CMI

CMI

• Wholly owned by Institute and Faculty of Actuaries
• Independent executive and management

Funded by subscription but free for academics and non-commercial research

Mission

To produce high-quality impartial analysis, standard tables and models of mortality and morbidity for long-term insurance products and pension scheme liabilities on behalf of subscribers and, in doing so, to further actuarial understanding.

Our vision is to be regarded across the world as setting the benchmark for the quality, depth and breadth of analysis of industry-wide insurance company and pension scheme experience studies
CMI structure

Executive Committee

Management Committee

Working parties, e.g. HAMWP

Annuities  Assurances  Income Protection  SAPS  Mortality Projections

22 June 2017  Mortality and Longevity Seminar 2017: CMI Update
SAPS Committee update
## SAPS Committee activity

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 2015</td>
<td>Investigation into mortality experience by industry classification of SAPS pensioners for the period 2006-2013 released</td>
</tr>
<tr>
<td>February 2016</td>
<td>Mortality experience of SAPS pensioners for the period 2007-2014 released</td>
</tr>
<tr>
<td>February 2017</td>
<td>Mortality experience of SAPS pensioners for the period 2008-2015 released</td>
</tr>
<tr>
<td><strong>30 June 2017</strong></td>
<td><strong>Deadline for data submissions to be included in “S3” Series dataset</strong></td>
</tr>
<tr>
<td>November 2017</td>
<td>Mortality experience of SAPS pensioners for the period 2009-2016 expected to be released</td>
</tr>
<tr>
<td>February 2018</td>
<td>Proposed “S3” Series mortality tables expected to be released for consultation</td>
</tr>
</tbody>
</table>
Assurances Committee update
## Assurances Committee activity

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2014</td>
<td>Experience report for 2007-2010</td>
</tr>
<tr>
<td>May 2016</td>
<td>Proposed “08” Series accelerated critical illness tables released for consultation</td>
</tr>
<tr>
<td>October 2016</td>
<td>Proposed “08” Series term assurance mortality tables released for consultation</td>
</tr>
<tr>
<td>January 2017</td>
<td>Final “08” Series accelerated critical illness and term mortality tables released</td>
</tr>
<tr>
<td>31 August 2017</td>
<td><strong>Target date for data submissions for 2011-2016?</strong></td>
</tr>
</tbody>
</table>
High Age Mortality Working Party update

Mark Cooper
CMI High Age Mortality Working Party
Background

• High Age Mortality Working Party (HAMWP) set up in June 2014 to investigate high age mortality
• Initial findings presented in Working Paper 85, released October 2015

Second phase of work, due to be published soon:
• Population exposure modelling
• Does mortality decelerate at high ages?
• Principles for closing off mortality tables
Population exposure modelling: Variants to K-T methodology

Kannisto-Thatcher (K-T) methodology used by ONS to estimate population exposures at high ages (90+). Variants to K-T methodology considered:

• **Mortality trend**: Allowance for recent trend in survivor ratios
• **Parameters \( k \) and \( m \)**: Investigate impact of varying number of cohorts (\( m \)) and number of ages (\( k \)) included in K-T
• **Join age**: Test impact of including larger data by joining at younger age
• **Adjustments to death data**: More sophisticated approach to determine ‘age at 1 January’ death counts from ‘age at death’ input data
• **Exposure adjustments**: Adjust modelled population exposures for convexity and birth distribution
Does mortality decelerate at high ages: Implications for mortality at the oldest old

Recent studies by Gavrilov and Gavrilova (2015), Ouellette and Bourbeau (2014) and Rau et al (2016)

Our review and analysis supports a mortality curve with deceleration at highest ages

Considers $m_x = 1$ at age 120 justifiable currently
Closing mortality tables: Desirable features

- Plausibility
- Data compatibility
- Cohort features
- Trend allowance
- Smooth progression

Age range A: Reflects specific population mortality at younger ages

Age range B: Constrained / informed by evidence from relevant populations at high ages

Age range C: Constrained / informed by biological plausibility / other considerations at the limiting age

Population mortality
Closing mortality tables: Proposed framework

High level framework steps:

1. Graduate portfolio data to age where data not sufficient / reliable
2. Analyse convergence with population mortality in graduated age range
3. Extend graduation to ultimate age, allowing for smooth convergence between portfolio and population table
Draft Annuities 2011-2014 results

Mark Cooper
CMI Annuities Committee
## Annuities Committee activity

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 2013</td>
<td>Experience report for 2007-2010</td>
</tr>
<tr>
<td>April 2015</td>
<td>Proposed “08” Series annuitant mortality tables released for consultation</td>
</tr>
<tr>
<td>June 2015</td>
<td>Final “08” Series annuitant mortality tables released</td>
</tr>
<tr>
<td>December 2015</td>
<td>Experience report for Enhanced Annuities in 2007-2010</td>
</tr>
<tr>
<td>July 2017</td>
<td>Experience report for 2011-2014</td>
</tr>
<tr>
<td>August 2017</td>
<td>Begin analysis on 2007-2014 dataset</td>
</tr>
</tbody>
</table>
Data volumes: Pension annuities in payment
Data volumes: Pension annuities in payment by product type

- 2007-2010 original
- 2007-2010 updated
- 2011-2014

- Individual
- Group
- Unknown
- Pension Buyout
Data volumes: Pension annuities in payment by calendar year (2011-2014)

Deaths

- 2011
- 2012
- 2013
- 2014

- Individual
- Group
- Unknown
- Pension Buyout

22 June 2017
Mortality and Longevity Seminar 2017: CMI Update
DRAFT 100 x Actual/Expected by product type

Expected calculated using PML08 and PFL08 without improvements

22 June 2017
Expected calculated using PML08 without improvements
DRAFT 100 x Actual/Expected by age band (all product types combined) – females

Expected calculated using PFL08 without improvements

22 June 2017
Data volumes: individual pension annuities in payment, 2011-2014, by distribution channel

- **External**
  - 20,098

- **Internal**
  - 147,008

- **Unknown**
  - 73,291
DRAFT 100 x Actual/Expected by distribution channel (individual annuities)

Expected calculated using PML08 and PFL08 without improvements
DRAFT 100 x Actual/Expected by duration (individual annuities) – males

Expected calculated using PML08 without improvements
DRAFT 100 x Actual/Expected by duration (individual annuities) – females

Expected calculated using PFL08 without improvements
DRAFT 100 x Actual/Expected by age band (group) – males

Expected calculated using PML08 without improvements
DRAFT 100 x Actual/Expected by age band (Pension buyout) – males

Expected calculated using PFL08 without improvements
What next?

• 2011-2014 results for pension annuities in payment to be released – target date end of July

• Further analysis of extended dataset (2007-2014) to follow in a subsequent working paper

• >50% of recent data has a socio-economic indicator => scope to analyse differences

• Key question is whether to update “08” tables for High Age Mortality findings or to graduate the 2011-2014 data (including product type)

• Timescales for data collection of Enhanced annuities, deferred annuities and Life annuities yet to be set
The CMI Model

Tim Gordon
Chair, CMI Mortality Projections Committee
Context

- **CMI_2016** (published March 2017)
  - Essentially similar to previous version of the model, although …
    - … faster, simpler, more transparent, more useable, pure Excel/VBA
  - The Core model is slightly less responsive than before, but …
    - … responsiveness can now be adjusted explicitly by users

- **National** mortality improvements have fallen off a cliff since 2011
  - Highlighted by Q1 2015, but it’s much more than this
  - This is *not* a UK only phenomenon
  - Dramatic shift is a cause for concern in itself – what are the drivers?
  - How does this relate to longevity projections for liability portfolios?
## Impact of CMI_2016

### Impact on life expectancy of moving to CMI_2016

<table>
<thead>
<tr>
<th>Age</th>
</tr>
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<tbody>
<tr>
<td>35</td>
</tr>
<tr>
<td>45</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>65</td>
</tr>
<tr>
<td>75</td>
</tr>
<tr>
<td>85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Projection</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Impact on life expectancy</td>
<td>Impact on life expectancy</td>
</tr>
<tr>
<td></td>
<td>−2.25%</td>
<td>−2.52%</td>
</tr>
<tr>
<td></td>
<td>−2.33%</td>
<td>−4.38%</td>
</tr>
<tr>
<td></td>
<td>−0.49%</td>
<td>−2.46%</td>
</tr>
<tr>
<td></td>
<td>−2.27%</td>
<td>−2.00%</td>
</tr>
<tr>
<td></td>
<td>−1.47%</td>
<td>−3.78%</td>
</tr>
<tr>
<td></td>
<td>−3.35%</td>
<td>−3.39%</td>
</tr>
</tbody>
</table>

Life expectancies are based on the Core model using an illustrative long-term rate of 1.5% p.a. applied to S2PMA / S2PFA base.

Male standardised mortality ratio (SMR)

Male log SMR for England & Wales ages 50 to 89

Source: CMI calculations. Standard population is European Standard Population 2013. Trend is $\Delta \log \mu$. 

22 June 2017 Mortality and Longevity Seminar 2017: CMI Update
Key questions

1. Is the recent fall in national mortality improvements a blip or persistent?

2. How do we value specific portfolios?
Is it heavy winters (or ‘flu epidemic in 2015)?

13 week average weekly SMR relative to 2000-2011 trend

Recent mortality has been heavier than trend throughout the year.


22 June 2017

Mortality and Longevity Seminar 2017: CMI Update
Is it heavier recent mortality at older ages?

Five-year average mortality improvements by age band

Recent mortality improvements have been lower at all ages


22 June 2017    Mortality and Longevity Seminar 2017: CMI Update
1. Is there basis risk per CMI’s own data?

SAPS vs England & Wales mortality improvements over 2011-2015 for ages 65-100

<table>
<thead>
<tr>
<th></th>
<th>E&amp;W</th>
<th>SAPS (Lives)</th>
<th>SAPS (Amounts)</th>
<th>Difference (Lives)</th>
<th>Difference (Amounts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>-0.1% ±0.4%</td>
<td>+1.2% ±1.4%</td>
<td>+0.4% ±2.7%</td>
<td>+1.2% ±1.4%</td>
<td>+0.5% ±2.7%</td>
</tr>
<tr>
<td>Female</td>
<td>-0.9% ±0.3%</td>
<td>+1.8% ±1.5%</td>
<td>+2.6% ±2.5%</td>
<td>+2.8% ±1.5%</td>
<td>+3.5% ±2.6%</td>
</tr>
</tbody>
</table>

• Is this statistically significant (once we allow for all the noise)?
• Can mortality differentials be projected reliably?

2. Is there basis risk per other data?

Annual male mortality improvement by socio-economic group

ONS data (by RGA)

Club Vita dataset

Source: RGA analysis of ONS data presented at CMI/SIAS meeting on 11 April 2017

Source: Club Vita / Hymans Robertson presented at CMI/SIAS meeting on 11 April 2017

22 June 2017
Key questions

1. Is the recent fall in national mortality improvements a blip or persistent?
2. How do we value specific portfolios?
The views expressed in this presentation are those of the presenter.

Please send any questions, views or feedback to info@cmilimited.co.uk