

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

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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

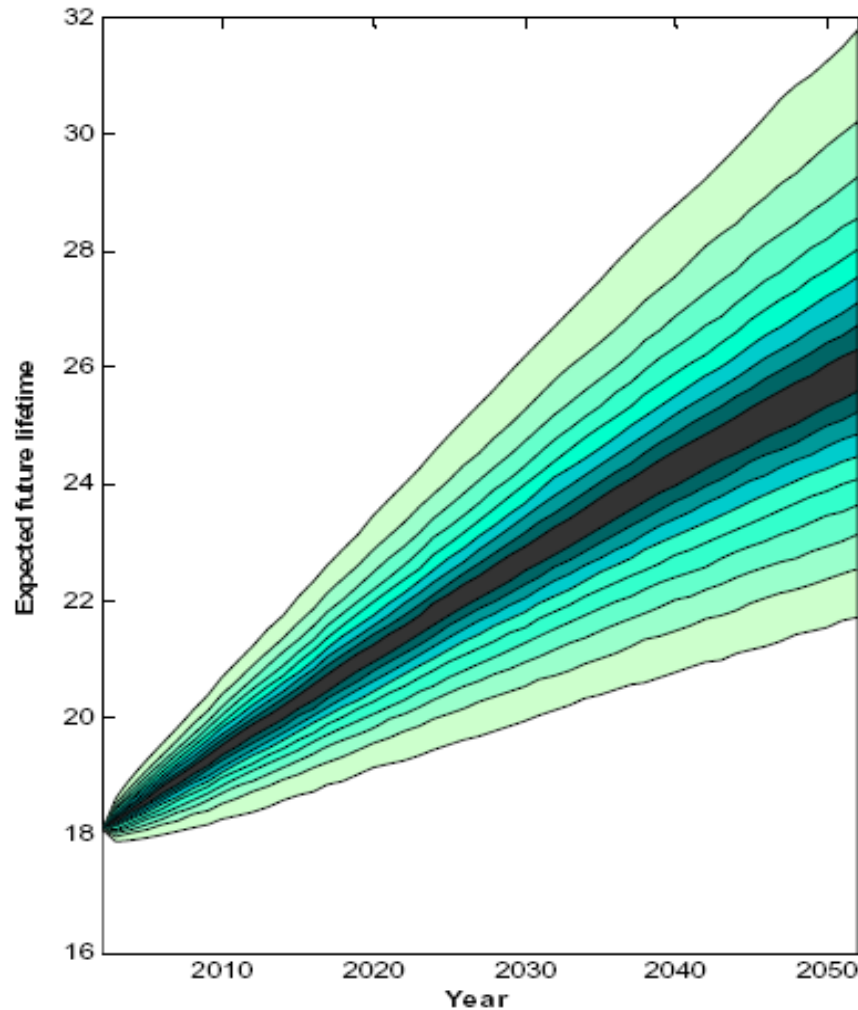
- Global pension liabilities = \$23trn
- Roger Lowenstein\* in *While America Aged* (2008) discusses “how pension debts ruined General Motors, stopped the New York subways, bankrupted San Diego, and loom as the next financial crisis”

\* Author of *When Genius Failed*

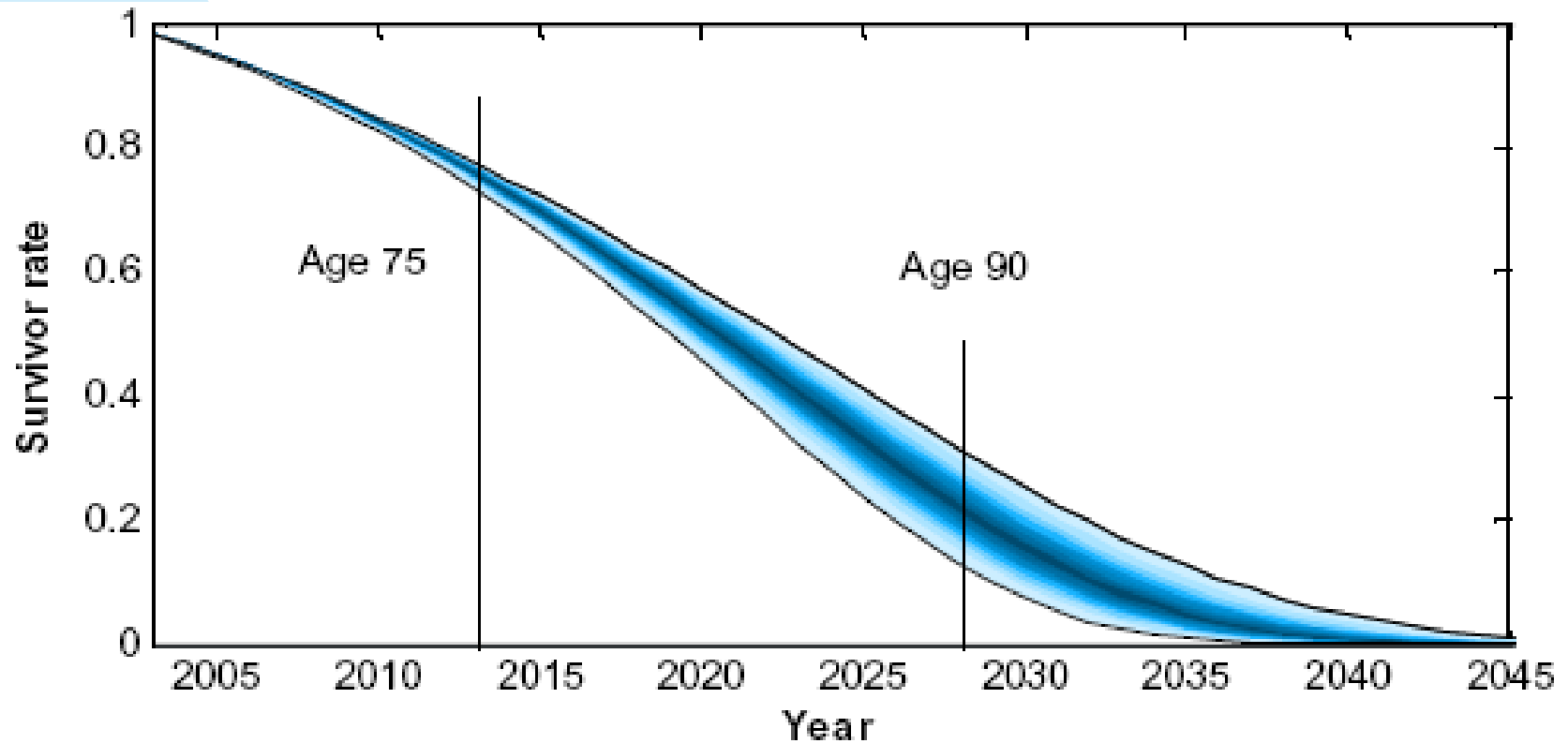
# Longevity risk in UK pension provision, £bn of total liabilities: 2003

	Pre-retirement? Still in employment	Post-retirement? Already in payment
Insurance companies	10?	70?
Pension funds	400?	400?
Unfunded public employee pensions	260	190
State pensions		
■ Earnings-related	190	100
<b>Total Earnings-related</b>	<b>860</b>	<b>760</b>
State pensions		
■ Basic	510	390
<b>Total</b>	<b>1370</b>	<b>1150</b>

# 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

Public sector

Private sector



# **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**

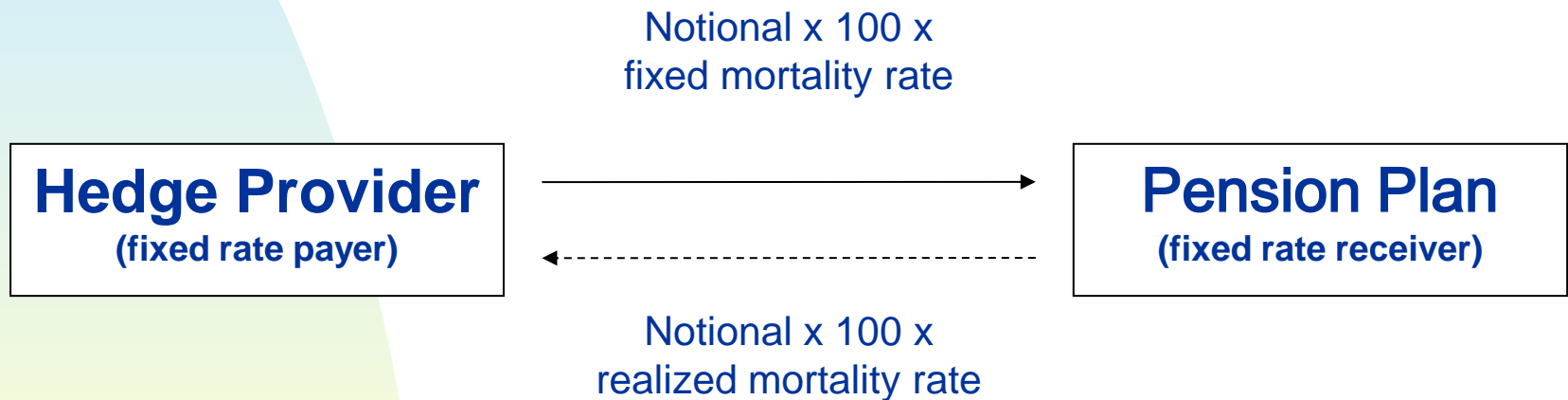
# Bonds

- 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



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 counterparty 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!

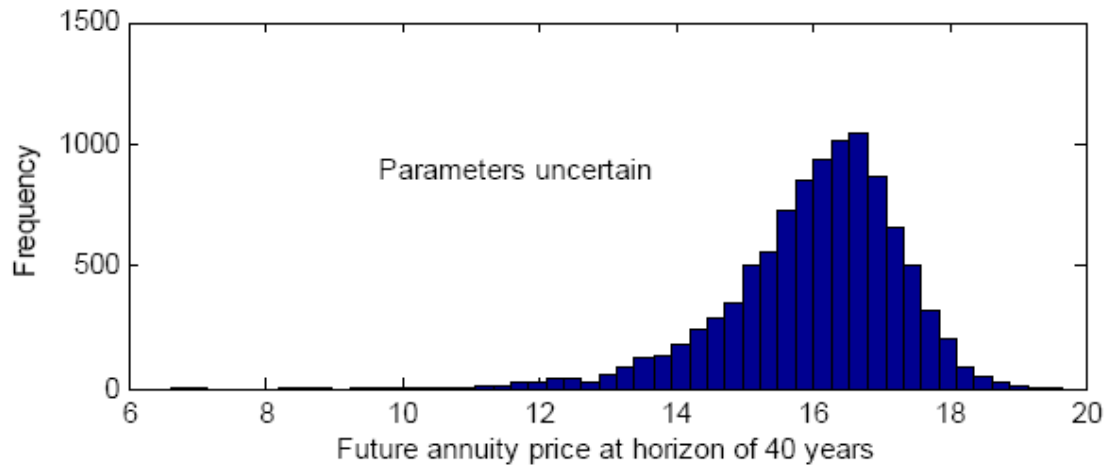


**Annuity providers also  
face interest rate risk**

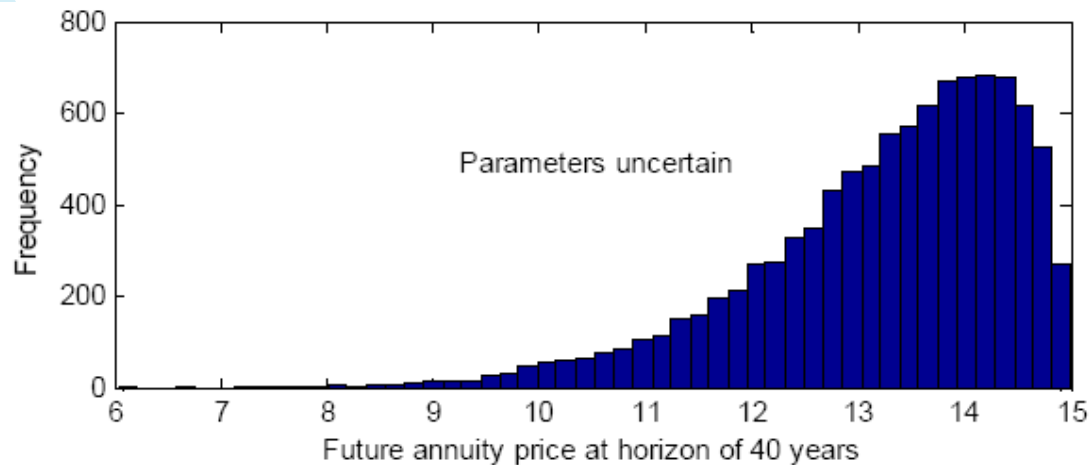
# Vital role of annuities

- 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

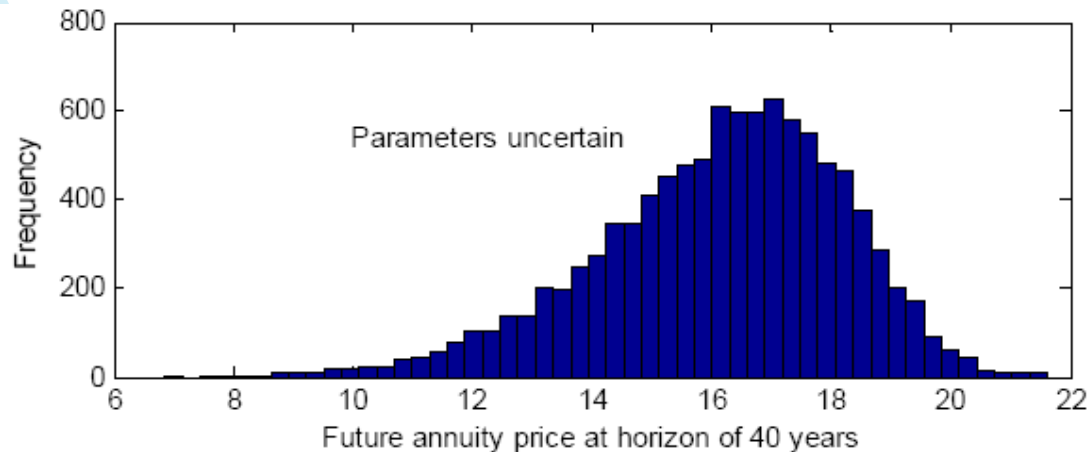
# Histogram of simulated future annuity prices under longevity risk but no interest-rate risk



# 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*
- *(2) economically important and that*
- *(3) 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