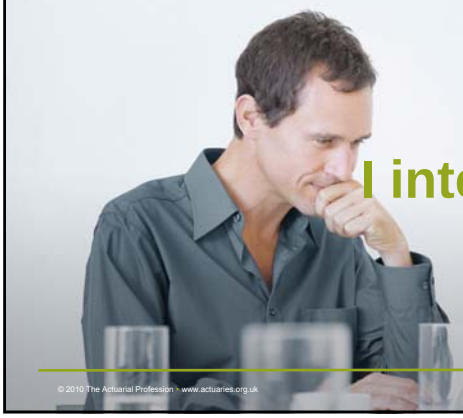
The Actuarial Profession
making financial sense of the future

Momentum conference 2010: for actuaries of today and tomorrow
Nigel Bodie



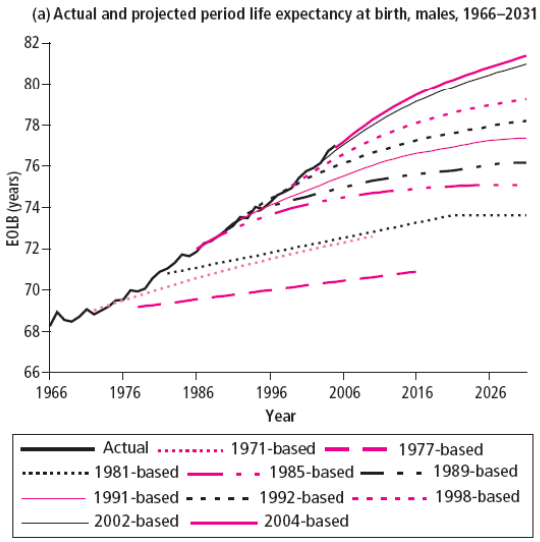
I intend to live for ever
- so far, so good

9 December 2010

Longevity – past, present and future

- How did we do in C20th?
- Are we getting better?
- What to do with the risks?

UK population projections – expectation of life

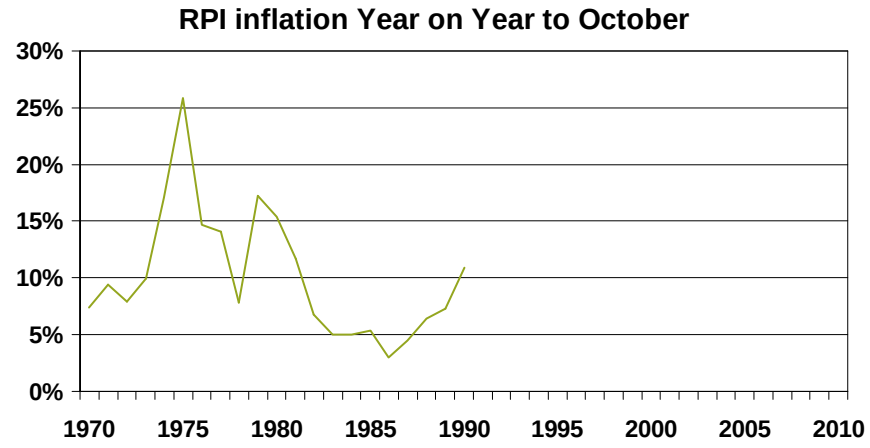


Source: ONS

The 1990 Pension Scheme Actuary
Tables and projections

- PA(90)
  - Life office pensioner mortality
  - Age rating to allow for improvements
- 80 and 92 series
  - Life office pensioner mortality
  - 2-dimensional improvement table with each
  - 92 series improvements: value ≈ ¼% to ⅓% off discount rate
  - 80 series lower

The influence of inflation (1)



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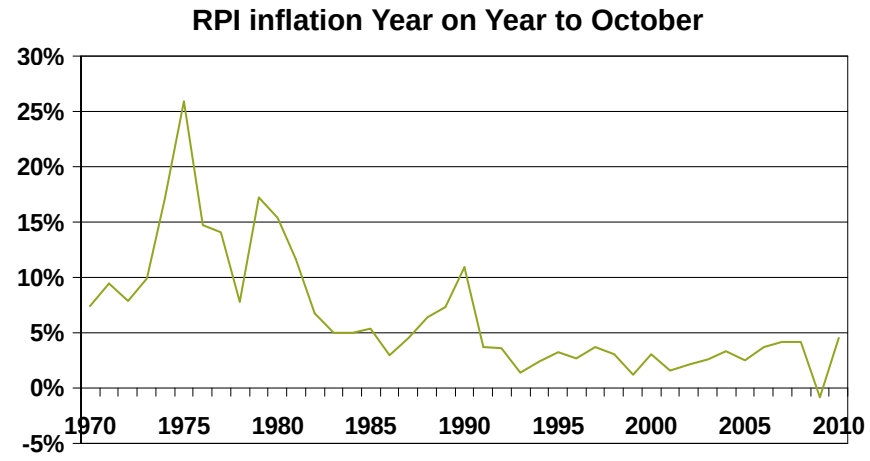
The influence of inflation (2)



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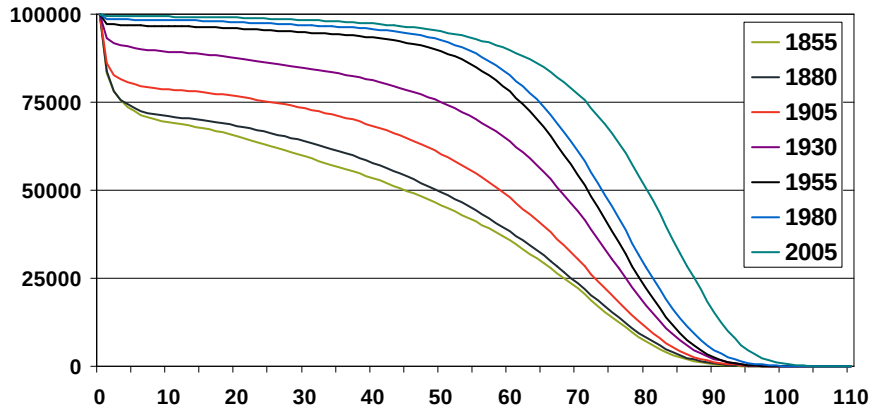
Survivorship curves 1855 - 2005



England & Wales male population
Source Human Mortality

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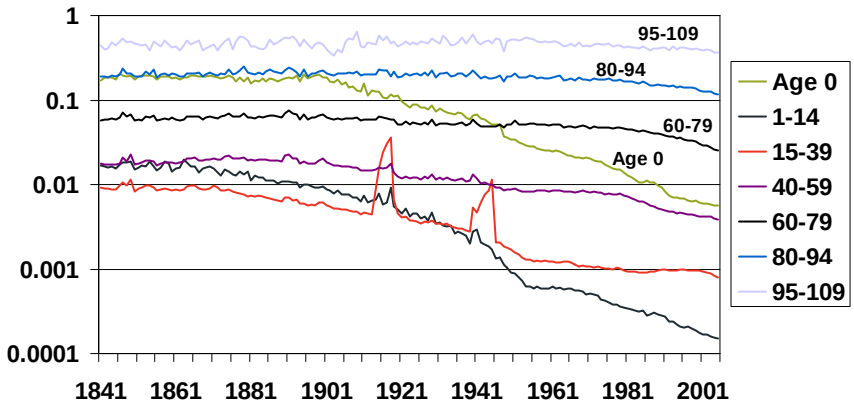
Long-run shifts in population mortality - males



Source – Human Mortality database

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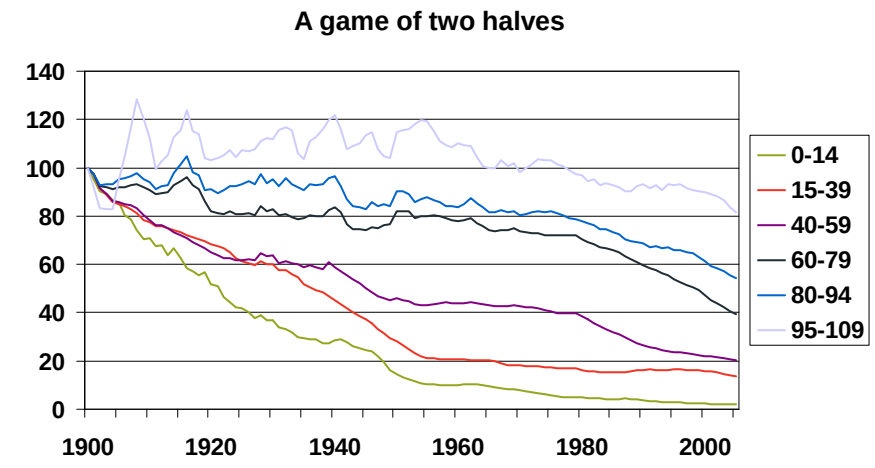
Trends in mortality – index values C20th
Males E and W



1900 = 100; 3-year rolling averages - World Wars smoothed out 15-39

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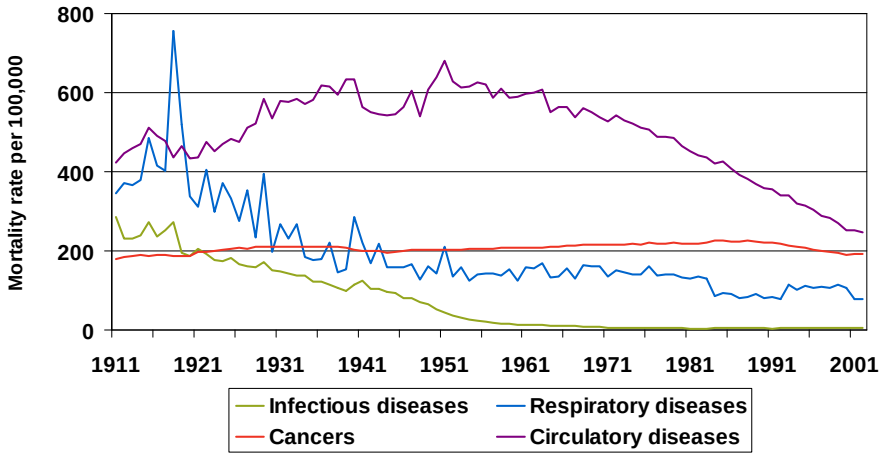
Source – Human Mortality database

Trends in major causes of death – UK population



Source: ONS

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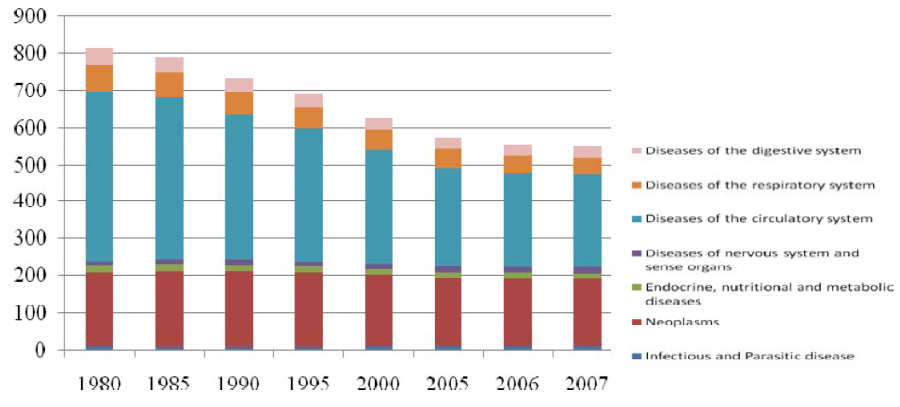
Similarly in Europe . . .

Trends in age-standardised mortality rate per 100k popn by major cause of death groups **EU**

Source: European Mortality Data Base



Source: Ridsdale, Gallop; ICA 2010

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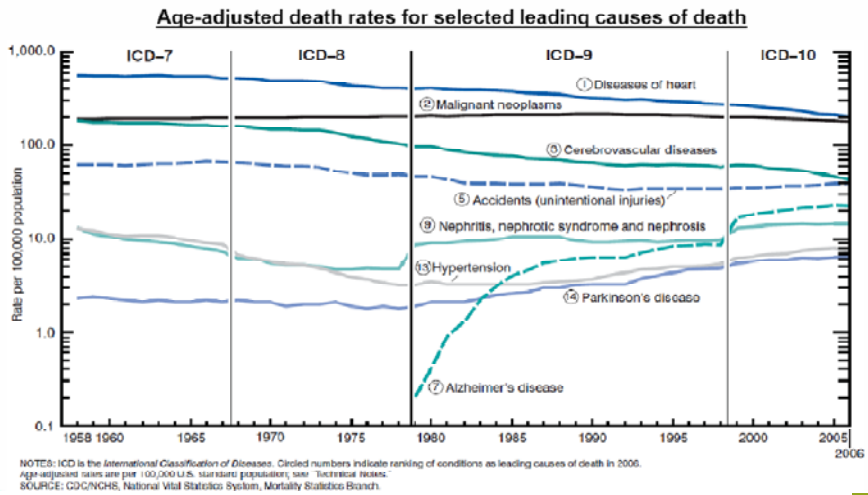
Emergence of causes of death
USA 1958 – 2008; logarithmic scale



Source: Ridsdale, Gallop; ICA 2010

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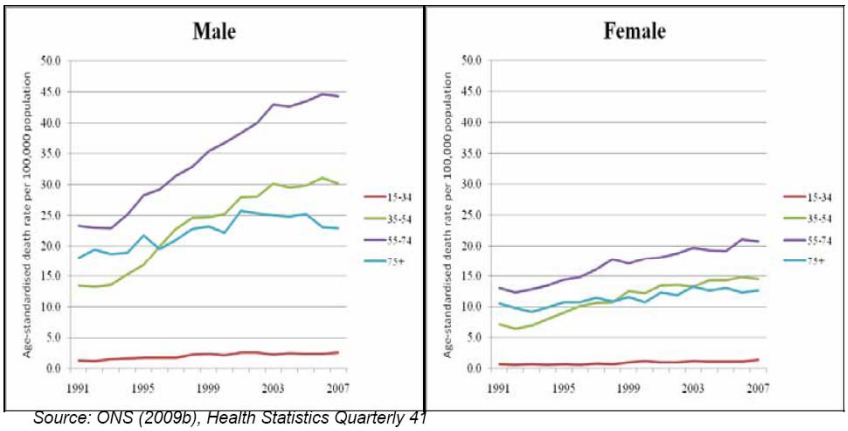
Emergence of causes of death
UK – alcohol-related

Figure 1. **Age-standardised alcohol-related death rates: by sex and age group, 1991-2007**



Source: ONS (2009b), Health Statistics Quarterly 41

Source: Ridsdale, Gallop; ICA 2010

Tables and projections

- PA(90)
  - Life office pensioner mortality
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  - 2-dimensional improvement table with each
  - 92 series improvements: value ≈ ¼% to ⅓% off discount rate
  - 80 series lower
- 00 series
  - Life office pensioner mortality
  - Separate improvement tables
  - Interim cohort projections
- SAPS series
  - Large occupational pension scheme mortality data
  - Separate improvement tables
- Improvement tables
  - Library of improvements
  - CMI_2009 and 2010

Alternatives to buy-in/out

Current hedging structures

- Vanilla swaps
- Bespoke swaps
- Synthetic buy-ins
- Insurance wraps can be added to give FSCS protection

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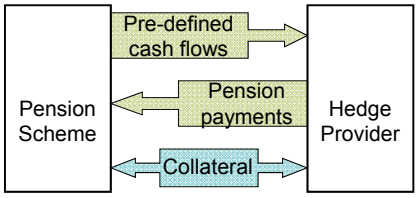
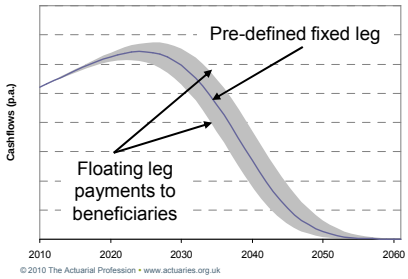
Unfunded longevity swap

Structure



Cashflows



Features

- Terms of an unfunded longevity swap:
  - The pension scheme pays a pre-defined series of cashflows to the hedge provider ("fixed leg")
  - In return the hedge provider pays the actual pension benefits to the pension fund ("floating leg")
  - Swap term of up to 50 (even 70) years
  - Hedge provider administers the swap (death tracking, escalations etc)
  - The transaction is fully collateralized to mitigate credit exposure
- The fixed leg is typically comprised of:
  - Best estimate projection of the pension amounts to be paid
  - Longevity hedging fee
- The fixed leg has a very similar "shape" to the expected pension payments

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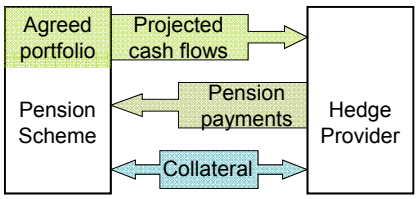
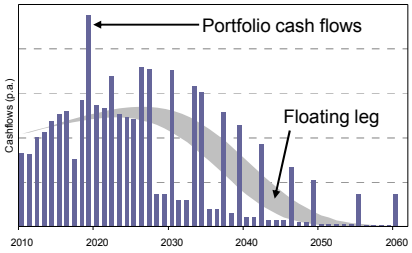
Unfunded longevity swap
Bespoke fixed leg

Structure



Cashflows



Features

- Pension scheme and hedge provider together determine an asset portfolio, subject to scheme's investment guidelines
- Fixed leg reshaped to equal the cashflows arising from the portfolio, with same PV as those payable by the pension scheme under the vanilla longevity swap
- Pension scheme retains asset risk. Should an asset default, the pension scheme is still liable to pay the cashflow that the asset would have generated

	Market value of assets backing swap	Yield on assets (% pa)
Gilts	£500m	3.94%
AAA Corporate	£467m	4.45%
AA Corporate	£419m	5.29%
A Corporate	£396m	5.77%
BBB Corporate	£376m	6.21%

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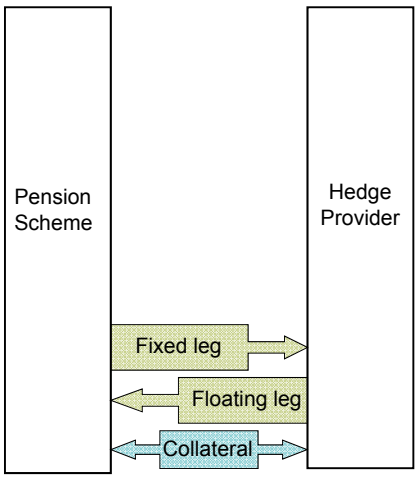
Synthetic buy-in
Longevity piece

Structure



Features – longevity piece

- As for unfunded longevity swap:
  - The pension scheme pays a pre-defined series of cashflows to hedge provider ("fixed leg")
  - In return the hedge provider pays the actual pension benefits to the pension fund ("floating leg")
  - Collateralized

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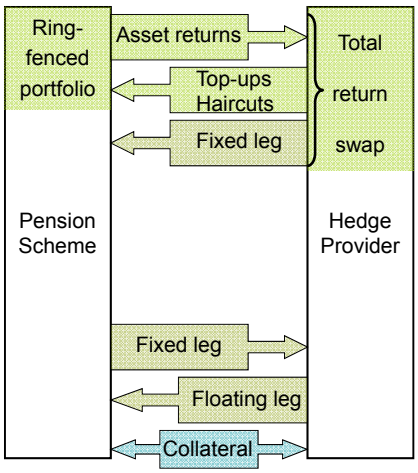
Synthetic buy-in
Asset piece

Structure



Features – asset piece

- Each month the hedge provider
  - Pays fixed leg to scheme
  - Calculates 'required value' of assets to cover balance of trade
- Portfolio assets subject to agreed investment constraints; given these, the hedge provider can vary the composition of the assets at any time
- Investment risk with hedge provider

Security

- In event of hedge provider default the scheme has:
  - The ring-fenced portfolio
  - Any "haircuts" on the assets
  - Collateral posted under the longevity swap

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Types of trade – indemnity/bespoke v index

Indemnity

- Complex to structure
- Ongoing administration
- Suitable for larger schemes
- Probably closer to what pension scheme trustees actually want
- 80/20 rule
  - Cost of setting up 'perfect' hedge expensive compared with the cost of a 'very good' hedge

Index

- Basis risk
  - Base mortality
  - Proportions married
- Statistical volatility
  - Size of scheme
  - Pension amounts skewed
- Easier to document/administer
- Typically shorter duration
  - Brings in capital markets
  - May be further from what trustees are looking for

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Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

The views expressed in this presentation are those of the presenter.