Challenges in projecting longevity

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1. About the speaker
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- Consultant on longevity risk since 2005
- Founded longevity-related software businesses in 2006:

  - Joint venture with Heriot-Watt in 2009:
2. Background
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“The actuary’s interest in the trend of mortality has taken on a more pressing character in recent years, for the trend at the older ages has become one of the great actuarial problems of the immediate future.”

A. Pedoe

Source: Gwilt (1956), page 167
3. Model risk
3. Model risk

- How do you know your model is correct?
- What are the consequences if it is not?
- What independent scrutiny has the model had?
3. Model risk — peer review

- Claims of “transparency” are not enough!
- Model must be openly published...
- ...and open to academic scrutiny
4. Targeting models
4. Targeting models

- Some models have targets:
  - for long-term improvement rate (CMI 1999, 2009–2011)
  - for maximum reduction factor
  - for maximum life expectancy
- Models with targets or limits have a spotty record...
4. Targeting models

“experts have repeatedly asserted that life expectancy is approaching a ceiling: these experts have repeatedly been proven wrong.”

Oeppen and Vaupel (2002)

“The disadvantage [of expert opinion] is its subjectivity and potential for bias. The conservativeness of expert opinion with respect to mortality decline is widespread, in that experts have generally been unwilling to envisage the long-term continuation of trends, often based on beliefs about limits to life expectancy.”

Booth and Tickle (2008)
4. Targeting models — CMI 2010

- Deterministic
- Defaults to projecting *decelerating* mortality improvements...
Source: Improvement rates labelled “actual” in CMI 2010.
4. Targeting models — CMI 2010

Source: Smoothed actual mortality-improvement rates for males born in 1946, together with projected rates according to CMI 2010 model using default parameters and a long-term target of 1% or 2% improvement per annum.
4. Targeting models

- CMI 2010 is at least published and open to scrutiny — Richards (2011)
- Beware unpublished models with built-in limits or targets
5. Cause-of-death data
5. Cause-of-death data

- Useful for understanding the past...
5. Cause-of-death data

Source: ONS data with own extrapolations.
5. Cause-of-death data

- ...but less useful for projecting the future
- Many difficult hurdles for CoD projections listed in Richards (2010)
- Problems begin with the data...
5. Cause-of-death data

Source: ONS data.
5. Cause-of-death data

- Examined and rejected as basis for projection:

  “Projections of mortality should not be carried out by cause of death.”
  
  GAD (2001)

  “Historic cause-specific mortality rates are not as reliable for older ages, reducing the credibility of projections based on them.”

  CMI (2004)
6. Extrapolative models
6. Extrapolative models

- Continuation of existing trends
- No pre-conceived targets
- Stochastic models deal explicitly with uncertainty
6. Extrapolative models

• Paradox:
  — a model which fits the data poorly may yield useful projections
  — a model which fits the data well may be unsuitable for projections
7. Uncertainty
7. Uncertainty

- Motto of Institute of Actuaries was “certum ex incertis”
- “certainty out of uncertainty” is not a good mindset for longevity risk!
7. Uncertainty — period $e_{65}$ using CBD model

7. Uncertainty — period $e_{65}$ using 2DAP model


www.longevitas.co.uk
8. Conclusions

- Stochastic projection models essential to manage uncertainty
- Beware trend reversal in CMI core projection model...
- ...or any other model with maximum improvements
- All-cause projections more robust than cause-of-death methods
- Never rely on a single projection model
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