Living with mortality: Longevity bonds and other mortality-linked securities

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Introduction

- Longevity risk = risk that aggregate survival rates are higher than anticipated.
- Now accepted as a key risk factor for many life assurers and pension funds
  → perceived need for solutions to tackle longevity risk
Range of responses

- Accept longevity risk as legitimate business risk
- Reinsurance
- Participating annuities with survival credits
- Securitisation
- Manage risk with mortality-linked securities
Stakeholders

- Hedgers
- General investors seeking low-beta securities for diversified portfolios
- Speculators:
  - Essential for providing liquidity
- Arbitrageurs:
  - Need well-defined pricing relationships between related securities
- Government:
  - Insurer of last resort
  - Encouragement of market stability
Existing mortality-linked securities

- Swiss Re mortality catastrophe bond 2003
  - 3 years
  - Reduces exposure to catastrophic mortality
  - Oversubscribed, second tranche issued 2005
- EIB/BNP longevity bond 2004
  - 25 years
  - 65-year old English and Welsh males
  - 2005: Withdrawn due to insufficient investor interest

- Can we learn from these experiences?
New mortality-linked securities

- Longevity bonds:
  - Classical LBs
  - Geared LBs to reduce capital outlay
    \[ S(t) \in [S_l(t), S_u(t)] \]
  - Deferred LBs to focus on longer-term, more-risky cashflows
  - Principal-at-risk LBs
    \[ \text{Reductions if survivorship above threshold} \]
New mortality-linked securities

- Mortality swaps (OTC):
  - Swap fixed for floating survivor index
  - Flexible and tailor-made
  - Swap embedded in EIB/BNP bond
New mortality-linked securities

- Mortality futures:
  - $F(t, T) = \text{futures price at } t \text{ for delivery of } X(t) \text{ at } T$
  - *E.g.* $X(t) = \text{longevity bond or survivor index}$

- AFPEN (France)
  - Annuity futures
  - $X(t) = \text{based on UK market annuity rates}$
New mortality-linked securities

- Factors making for success of futures:
  - Liquid spot market
  - Spot prices must be sufficiently volatile to create both hedging needs and speculative interest
  - Underlying must be homogeneous or have well-defined grading system
  - Requires active participation of both hedgers and speculators
New mortality-linked securities

- Mortality options:
  - Survivor caps
    - $\text{Payout} = \max\{S(t,x) - s_c(t), 0\}$
  - Survivor floors
    - $\text{Payout} = \max\{s_f(t) - S(t,x), 0\}$
  - Annuity futures options
Which mortality index?

- Choice of reference population critical
  - Basis risk
  - Integrity / Moral hazard
    - E.g. Swiss Re bond uses population mortality
- Choice of mortality table:
  - Population tables?
  - CMI tables?
  - Hedger’s own mortality experience?
Credit risk

- Hedgers need to be confident that the counterparty will deliver

- Solutions:
  - Credit enhancement
  - Credit derivatives
  - Securitisation tied to Special Purpose Vehicle
Barriers to development

- What needs to be done to establish both a spot and a derivatives market in longevity-linked securities?
- EIB longevity bond did not generate sufficient demand to be launched.
- Instructive to look at possible reasons:
  - design issues
  - pricing issues
  - institutional issues
Barriers to development

Design issues:

- Capital outlay too high relative to hedging capacity
  - No capital left over e.g. for hedging inflation
- Basis risk too high??
  - Population versus Own mortality
  - Age 65 versus Range of cohorts
  - Males versus Females
Barriers to development

- Pricing issues:
  - Longevity risk premium built into initial price of bond set at 20 basis points.
  - Demand versus supply
  - Need here for more research and education?
  - Impact of basis risk on price
Barriers to development

- Institutional issues:
  - Issue size too small to create liquid market.
  - Consultants reluctant to recommend it to trustees:
    - unwilling to be the first to leap.
  - Fund managers do not currently have mandate to manage longevity risk
  - Insufficient reinsurance capacity:
    - EIB/BNP could not find UK/EU reinsurer
    - Partner Re would not cover > £540m
Barriers to development

- Futures and options market needs:
  - Liquid spot market
  - Underlying mortality index must be fair and trustworthy
  - Underlying survivor indices must be few in number, but also appropriately graded:
    - A small number of contracts helps to increase liquidity, but also leads to basis risk
    - Basis risk can be reduced with suitably graded contracts
Conclusions

- Mortality-linked securities are potentially very useful tools for managing longevity risk.
- Once teething problems are overcome, way will be clear for markets in these securities to develop and mature.
- We would then be on cusp of completely new global financial market in mortality-linked securities.
Discussion themes:

- What prospects for market development?
- How much appetite is there for hedging?
- Views on good/bad contract design
- Is basis risk perceived as a problem?
- Your experiences in security design
- Your views as an adviser
- Your views as a hedger
  - Pension fund
  - Life office
  - Reinsurer