The role of the LLMA in the Longevity Markets

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Agenda

- Introduction to the LLMA
- Longevity Indices
- Basis risk

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1. Introduction to the LLMA

What is the LLMA?

- The **Life and Longevity Markets Association** ('LLMA') is a non-profit organisation funded by current members
  - Website: www.llma.org
- **The LLMA aims to promote the development of a liquid traded market in longevity and mortality-related risk**
- It is a cross-industry association, currently including members from the banking, insurance and reinsurance industries
- Current members are (in alphabetical order):
  AVIVA, AXA, Deutsche Bank, J.P. Morgan, Legal & General, Morgan Stanley, Munich Re, Pension Corporation, Prudential, RBS and Swiss Re
- The LLMA is open to new members that share its aims and objectives, and that intend to be active participants in this market
- The Association was formally launched in the UK on February 1st 2010

What does the LLMA do?

Our aim is to allow the capital markets to invest with confidence in this new asset class, which will bring knock-on benefits of increased stability and certainty to the UK's pension funds.

The Association aims to support the creation of a liquid market in Longevity Risk.

Output from the Association includes:

- Standardised glossary of terms
- Standardised longevity product definitions
- Standardised documentation
- **Longevity indices and index methodologies**
- Standardised valuation/pricing model for longevity
- Standardised framework for risk management

2. Longevity Indices

Longevity Indices

The LLMA publishes national population mortality indices for England and Wales, Holland, Germany and the US

Raw Data

– Exposure (e.g. number of lives at an indicated time)
– Death (e.g. number of deaths over a defined period)

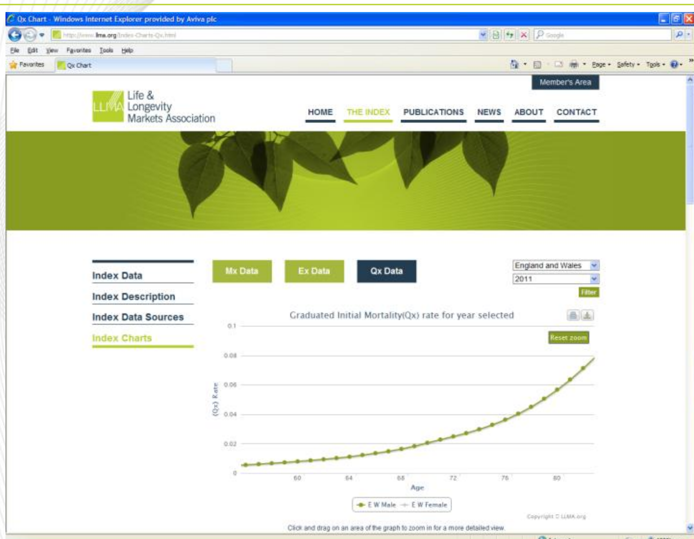
Metrics:

– Crude mortality rates
  = Death / Exposure
– Graduated mortality rates
– Period life expectancies

Breakdown

– Age
– Gender
– Country
– Annual frequency

Index example
England & Wales 2011



How are the indices used?

Benefits

- Lower Cost
- Faster Execution
- Potential for liquidity
- Transparent
- Flexible structure

S-forward flows

Notional x Realised Survival Rate

Longevity Protection Buyer (Fixed Rate Payer)

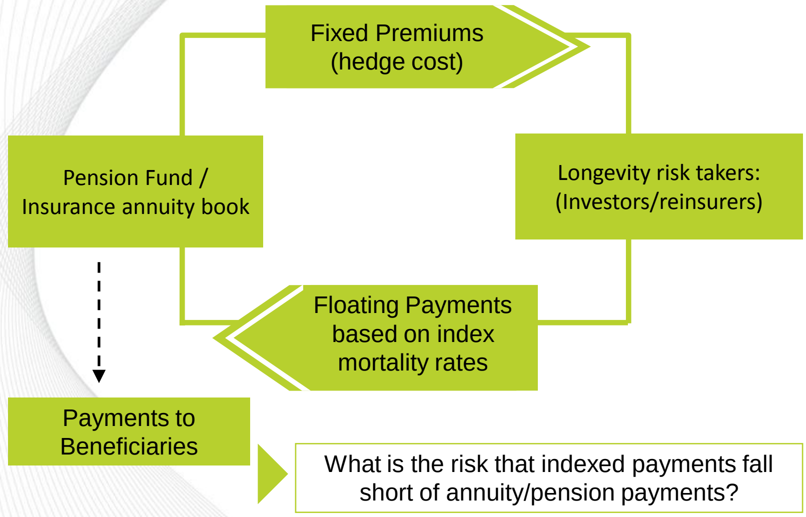
Longevity Protection Seller (Floating Rate Payer)

Notional x Fixed Survival Rate

S-forward payoff at maturity

3. Basis risk

The Basis Risk Question



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Types of Basis Risk:
Three Main Categories

Structural

- Choice of reference age and genders
- Duration of hedge

Sampling

- Small population
- Large annuity amounts

Demographic

- Socio-economic status
- Lifestyle
- Geography

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Assessment of Basis Risk: Main Steps and Questions to Answer

Historical Analysis

- What relationship have the two populations demonstrated in the past?
  - Empirical assessment
  - Establish an underlying link

Modeling

- What do you expect the future relationship to be?
  - Stochastic models
  - Two-population models

Measurement

- What measure to use for hedge effectiveness?
  - Deterministic quantification
  - Select appropriate metrics

The Longevity Basis Risk Working Group: The LLMA and the Institute and Faculty of Actuaries

Objective

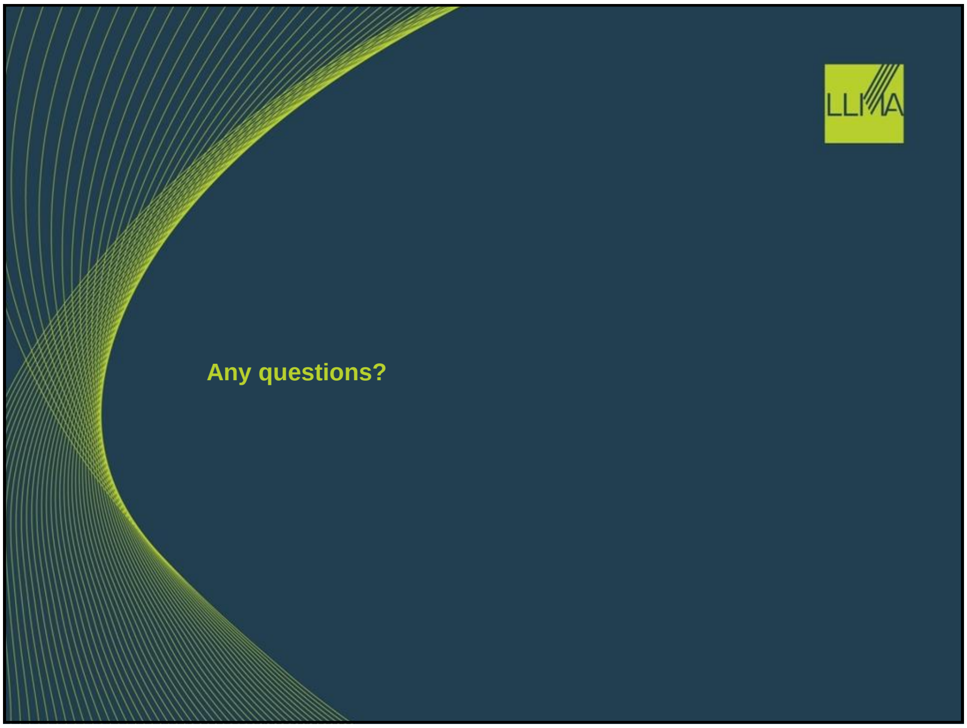
- Define a practical methodology to assess basis risks for longevity transactions which is easily accessible to market practitioners

Work Performed

- Review of existing literature
- Identification of available inputs and desired outputs
- Simplified spreadsheet analysis

Ongoing work

- The biggest challenge is how to model the demographic risk
- How do we simulate the two populations? (Hedge and portfolio)
- How are their mortality rates related?


Any questions?