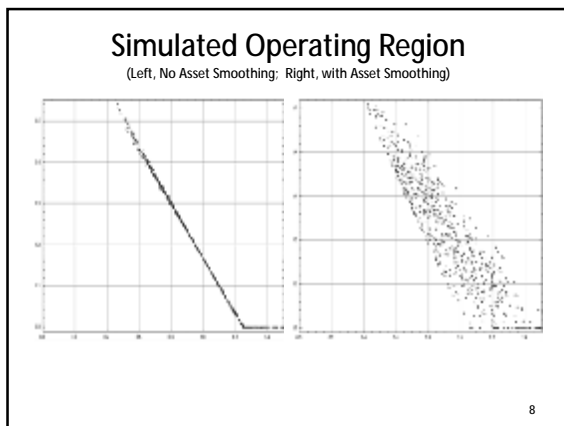
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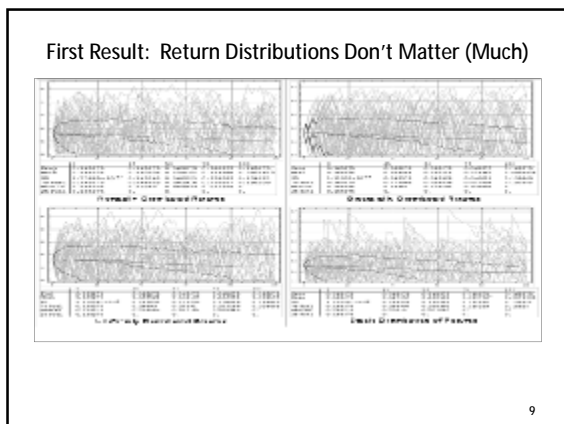
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### Risk

- Investment Risk
- Benefit Risk
- Funding Risk
- Actuarial Funding Risk
- Amortization Risk
- Assumption Risk



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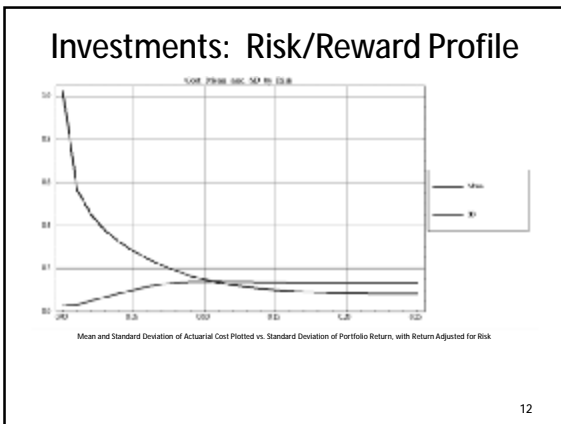
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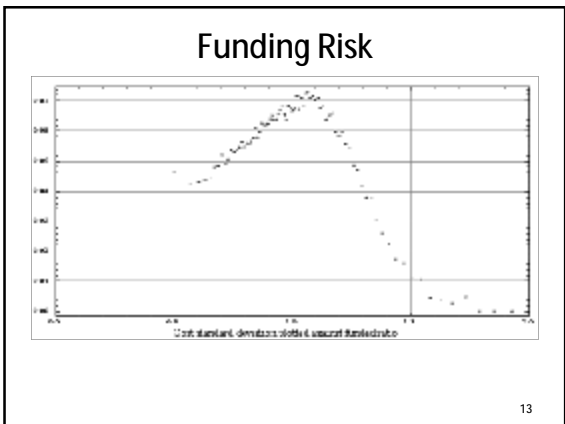
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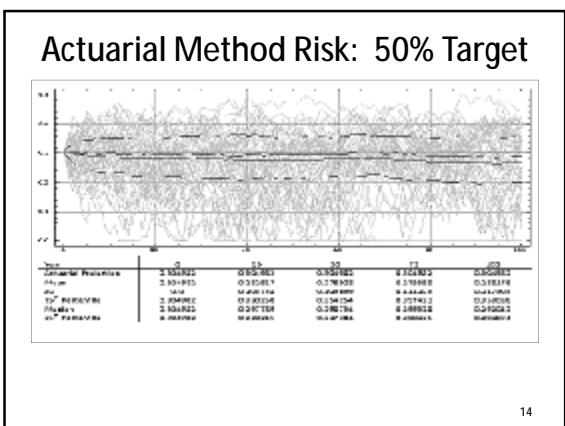
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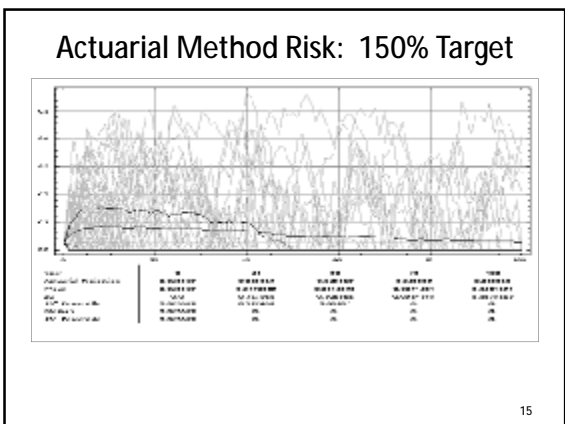
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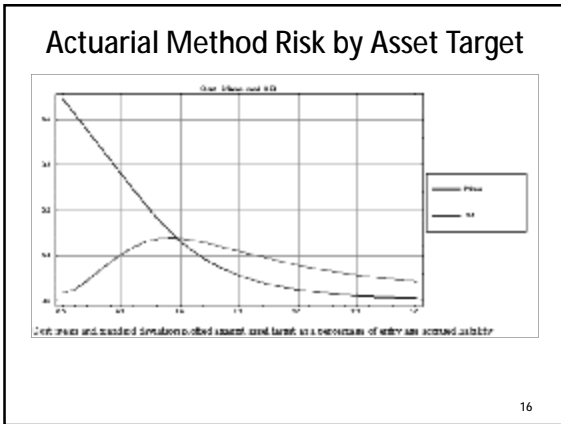
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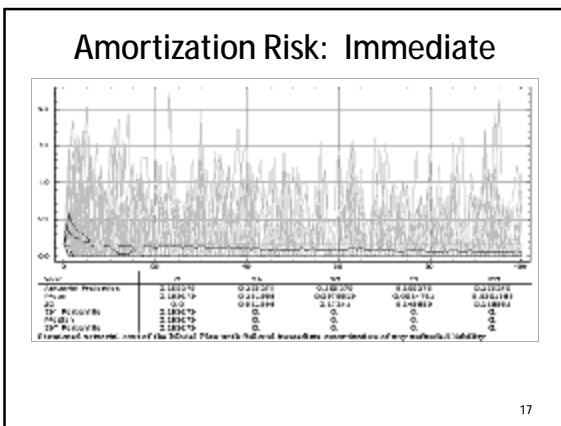
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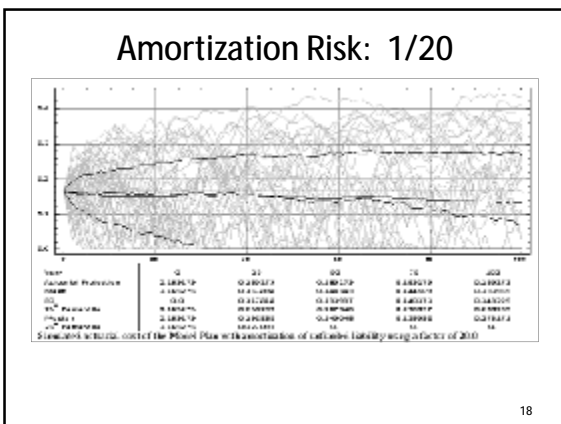
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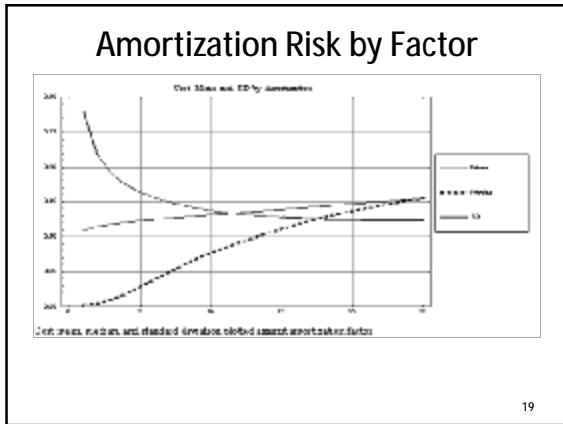
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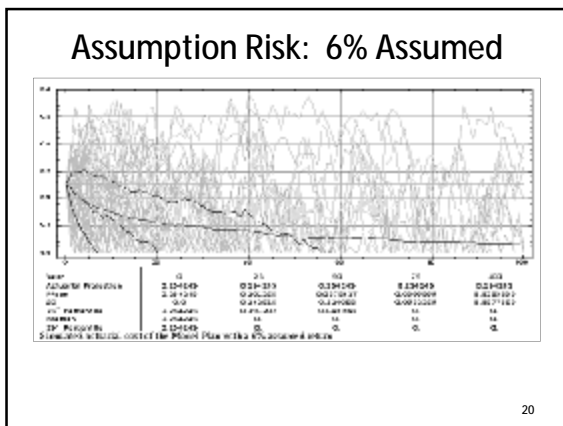
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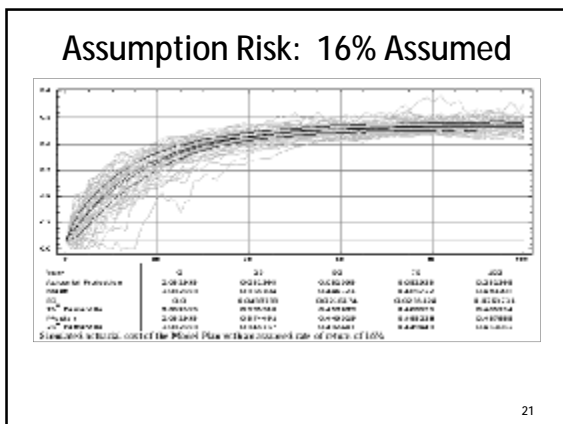
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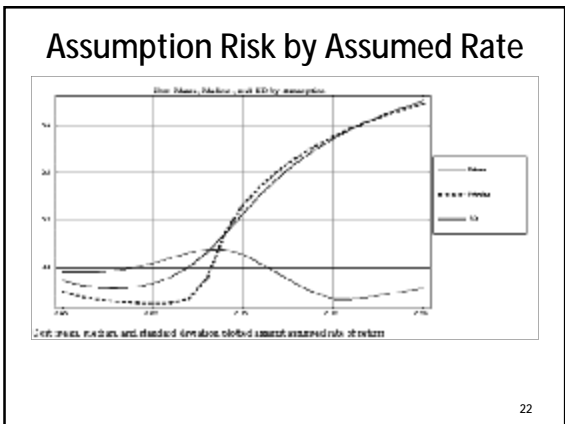
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### Actuaries Create Risk

- We fund to the riskiest asset target
- As funding increases to 100%, risk increases
- Accuracy in setting assumptions increases risk



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### Summary

- Pension plans are complex dynamic systems
- Behavior of these systems is not at all obvious
- Risk arises in unexpected ways
- These plans deserve study and thought through experimentation and empirical analysis



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## Contact Information

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