Cash Flow Projection

- For each future year, calculate expected cash paid out of the plan.
- Discount future payouts to calculate Present Value of Benefits

Projected Payout for Retirees

- Adjust for monthly pensions payable at beginning of month
- Comparable to calculating $N_x^{12}$ and $D_x$ without regard to interest.
- For multiple retirement decrements, use this procedure for each possible retirement age.

$$\text{cashflow}_y \approx \frac{l_{y} - (11/24)d_{y}}{l_{y}} \cdot \text{MoBen}_{y} \cdot 12$$

$$PVB_y \approx \sum_{t=y}^{\infty} \text{cashflow}_t \cdot v^{t-y}(11/24)$$

Projected Payout for Actives

- Payout Begins at Projected Retirement
- Using Active Decrements, must survive until Retirement.

$$\text{cashflow}_y \approx \frac{\underline{l}_y}{l_y} \cdot \frac{l_{y} - (11/24)d_{y}}{l_{z}} \cdot \text{MoBen}_{y} \cdot 12$$

$$PVB_y \approx \sum_{t=2}^{\infty} \text{cashflow}_t \cdot v^{t-y}(11/24)$$
Actuarial Assumptions
- Reasonable
  - Individually
  - In the aggregate
- Conservative
- Independence vs. Dependence

Choosing Interest rate
- Building Block Approach
  - Core Inflation
  - Return of Each Asset Class over inflation
    - Stocks
    - Bonds
    - Cash
    - Other
  - Expenses or Hedges
  - Provision for Adverse Deviation

Core Inflation
- CPI data
- Long-term trends
- Specific Inflation
  - example: medical inflation may be significantly different from overall CPI

Return on each asset class
- Historical data
- Long term projections
- CAPM Model for stocks
- Yield Curve for Bonds
- Efficient Frontier
- Non-liquid assets hard to value
Efficient Portfolios

Investors prefer portfolios on the Efficient Frontier.

Portfolios of other assets:
- Asset 1
- Asset 2

Minimum-Variance Portfolio

Efficient Frontier

Individual Asset Allocations

- Point x is the optimal portfolio for the less risk averse investor (red line)
- Point y is the optimal portfolio for the more risk averse investor (black line)

Expenses

- Investment Related
  - Investment Manager
  - Brokerage commissions
- Non-Investment Related
  - Professional Fees (ie: the actuary!)
  - Government Fees
  - Trustee Fees

Provision for Adverse Deviation

- Conservatism
- Look at “risk” of downturn
  - Volatility risk
  - Diversification risk
- Funded Condition of Plan
  - More conservative with poorly funded Plans
- Is it Allowed?
  - IRS requirements
  - FASB requirements
Multiple Life Distributions

- Probability all are alive at time $t$
- Focus on Joint-life model $x$ and $y$
- Probability both are alive at time $t$
  \[ p_{xy} \]
- Probability either are alive at time $t$
  \[ p_{xy} = 1 - (1 - p_x)(1 - p_y) \]

Joint Life Tables

- Combine Probabilities
- Matrix of tables based on age difference
- Used for Benefits that continue to Spouse
- Examples