The Importance of Unbiased Estimation of Life Expectancy and Heterogeneity in Life Expectancy for Financial Stability and Fair Outcomes in DC Pension Schemes

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About the paper:

- **Projection of life expectancy:**
  - How do the current projection methods work?
  - The point of departure: longevity of older birth cohort is increasing at an accelerating rate (Alho, Bravo & Palmer, 2013)
  - What does this mean for DC pension schemes?
  - Replace period data for estimating LE with cohort data? How would this work? → Data analytic period-cohort method?
  - Variable annuities?

- **Heterogeneity in life expectancy:** What does it look like? What can we do about it?
The rate of change in mortality is not time-invariant
Why worry about the second derivative?

- Projections of life expectancy determine the annual pension payments, i.e., the annuity payments
- *Systematic underestimation* leads to deficits that accumulate over time.
  
  Systematic overestimation leads to surpluses that can not be distributed post humus

- For Public NDC Schemes: Unfair inter-generational redistribution
  For Public/Private FDC Schemes: Who pays the price for uncertainty?

- Socio-economic heterogeneity? → Death is not a random event.
How well do current projection methods work? --- Systematic underestimation!

- Lee-Carter model
- Swedish method
A new “data analytic period-cohort method” Palmer-Alho-de Gosson (PAD) model

To make a projection for cohort X, we perform the following procedure:

Step I
- Create a *synthetic database* with a weighted average of the rates of change in mortality of those immediately preceding cohorts

Step II
- Extrapolate the rate of change in mortality of the projection cohorts

Step III
- Calculate mortality for cohort X
How to best extrapolate the *rate of change in mortality* for the projection cohort?

We test four methods:

1. Rate of change in mortality = the latest empirical rate
2. Rate of change in mortality = the latest 20 empirical rates
3. Rate of change in mortality = the latest 5 empirical rates
4. Rate of change in mortality = the forecasts of an ARMA model

Using the synthetic PAD database these 4 models are tested both *ex post* and *ex ante* on data from 8 countries.
Results from the evaluation of expired cohorts:
The projection errors of PAD – 2 och 4 are randomly distributed with zero expected value.
Ex ante evaluation of still-living cohorts: PAD-models yield much higher estimation values of life expectancy for the current retirees

This is how it looks for Sweden:
The Swedish Fixed Annuity Model gives deficits of 5 – 9 percent when the annuity value is set at age 65. What do we gain by adjusting annuity regularly using new projections after retirement?

- Reduce the uncertainty in projection of mortality and life expectancy;
- Reduce the risk of financial deficits;
- Redistribution within cohort annuity pools.

<table>
<thead>
<tr>
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<th>Fixed annuity with PAD-2</th>
<th>Fixed annuity with PAD-4</th>
<th>Variable annuity with PAD-2</th>
<th>Variable annuity with PAD-4</th>
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Table: Average size of financial deficits with new projections at five-year intervals up to age 85.
Heterogeneity in Life Expectancy
Social gaps in life expectancy are well documented

Shorter life expectancy for:

- Men (5 → 4 years → 2 in Sweden)
- Lowest income deciles
  Note: Income = f(education, health, preferences for work vs. Leisure)
- Occupation
- Genetics
- Living style, diet ...

Peter Diamond: If people are well-informed, rational decision makers, they will take knowledge of these factors into account in determining the age at which they retire.
Is heterogeneity in life expectancy a big problem for the (N)DC and (F)DC schemes?

- Create sub-pools?
- Estimated relative risks can change quickly over time.
- Mobility between groups.
- What about individuals’ conscious influence on their health?
Thanks!