



AFIR MUNICH
LIFE 2009

Longevity and Mortality risk transfer in the capital markets through the LifeMetrics platform

Chris Watts
christopher.s.watts@jpmorgan.com
7 September 2009



Capital markets solutions for longevity and mortality risk transfer

– Insurance-based solutions

- Annuities
- Buy-out
- Longevity insurance

– Capital markets-based solutions

- **Customised** longevity hedges
 - Longevity cash flow swap
- **Standardised (Index)** longevity hedges
 - q-Forward
- Extreme mortality structures

The market for longevity & mortality risk involves a broader set of players and exposure types

– The Players

- Insurers & reinsurers
- Pension trustees/fiduciaries
- Pension sponsors
- Banks
- Investors

– Exposures

- Life settlements
- Life insurance portfolios
- Mortality cat exposure
- Annuity portfolios
- Pension plans
- Equity release mortgages

More than just longevity: This is the Life Market

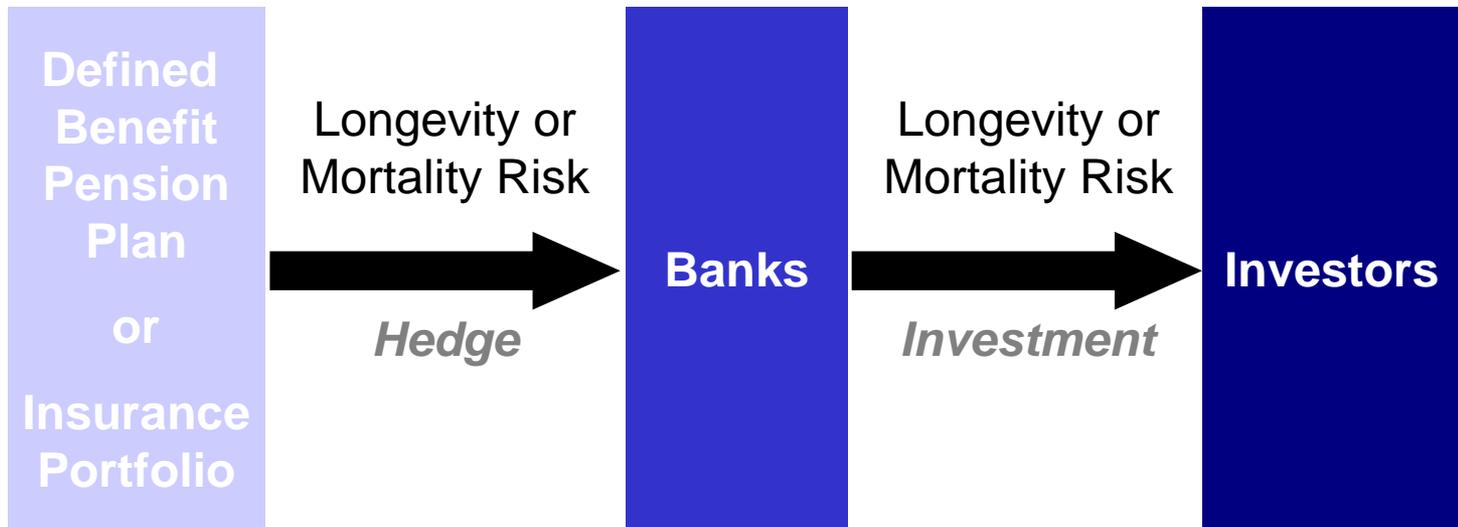
Capital markets can transfer longevity risk to financial investors in return for a risk premium

– Investors

- Earn a risk premium
- Gain exposure to an uncorrelated risk

– Banks intermediate

- Provide liquidity
- Credit intermediation
- Structuring



Trades have been done

Overview of hedging and investment opportunities

- Fully-funded (bond) and Leveraged (derivative)
- Mortality and Longevity exposure
- At-the-money and Out-of-the-money risk structures
 - Essentially the difference between a Swap and Catastrophe Structure
- Customised and standardised index exposure

There two kinds of longevity risk hedges, both of which have been transacted

Customised Hedge:

- **Copy reinsurance**
 - Indemnification paradigm
- Hedge is **tailored** to reflect actual longevity experience of the pension members
- Structured as a **cash flow hedge**

=> Exact hedge

Standardised Index Hedge:

- **New approach**
 - Risk management paradigm
- Hedge is **standardised** to reflect national longevity **index**
 - But calibrated to the mortality sensitivity of the pension
- Can be structured as a **value hedge**
- Can be shorter maturity

=> Cheaper, simpler, more liquid

Each provides different advantages to hedgers

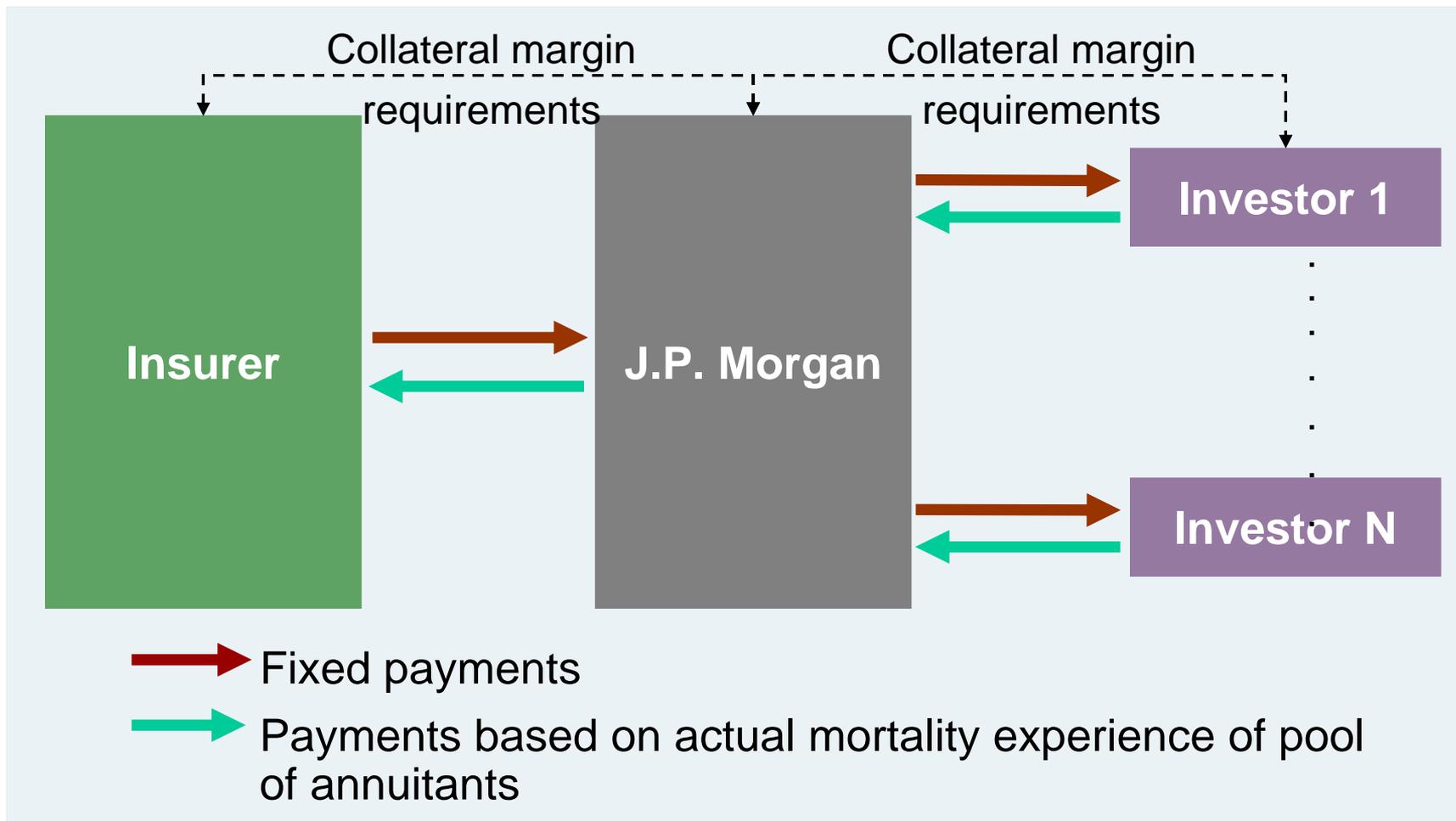
Investor perspective on longevity risk transfer formats

- Challenges for investors in customised longevity investments
 - Very long maturity
 - Customised longevity risk complicated and unique
 - Very illiquid
 - Uncapped downside risk
 - ***Require additional risk premium***

- Standardised index products more appealing
 - Can be short maturity
 - Standardised population longevity risk
 - Potentially more liquid
 - ***A larger investor base, lower required risk premium***

Investors will buy both, but tend to prefer standardised products

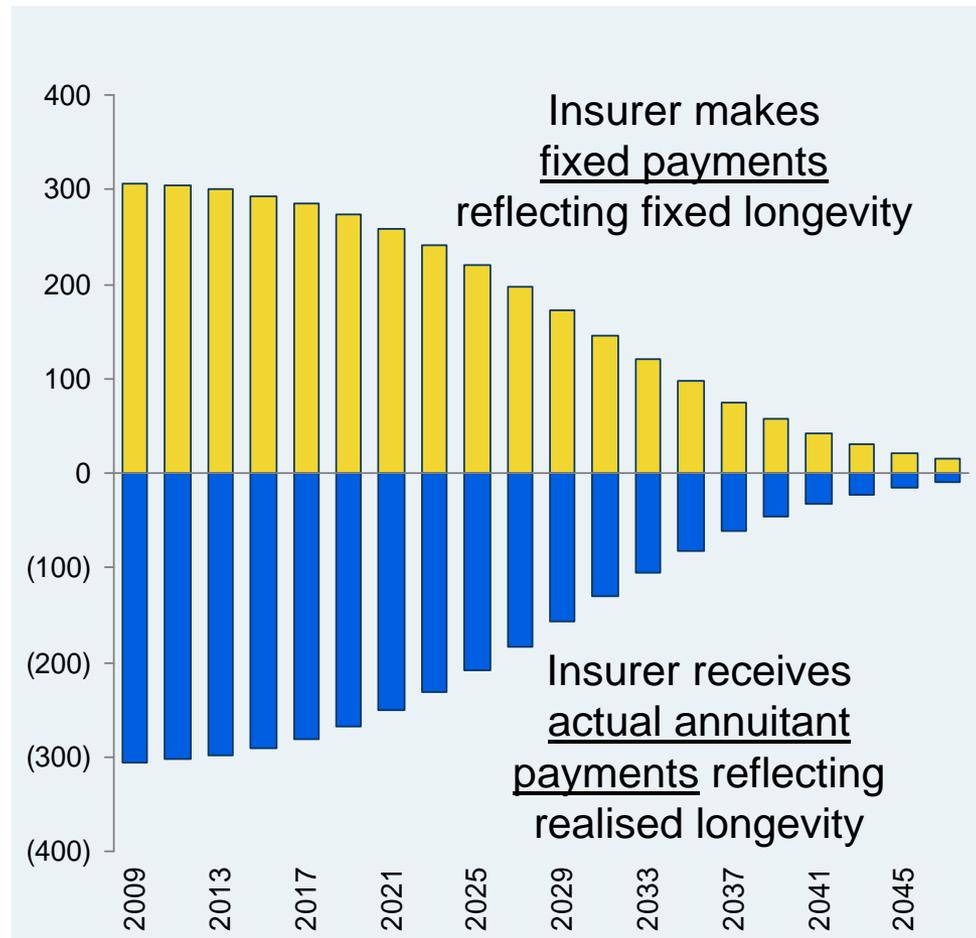
Example of customised hedge: GBP 500mm capital markets longevity swap for a UK life insurer



Customised longevity cash flow swap

- Exchanges fixed longevity for realised longevity over 40 years
- **Insurer pays fixed leg:**
 - The fixed leg is a series of defined payments payable by the insurer
- **Insurer receives floating leg:**
 - The floating leg corresponds to actual payments made to annuitants and is paid to the insurer by the hedge provider
- **Result:** Fixed liability payments are “locked in”

Longevity cash flow swap payments



LifeMetrics provides a toolkit for longevity risk transfer

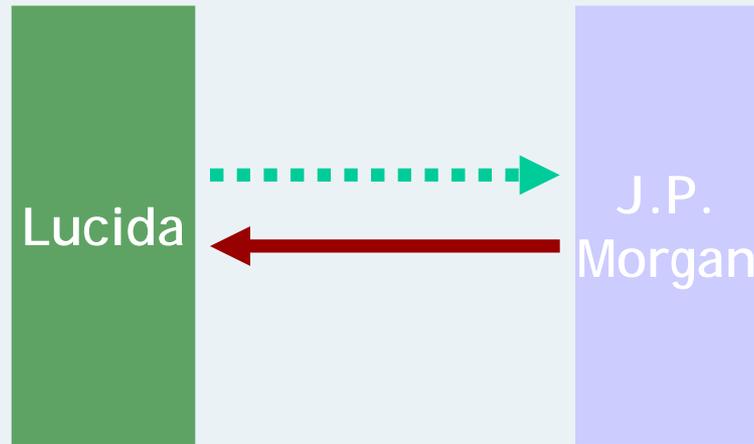
LifeMetrics Toolkit

- **Launched by JPMorgan in March 2007 – free to all**
- Longevity Index
 - Longevity and mortality indices – national population
 - England & Wales, US, the Netherlands and Germany
- Framework
 - Documents and analytics for risk management
- Software
 - Tools for modelling and forecasting mortality

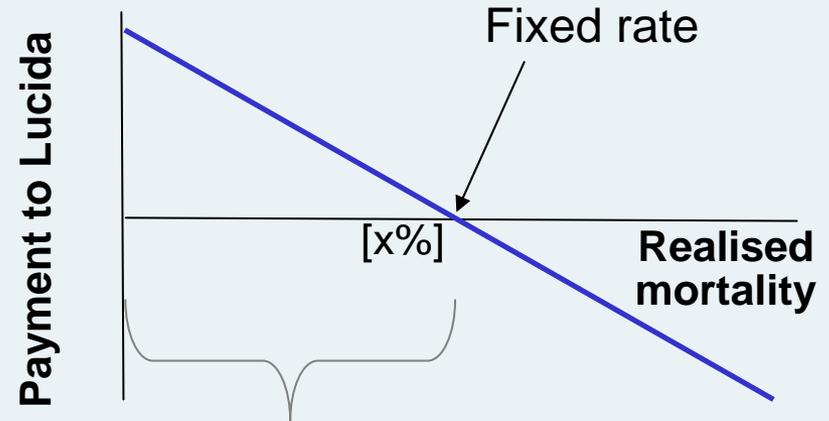
Features

- Open-source, transparent, non-proprietary and free
- Independent Calculation Agent
- Independent Advisory Committee
- Advisors: The Pensions Institute, Watson Wyatt, Heubeck

Example of Index longevity hedge : q-Forward



- ← Amount x fixed mortality rate
- Amount x realised index mortality rate

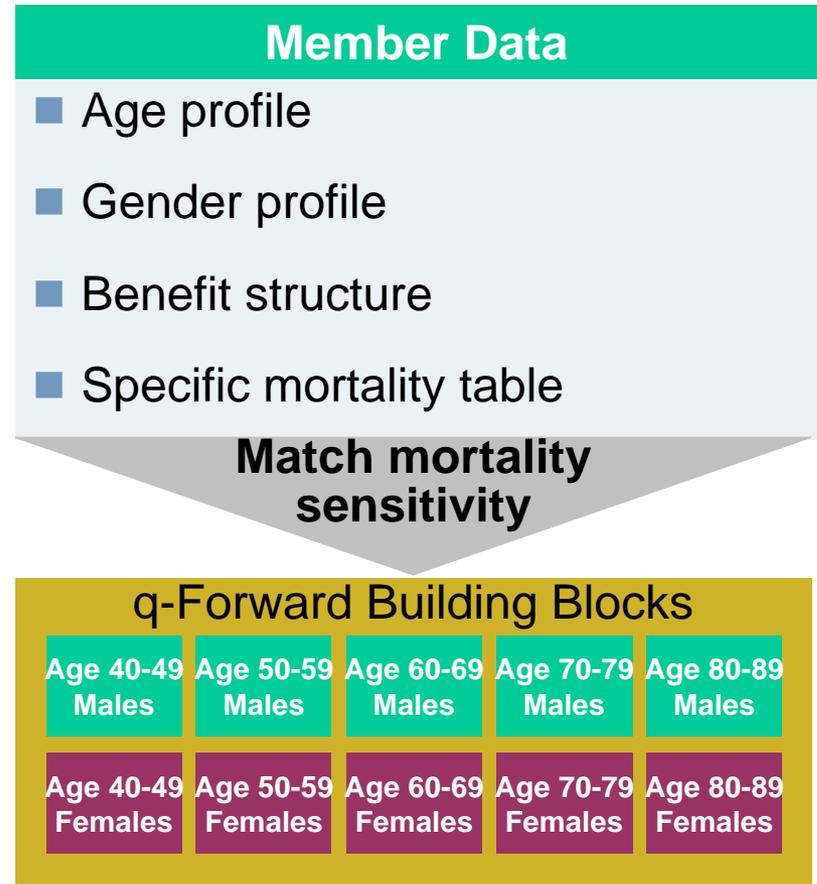


Lower realised mortality results in a payout to offset the increase in liabilities

- Hedge of liability value
- Mortality on specified population
 - Single exchange at maturity
 - Fully collateralised

Standardised longevity Index derivatives can be combined to create a tailored hedge for a pension plan or insurance portfolio

- Hedge is based on standardised index “building blocks”
 - “q-Forwards”
- Match mortality sensitivity of the liability value with the mortality sensitivity of the hedge
- **Basis risk can be measured and managed**

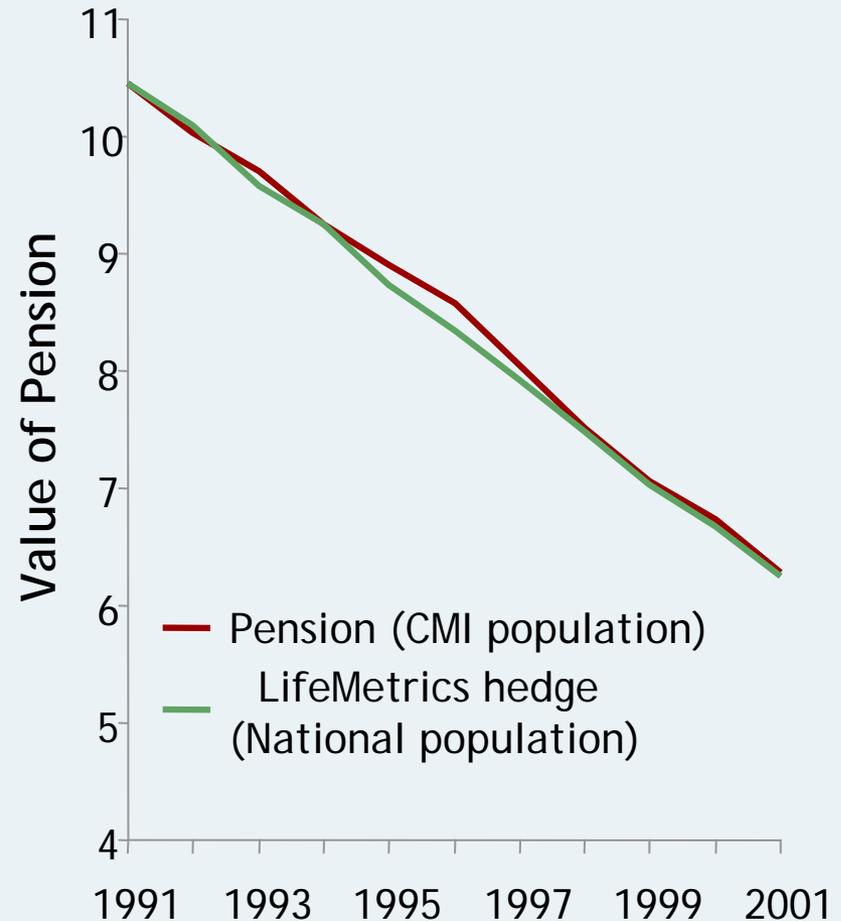


Provides an effective hedge of liability value

The basis risk associated with standardised hedges can be measured and managed

- Basis risk can be managed
 - Short term movements in **mortality rates** have a low correlations
 - But movements in the **value** of pensions for different populations are correlated over the long term
- Example
 - Pension for cohort of males with the same demographics as CMI
 - Hedge based on LifeMetrics
 - Values track very closely over the long term

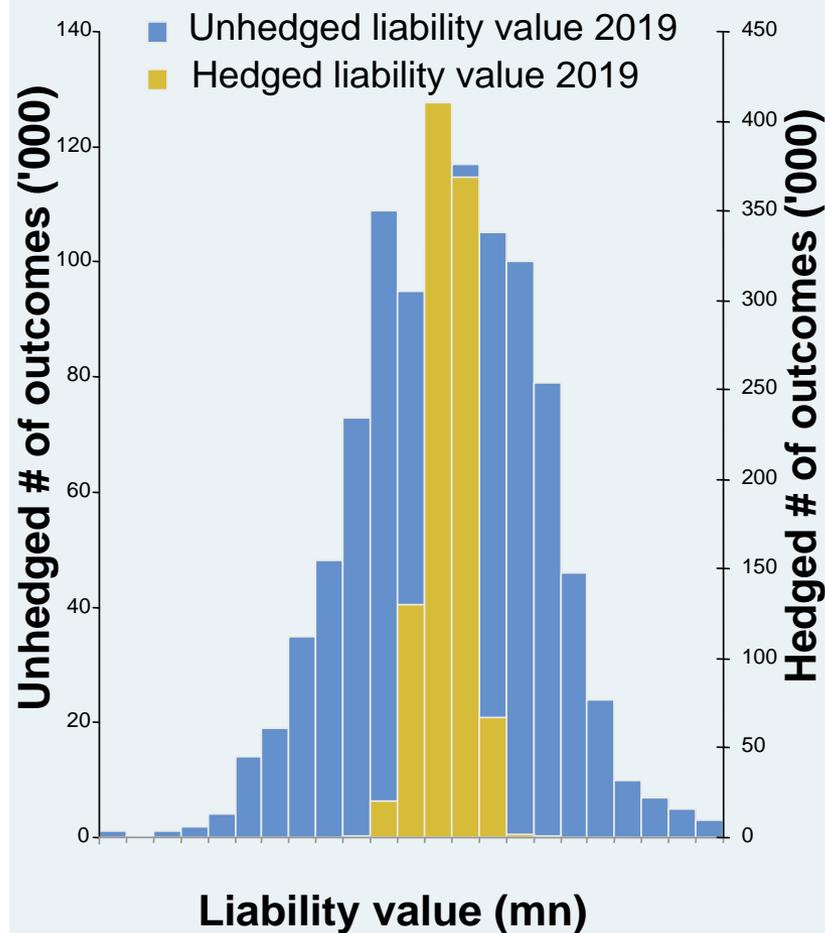
Pension value UK males aged 65 in 1991
CMI demographics vs LifeMetrics hedge



Hedge effectiveness can also be measured stochastically

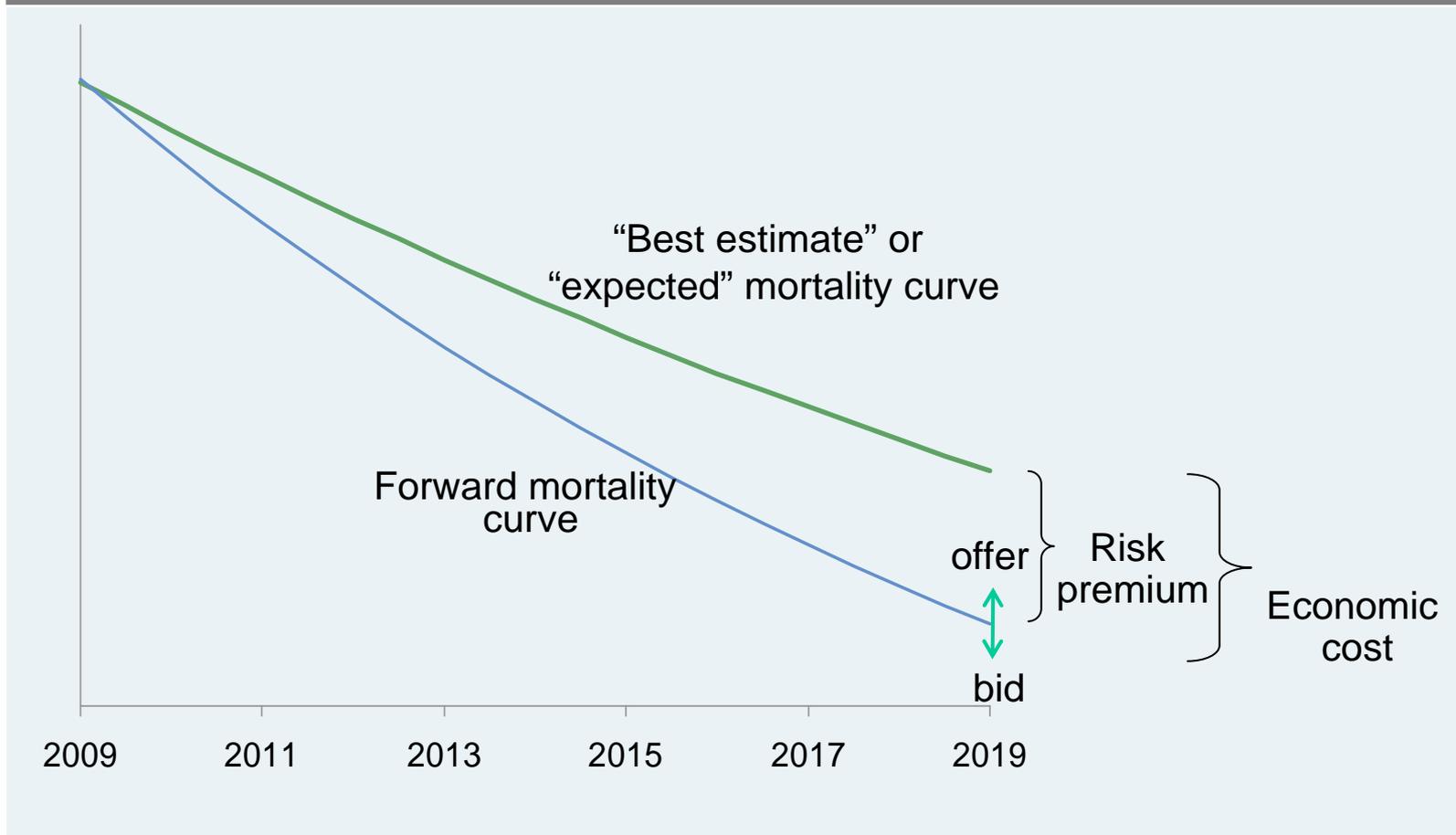
- Hedge effectiveness is about risk reduction
 - Quantifying how hedge reduces potential for **monetary loss**
 - Need to measure residual risk
- Example
 - Risk reduction = 86%
 - Residual risk = 14%
- Residual risk mainly reflects basis risk between pension population and the national population

Distribution of liability value in 2019:
Before and after hedging



How much does it cost?

Mortality rates



Summary

- Longevity risk transfer via the capital markets is now possible
 - Hedges have been traded
 - Investments have been made
- Customised Hedges
 - Mimic reinsurance but in capital markets format
- Standardised Index Hedges
 - A new paradigm based on risk management rather than indemnification
 - Basis risk can be managed