Longevity risk hedging: The role of the private & public sectors

Professor David Blake
Director
Pensions Institute
Cass Business School
d.blake@city.ac.uk

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Issues

- Quantifying longevity risk
- The role of the private sector in hedging longevity risk
- Types of instruments for hedging longevity risk
- The role of the public sector in hedging longevity risk
- Annuity providers also face interest rate risk
- Conclusion
Quantifying longevity risk
Cost of longevity risk

- Global pension liabilities = $23trn

- Roger Lowenstein* in *While America Aged* (2008) discusses “how pension debts ruined General Motors, stopped the New York subways, bankrupted San Diego, and loom as the next financial crisis”

* Author of *When Genius Failed*
## Longevity risk in UK pension provision, £bn of total liabilities: 2003

<table>
<thead>
<tr>
<th></th>
<th>Pre-retirement?</th>
<th>Post-retirement?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Still in employment</td>
<td>Already in payment</td>
</tr>
<tr>
<td><strong>Insurance companies</strong></td>
<td>10?</td>
<td>70?</td>
</tr>
<tr>
<td><strong>Pension funds</strong></td>
<td>400?</td>
<td>400?</td>
</tr>
<tr>
<td><strong>Unfunded public employee pensions</strong></td>
<td>260</td>
<td>190</td>
</tr>
<tr>
<td><strong>State pensions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Earnings-related</td>
<td>190</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total Earnings-related</strong></td>
<td>860</td>
<td>760</td>
</tr>
<tr>
<td><strong>State pensions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Basic</td>
<td>510</td>
<td>390</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1370</td>
<td>1150</td>
</tr>
</tbody>
</table>
Longevity fan chart for 65-year old male (Cairns-Blake-Dowd model)
Survivor fan chart for 65-year old male (Cairns-Blake-Dowd model)
Stakeholders in bearing longevity risk

- Individuals
- Company pension funds
- Annuity providers:
  - Insurance companies
- Government:
  - State and public employee pension systems
Range of responses

- Accept longevity risk as legitimate business risk
- Share longevity risk: e.g.,
  - via participating annuities with survival credits
  - higher employee contributions, later retirement
- Reinsurance:
  - Buy-out of pension liabilities
  - Buy-in of bulk annuities
- Manage risk with longevity-linked instruments
Decomposition of longevity risk

Total longevity risk
= Aggregate longevity risk + Specific longevity risk
The role of the private sector in hedging longevity risk
Private sector role

- **Investment banks:**
  - act as intermediaries
  - establish indices (e.g. LifeMetrics Index)

- **Hedgers:**
  - Require longevity risk premium

- **General investors seeking uncorrelated securities for diversified portfolios:**
  - hedge funds
  - ILS investors
  - endowments

- **Speculators:**
  - essential for providing liquidity

- **Arbitrageurs:**
  - need well-defined pricing relationships between related securities
Types of instruments for hedging longevity risk
Bonds

- Principal-at-risk bond linked to mortality:
  - E.g Swiss Re mortality catastrophe bond 2003-2007

- Annuity bond linked to survivorship (longevity or survivor bond):
  - EIB-BNP-PartnerRe bond 2004
    - Payments linked to national data
  - PensionsFirst Blue Bond
    - Payments linked to plan specific data
Swiss Re – Friends’ Provident longevity swap

- World’s first publicly announced longevity swap in April 2007
  - a pure longevity risk transfer
  - but insurance contract not capital market instrument
- Friends’ Provident’s £1.7bn book of 78,000 of pension annuity contracts
- Swiss Re makes payments and assumes longevity risk
  - in exchange for undisclosed premium
JPMorgan q-forward with Lucida, Feb 2008

Hedge Provider (fixed rate payer) \[\text{Notional} \times 100 \times \text{fixed mortality rate}\]

\[\text{Notional} \times 100 \times \text{realized mortality rate}\]

Pension Plan (fixed rate receiver)

Source: Coughlan et al (2007)
JPMorgan – Canada Life longevity swap

- World’s first capital market longevity swap in July 2008:
- Canada Life hedged £500m of its annuity book:
  - 125,000 lives
  - 40-year swap customized to insurer’s longevity exposure
  - But based on LifeMetrics Index improvements
- Longevity risk fully transferred to investors:
  - Hedge funds and ILS funds
- JPM acts as intermediary and assumes counter-party credit risk
The role of the public sector in hedging longevity risk
Public sector role

State:
- encouragement of market stability
- insurer of last resort

Recognise:
- Total risk = Aggregate risk + Specific risk

Private sector can hedge specific longevity risk via risk pooling

But CANNOT hedge aggregate longevity risk without a matching asset
Public sector role

- ONLY the state can issue an instrument to hedge aggregate longevity risk:
  - C.f., inflation risk and index bonds
- Role for the state to issue longevity bonds to determine the risk-free term structure for mortality:
  - C.f., risk-free nominal term structure
  - C.f., risk-free real term structure
Public sector role

- But state already very long longevity risk?
- Yes but state will earn a longevity risk premium for hedging longevity risk
- So can finance national debt at lower cost than with conventional bonds
- Also to repeat:
  - social benefit:
    - the need for orderly/ efficient markets
  - Will pick up the pieces if things go wrong!
Annuity providers also face interest rate risk
Life annuities are mainstay of pension plans throughout the world:
  - they are the only instrument ever devised capable of hedging specific longevity risk.

Without them, pension plans will be unable to perform their fundamental task of protecting retirees from outliving their resources for however long they live.

Real danger that they might disappear from financial scene:
  - especially deferred annuities
Histogram of simulated future annuity prices under longevity risk but no interest-rate risk

Histogram of simulated future annuity prices under interest-rate risk but no longevity risk

Histogram of simulated future annuity prices under longevity risk and interest-rate risk

Conclusion
Conclusion

- Longevity risk is a real, underestimated and slow-burning risk:
  - It needs to be quantified and managed
- Tools are now being developed to do both:
  - In insurance and reinsurance companies
  - In the capital markets
- However, insufficient capital in insurance/reinsurance industry to deal with global longevity risk
- Capital markets more efficient than insurance industry in:
  - Reducing informational asymmetries
  - Facilitating price discovery
For a new capital market to succeed it...

- (1) must provide effective exposure, or hedging, to a state of the world that is economically important and that cannot be hedged through existing market instruments, and
- (4) it must use a homogeneous and transparent contract to permit exchange between agents. (Loeys et al, 2007)
- These conditions now hold for the Life Market
Conclusion

- But there is a critical role for the state in facilitating the development of the Life Market:
- If longevity-linked instruments fail to be issued in sufficient size:
  - either the state (i.e., the next generation) is forced to bail out pensioners
  - or companies withdraw from pension provision
  - or insurance companies stop selling annuities
  - or pensioners risk living in extreme poverty in old age, having spent their accumulated assets
Effect of current financial crisis

- Will force explicit recognition of longevity risk in pension fund and annuity provider balance sheets:
  - What gets measured gets managed!
- Will encourage investors to look for assets that are uncorrelated with traditional financial asset classes:
  - E.g. longevity-linked instruments such as life settlements
- State will begin to recognise its role in hedging aggregate longevity risk