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Selecting Discount Rates for Assessing Funded Status of Target Benefit Plans

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Agenda

- Discount Rate Controversy
- Brief History of DB Funding Regimes in North America
- Recent Developments
- Selecting Discount Rates for Assessing TBPs
- Demonstration of Wealth Distribution Effects by Monte Carlo Simulations
- Conclusion & Further Research



Discount Rate Controversy

- Ongoing controversy on how to value pension obligations for defined benefit (DB) plans
 - Traditional (Actuarial) approach
 - Discount rate based on expected return on plan assets
 - Financial economics (FE) approach
 - Discount rate based on market yields on low risk bonds



Brief History of DB Funding Regimes in North America

- Traditional approach was typically used for funding assessment of public and corporate DB plans in 1970's and 1980's
- For corporate plan funding, dual measures based on Traditional and FE approaches began to apply in early 1990's
- Since 2008, funding stress on plan sponsors has led to the closure or freezing of DB benefits in many corporate plans



Recent Developments

- Governments have implemented temporary measures to relief funding pressure on DB plan sponsors
- Begin to review appropriateness of FE approach (i.e., solvency) for funding DB plans
- Explore alternative plan designs with new risk-sharing arrangement
- In Canada, three jurisdictions (New Brunswick, Alberta & British Columbia) have enacted legislation and regulations for target benefit/shared-risk plans (as of May 2017)



What is a target benefit plan?

“A TBP is a collective, pre-funded pension plan pooling both economic and demographic risks, with a predefined retirement income goal (the “target benefit”), where the employer’s financial liability is limited to predefined contributions while members’ benefits may periodically be adjusted upwards or downwards relative to the original target.”

CIA Task Force on Target Benefit Plans, June 2015



Main features of TBPs

A target benefit plan combines certain features of DB & DC plans:

Like DB

- Target benefit is defined by a formula based on service, salary etc., and paid as a lifetime annuity
- Investment and demographic risks are pooled; no individual member accounts

Like DC

- Sponsor's financial obligation is limited to pre-defined contributions
- Target benefit is not guaranteed; it varies according to plan experience



TBP design is not uniquely defined

- TBP designs span across a wide spectrum with varying objectives
 - DC-like design – greater emphasis on intergenerational equity (not individual member equity)
 - DB-like design – greater emphasis on security and stability of benefits

Selection of discount rate assumption

- Focus of paper – DC-like TBPs
- *Key issue to be addressed:*
 - *What discount rate should be used to measure the liabilities for a DC-like TBP, in order to attain the objective of maintaining intergenerational equity?*

Intergenerational equity

- A TBP pension deal model:
 - Open to all employees meeting eligibility
 - Same rate of contributions paid for each member
 - Preset investment policy
 - Annual benefit payments are variable depending on investment performance
 - All generations of members have identical attributes (age, sex, etc.)
- *Ex-ante*: The deal is fair if the expected benefit payout to each generation is the same
- *Ex-post*: There will always be winners and losers among different generations



Summary of discount rate *ex-ante* impacts

Expected investment return (Traditional approach)	No advance credits for expected risk premiums (FE approach)
Equal incidence of investment gains and losses	Greater incidence of investment gains than losses
Speedier recognition of gains and losses	Slower recognition of gains and losses
Every generation has equal tendency to reap the rewards (i.e., gains) and to bear the risks (i.e., losses) from previous generations	Later generations have a greater tendency to reap the rewards than to bear the risks from earlier generations
Different generations of members with identical attributes can expect to receive the same level of benefits <i>ex-ante</i>	Later generations can expect to receive a higher level of benefits than earlier generations <i>ex-ante</i>

Demonstration of Wealth Distribution Effects by Monte Carlo Simulations



Model Target Benefit Plans

Plan B

- Covered membership: open group of pensioners
- Static mortality decrements
- Each pensioner pays the same amount at age 65 for a life annuity-due
- Annuity payments are variable depending on valuation basis and pension fund performance

Plan C

- Covered membership: open group of active members
- All members enter the plan at age 30 and retire at age 65
- The same amount is contributed for each member each year
- Benefits are paid as a lump sum at members' retirement and are variable depending on valuation basis and pension fund performance



Assumptions for simulations

- Pension fund asset mix – 50% Canadian stocks & 50% Canada long bonds
- Average return, standard deviation & correlation

Asset class	Average return (%)	Standard deviation (%)	Correlation
Canadian stocks	5.13	18.21	-0.55
Canada long bonds	6.96	7.41	

- Return factor $1+R$ is assumed to follow a lognormal distribution, i.e.,

$1 + R = \exp(\mu + \sigma Z)$, where the random variable Z follows a standard normal distribution, $Z \sim N(0,1)$, $\mu = 0.056$, and $\sigma = 0.0726$.

- Expected rate of fund return = mean value of $R = e^{\mu} - 1 = e^{0.056} - 1 = 5.76\%$
- Discount rate assumption used for funding assessment:
 - Traditional approach: expected rate of fund return = 5.76%
 - FE approach: expected rate of return on safe long bonds = 2.5%

Plan design parameters

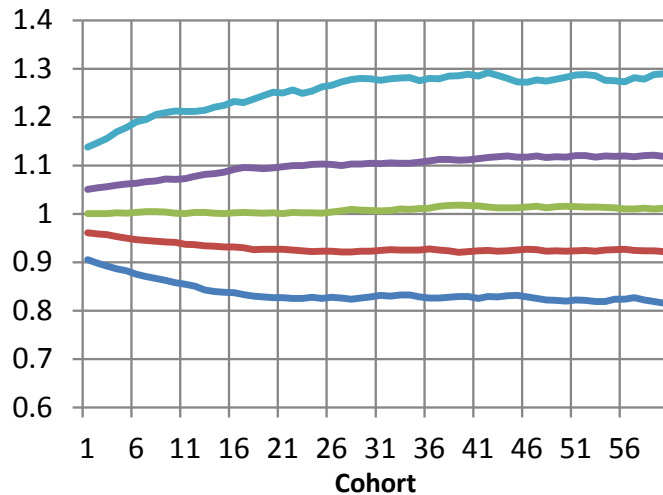
- Plan B:
 - Target benefit – a life annuity-due of \$1
 - Premium paid by each pensioner at age 65 - \$11.314
 - Premium is determined based on a discount rate equal to expected rate of fund return
- Plan C:
 - Contribution paid for each member - \$1 payable at the beginning of each year of employment
 - Target retirement benefit – a single payment of \$112 at age 65
 - Target retirement benefit is determined based on a discount rate equal to expected rate of fund return



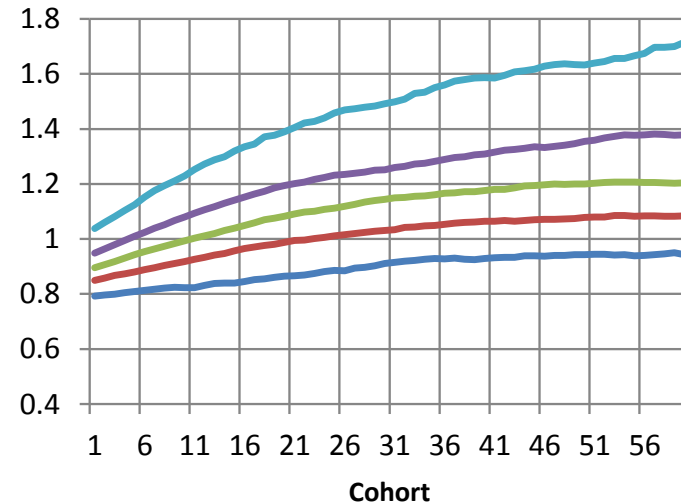
Plan B simulation outputs

Distribution of average pension, by cohort

Discount rate: expected return (5.76%)



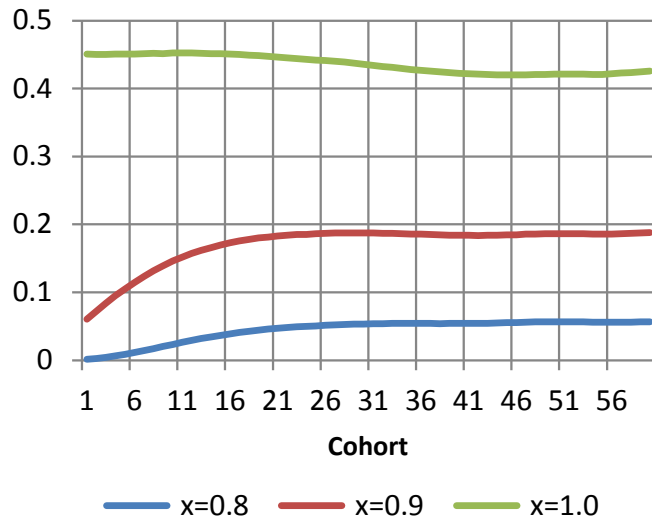
Discount rate: risk-free (2.5%)



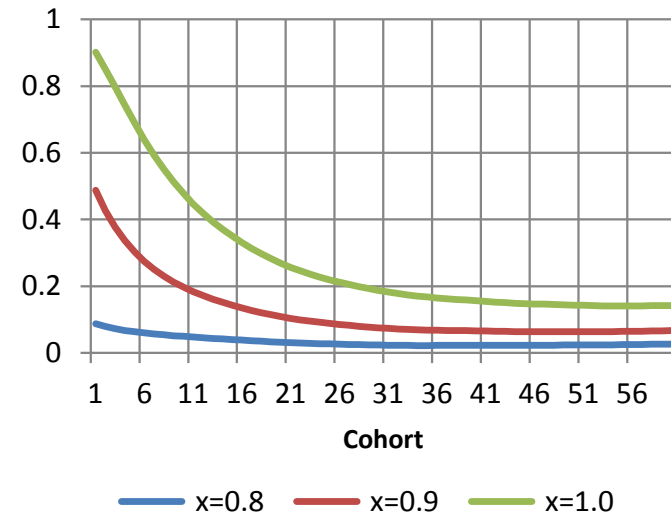
Plan B simulation outputs

Probability of average pension falling below
1.0, 0.9 and 0.8, by cohort

Discount rate: expected return (5.76%)



Discount rate: risk-free (2.5%)



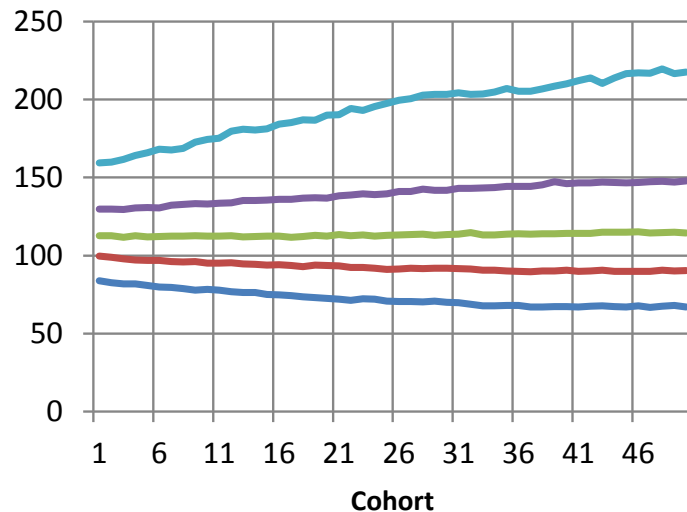
Commentary

- Discount rates affect distribution of pension wealth among different generations of pensioners
- Distribution is *ex-ante* fair when a discount rate equal to expected return is used:
 - Pensioners can expect to receive the same target pension, regardless of when they enter into the plan
- Distribution would benefit later cohorts *ex-ante* when a significantly lower discount rate is used:
 - Later cohorts can expect to receive a significantly higher level of pension than earlier cohorts

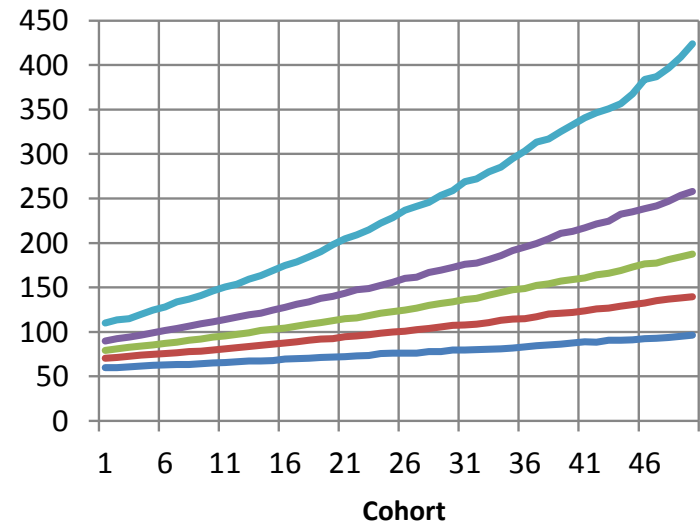
Plan C simulation outputs

Distribution of retirement benefit, by cohort

Discount rate: expected return (5.76%)



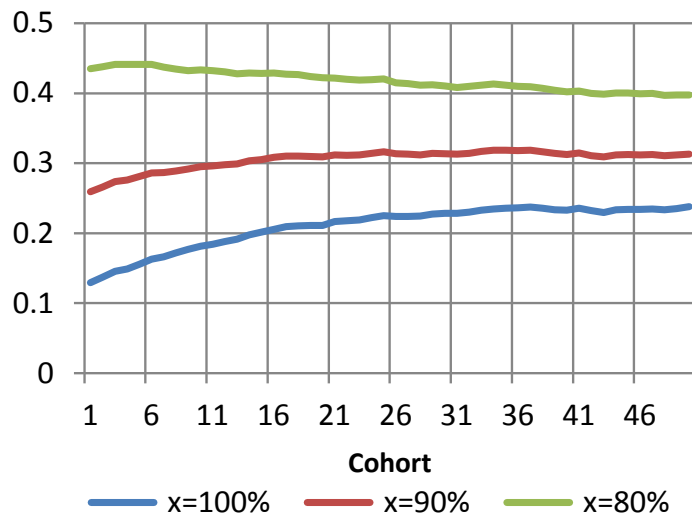
Discount rate: risk-free (2.5%)



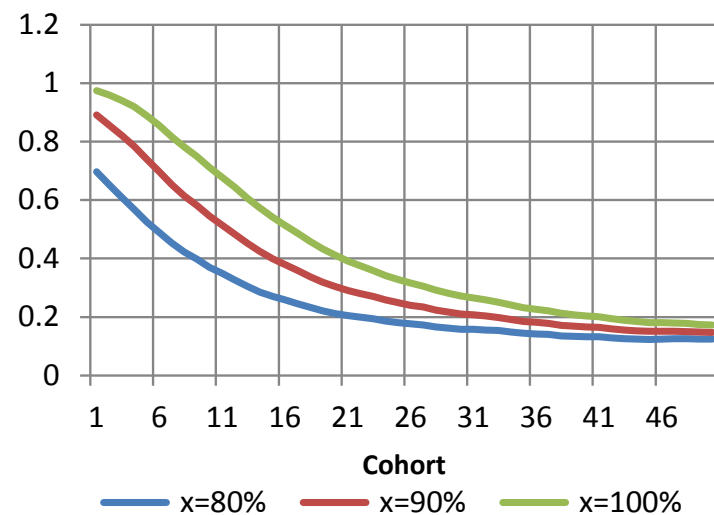
Plan C simulation outputs

Probability of retirement benefit falling below 100%, 90% and 80% of target retirement benefit, by cohort

Discount rate: expected return (5.76%)



Discount rate: risk-free (2.5%)



Commentary

- Discount rates affect distribution of pension wealth between different generations of members
- Distribution is *ex-ante* fair when a discount rate equal to expected return is used:
 - Members with the same career contributions can expect to receive the same retirement benefit, regardless of when they enter into the plan
- Distribution would benefit later cohorts *ex-ante* when a significantly lower discount rate is used:
 - Later cohorts can expect to receive a significantly higher level of retirement benefit

Conclusion & Further Research



Conclusion of the paper

- Primary objective of a DC-like TBP is to distribute members' collective pension wealth for the payment of benefits to members on an equitable basis
- Use of a discount rate that excludes expected risk premiums (i.e., FE approach) could lead to an unfair distribution of pension wealth between generations:
 - Later generations of members can expect to receive a higher level of benefits than earlier generations
- Use of a discount rate based on expected investment return (i.e., Traditional approach) would give rise to a fair wealth distribution *ex-ante*

Further research

- A plan's design objectives (e.g., benefit level, security, stability, etc.) would impact on the choice of discount rate assumption
- Use of Monte Carlo simulation technique is a direct approach to studying the stochastic properties of benefit payments under TBPs
- Examples of issues for further research:
 1. *If a plan's design objective is to provide a target benefit with a high level of certainty, issues to be addressed include: **target benefit level, investment strategy, margin in setting discount rate assumption, wealth distribution effects***
 2. *How different triggers, smoothing mechanisms and priorities for benefit adjustment would impact on **benefit payment patterns, pension wealth distributions, probability of success in delivering target benefit***



THANK YOU!