

# Coping with Longevity Risk within retirement provision in Singapore

*Prepared for SAS Retirement Committee*

*<not to be distributed>*



## Agenda

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- Section 1      Longevity Risk
- Section 2      Modelling
- Section 3      Solutions
- Section 4      Current Market
- Section 5      Role of Government
- Section 6      Conclusion

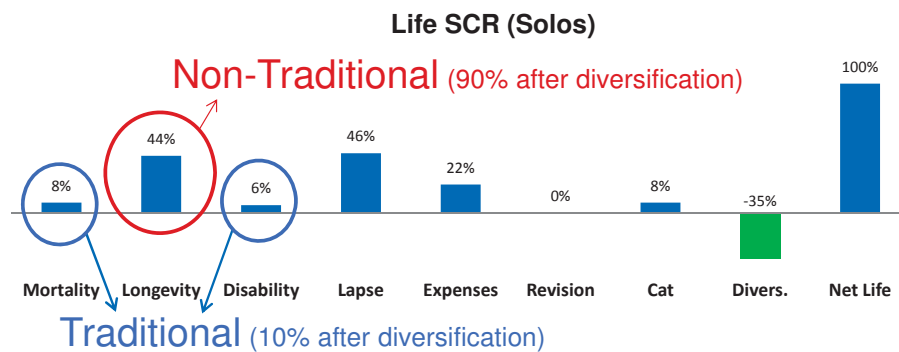


# Section 1: Longevity Risk

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## Solvency II Highlighted the Main Life Underwriting Risks

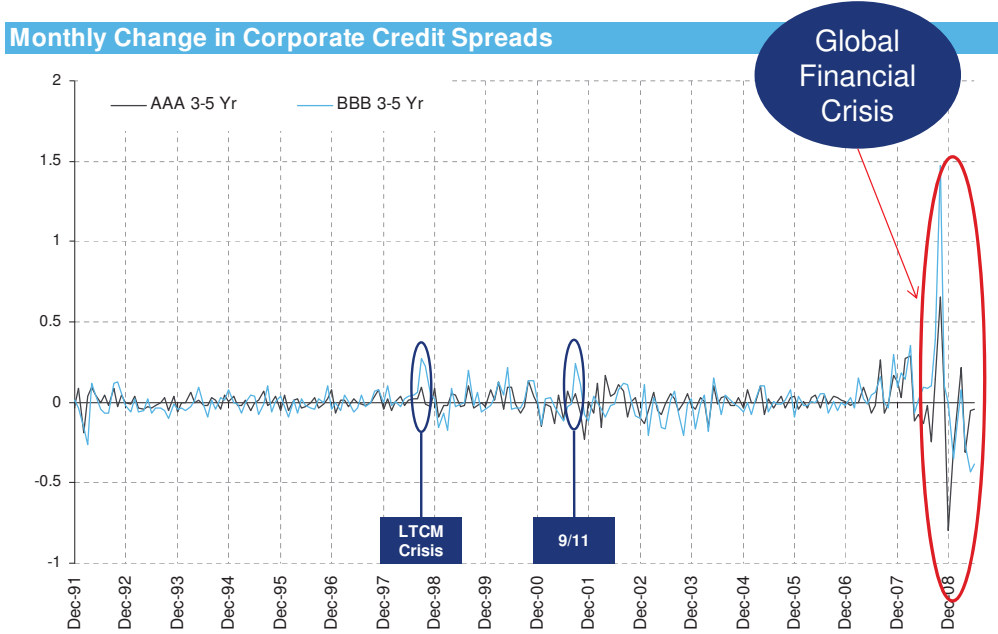
- Longevity risk (amongst others, including Lapse risk) are amongst the most material life risks
  - Unlike other “catastrophe” risks faced by Life insurers, this is a **“slow and yet financially painful”** risk
  - Rather than a shock risk, **“trend risk is amongst the most dangerous”**
  - Life companies and Pension funds, largely in Europe and US are facing this risk
  - Whereas in Asia, the risk is still largely retained by individuals (and ultimately governments)
  - It has even been referred to as a “toxic tail” risk by Blake, Cairns, Dowd and MacMinn (2006)



Are you afraid yet?

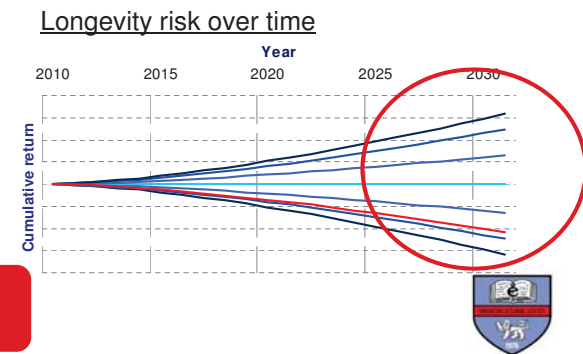
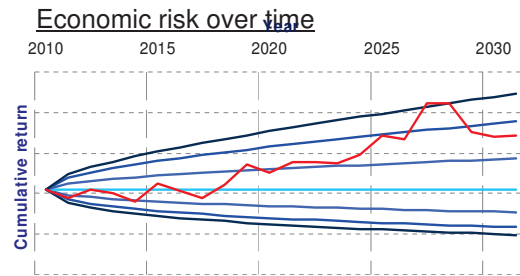


# Market Risk



## Longevity Risk versus Market Risk

Mortality and most other economic risks are fundamentally different:	
Market risk	Longevity risk
<ul style="list-style-type: none"> <li>• The longer I run the risk, the more predictable (in relative terms) the outcome</li> <li>• “Funnel of doubt” expands at a lower rate further into the future.</li> <li>• <b>“in the long term, risky assets outperform”</b></li> </ul>	<ul style="list-style-type: none"> <li>• The longer I run the risk, the more extreme the outcome could be</li> <li>• “Funnel of doubt” diverges</li> <li>• <b>“once longevity starts to move against me, it will probably get even worse”</b></li> </ul>



Longevity Risk – it creeps up on you...

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## Social Economical Risks

- Social/Economical (*source: longevity tsunami, IAA*)
  - The **average global life expectancy has doubled over the past 100 years** (*Source: The World Health Report 2998: Primary Health Care, (Now More Than Ever)*)
  - **Underfunding of retirement is a global issue**
  - Compounded by the problems in **Europe** and the need for austerity measures including the lifting of the retirement age and the reductions in age pensions in some countries
  - In the **United States** it has been noted: “*Social Security remains in a period of permanent cash deficits, with slower economic growth moving the looming bankruptcy date up to 2033. When its trust fund is exhausted, seniors can expect a 25 percent cut in their benefits.*”
  - In **Japan**, a leader in longevity risk, but not really in products or solutions (i.e. some products exit, variable annuities, local government funds etc)

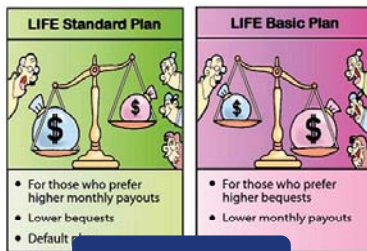
In Australia, improvement of around 1-1.5 years in life expectancy = increase in public pension expenditure of 0.3% of GDP, and this may be compounded by the baby boomers retiring over the next few years....**so who pays?**

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## Social Economical Risks – The Government Pays...

### Cost of Action!

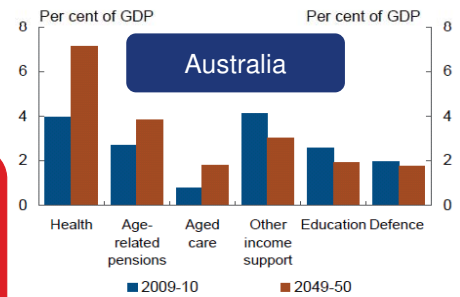


Singapore

### Cost of InAction!

In Australia, this problem is well understood and policymakers have been focused on the issue for a number of years. Treasury's Intergenerational Report 2010<sup>12</sup> identifies the future increases in Commonwealth Government spending (expressed as a % of Australia's GDP) from our ageing population, especially in the areas of health costs (from 4% to 7% of GDP) and Age Pensions (from 2.7% to 3.9% of GDP).

#### The spending pressures of ageing...



source: longevity tsunami, IAA



Either way, it's a cost and ultimately, it's inevitable that our governments will fund the gap – just a matter of when?

## Section 2: Modelling Longevity Risk

# Longevity Assumptions

Longevity assumptions are comprised of two parts

Current experience  
(The Base Table)

Future projections  
(Trends)

Representing life expectancies at the measurement date

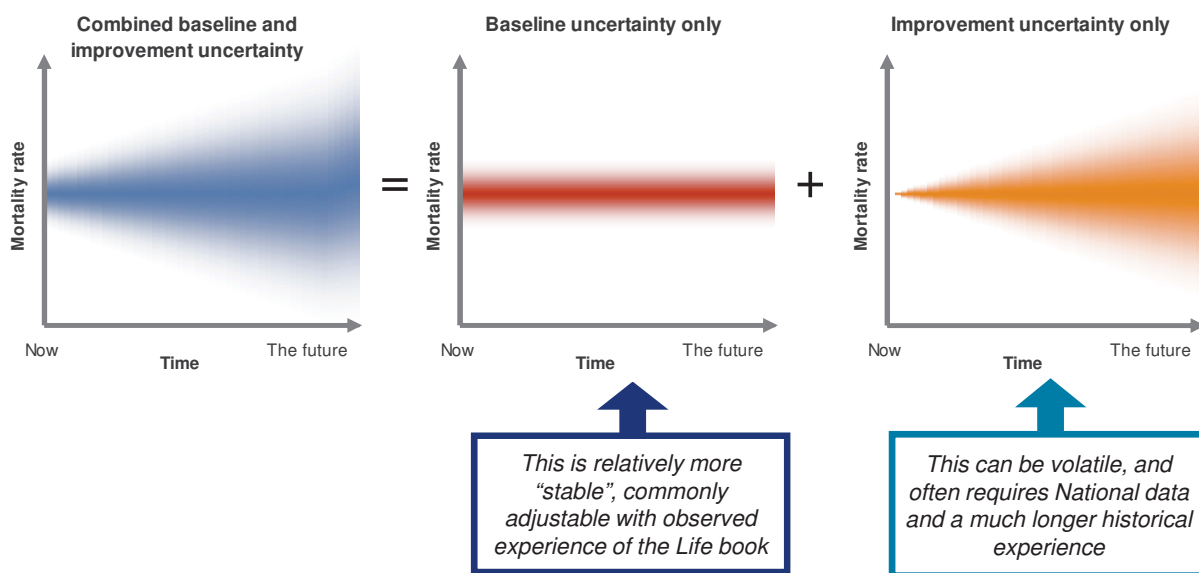
Representing how we expect life expectancy to change over the future of the pension fund

Typically based on standard mortality tables adjusted for the observed experience of the Fund

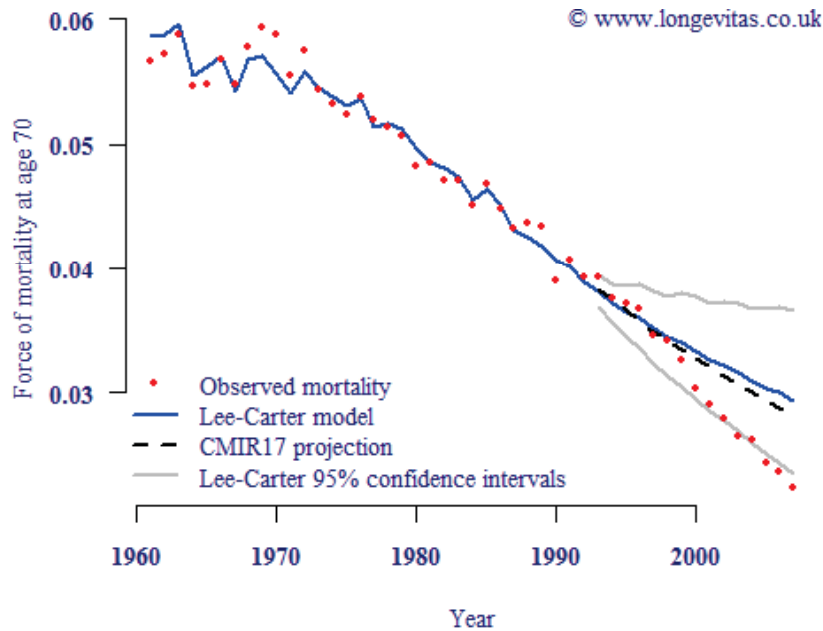
Typically based on industry research



## Risk Assessment - Analysis of Mortality Rate Uncertainty



## Actuaries, our love affair with “best – estimate”



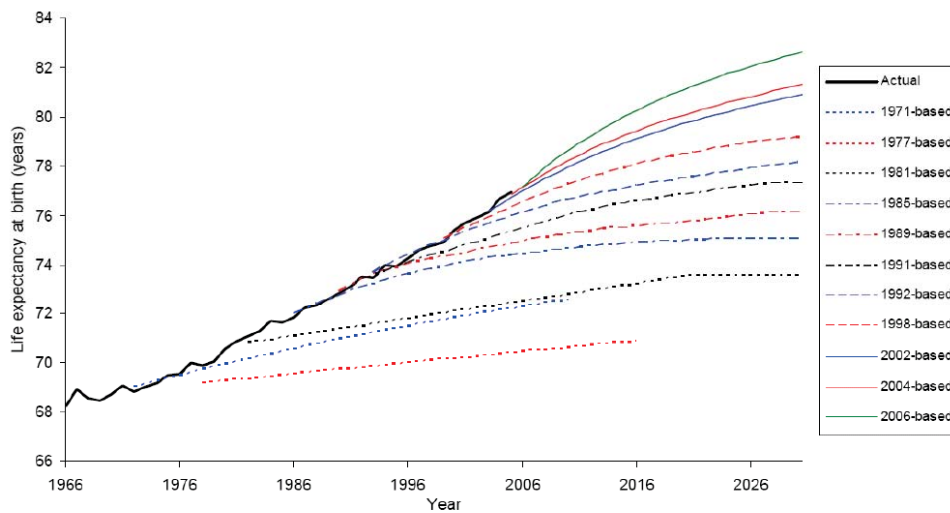
### “Blue Line” –

Actuaries reserved at the “mean” or “best-estimate” would have been *unpleasantly* surprised

### “Grey Line”

Actuaries who used stochastic modelling and reserved at the lower confidence interval would have been *pleasantly* surprised.

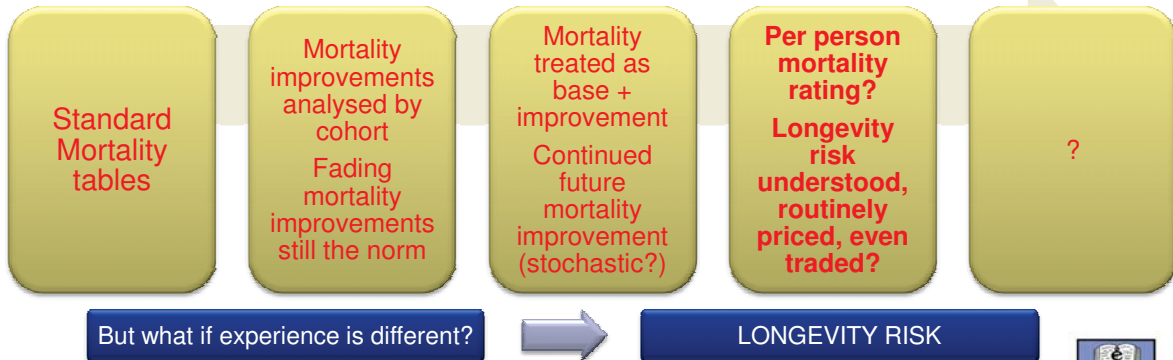
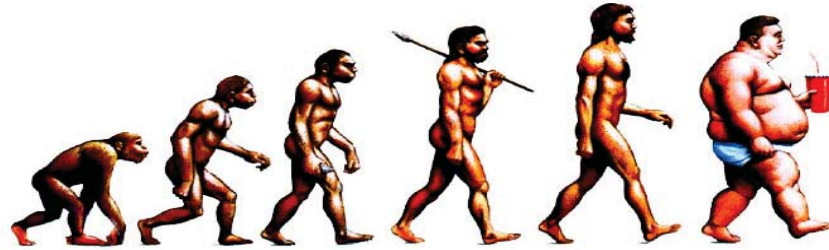
## Can we live forever?



Everybody dies eventually....are the mortality improvement trends sustainable?

- What if we all exercise the recommended 15mins per day?
- Nobody smokes?

# Evolution of Mortality Modelling



But what if experience is different?



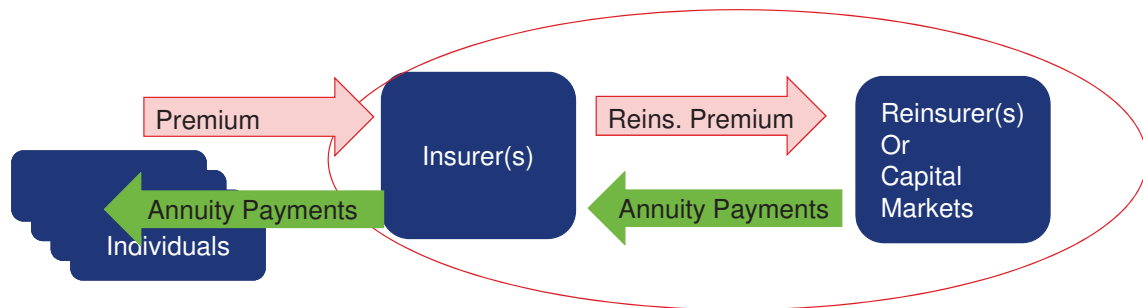
LONGEVITY RISK



## Section 3: Solutions



## The Industry Has a Vital Role



Individuals can't do this alone, given the complexities, we need partners...but how to "kick start the market"?



## Credit Derivatives Market – the Good?

- Longevity market is at its infancy and the volume has been underwhelming
- Main drawback with the above structures is the Lack of Standardisation
  - Standardisation has been the key driver behind the success of various complex derivatives that the markets have seen, prime example being Credit Derivatives
  - Credit Derivative market that was very bespoke back in mid 90's with a size running into tens of billions has witnessed an exponential growth since the standardisation in documentation championed by ISDA and the creation of market traded indices leading to a current size of USD 30 odd trillion
  - For a long time a Bank could not realistically hedge this core risk that it carried on its balance sheet (besides syndicating to other banks), which ultimately limited the amount of business a bank could do. Akin to how much insurance business an Insurer or Re-insurer could do if they cannot hedge or distribute the mortality/longevity risks

Just like mortality and longevity are the core risks that an insurer carries, credit was the core risk that a bank carries



## Credit Derivatives Market – the Lessons?

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- The advent of Securitisation and Credit Derivatives enabled Banks and other market participants to grow the size of the credit availability in the system, partly responsible for the Credit Crisis of 2008 as it led to a credit bubble
  - There should be fewer indices to ensure there is sufficient liquidity in each of them to sustain interest from various market participants
  - All the indices should be based on the same rules, there by making it easier to understand and follow the evolution of these index values by market participants
  - The index, along with the securities that are built around this, should be properly regulated by independent bodies
  - The index should be sensitive enough to be affected by reasonable market information to sustain a “mark-to-market” price

Credit Derivatives market had good intentions, but the result was far from being successful. Longevity Risk Transfer market has more to lose than just “financial losses” and the industry needs develop cautiously



## Longevity Risk Market – it’s a Start!

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- To start with there can be about 5 indices, one each for North America, Europe and Japan and 2 for Asia (developed and developing)
  - *LLMA has already created indices in Europe and UK*
- These indices can be maintained by an independent market information provider like Markit, where the index information is computed and provided on a daily basis.
  - *LLMA started in 2010 with information that can be updated annually*
- Like in the case of credit indices, there should be a group of market makers who needs to be identified to support market making thereby enabling the price discovery process
  - *The major banks have already started this process with recent transactions in UK and Europe, such as Deutsche Bank, JP Morgan, Morgan Staley, RBS etc.*
- Insurance companies should also take the role of market makers in some of the indices in the current environment to facilitate the process
  - *The LLMA has the membership of major insurers such as Aviva, AXA, Prudential, Munich Re., Swiss Re, etc.*



## Role of LLMA – Introduction

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- The Life and Longevity Markets Association ('LLMA') is a non-profit organisation funded by current members
  - The LLMA aims to promote the development of a liquid traded market in longevity and mortality-related risk, in particular, the basis of index creation
  - Current members are (in alphabetical order): AVIVA, AXA, Deutsche Bank, J.P. Morgan, Legal & General, Morgan Stanley, Munich Re, Pension Corporation, Prudential, RBS and Swiss Re, across both Banking and Insurance/Reinsurance industries
  - Formally launched in the UK on February 1st 2010
- *“Our aim is to allow the capital markets to invest with confidence in this new asset class, which will bring knock-on benefits of increased stability and certainty to the UK’s pension funds” ~ LLMA*

Source: LLMA ([www.llma.org](http://www.llma.org))



## Role of LLMA – Current Launched Indices

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- LLMA publishes national population mortality indices for England and Wales, Holland, Germany and the US
- Raw Data
  - Exposure (e.g. number of lives at an indicated time)
  - Death (e.g. number of deaths over a defined period)
- Metrics:
  - Crude mortality rates = Death / Exposure
  - Graduated mortality rates
  - Period life expectancies
- Breakdown
  - Age
  - Gender
  - **Country**
  - **Annual frequency**

### “Asia” Basis Risk:

- cultural and / or dietary
- climate
- human development stages
- lifestyle choices

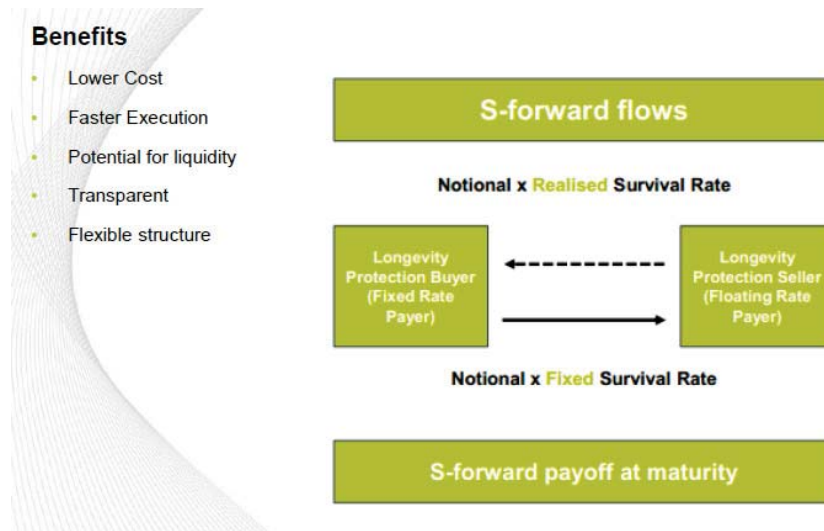
that would mean the European/UK indices would result in major basis risk

### Annual Frequency:

- need to establish extrapolation methodologies if monthly valuations/cash flow settlements are done (as per current market practice)

Source: LLMA ([www.llma.org](http://www.llma.org))

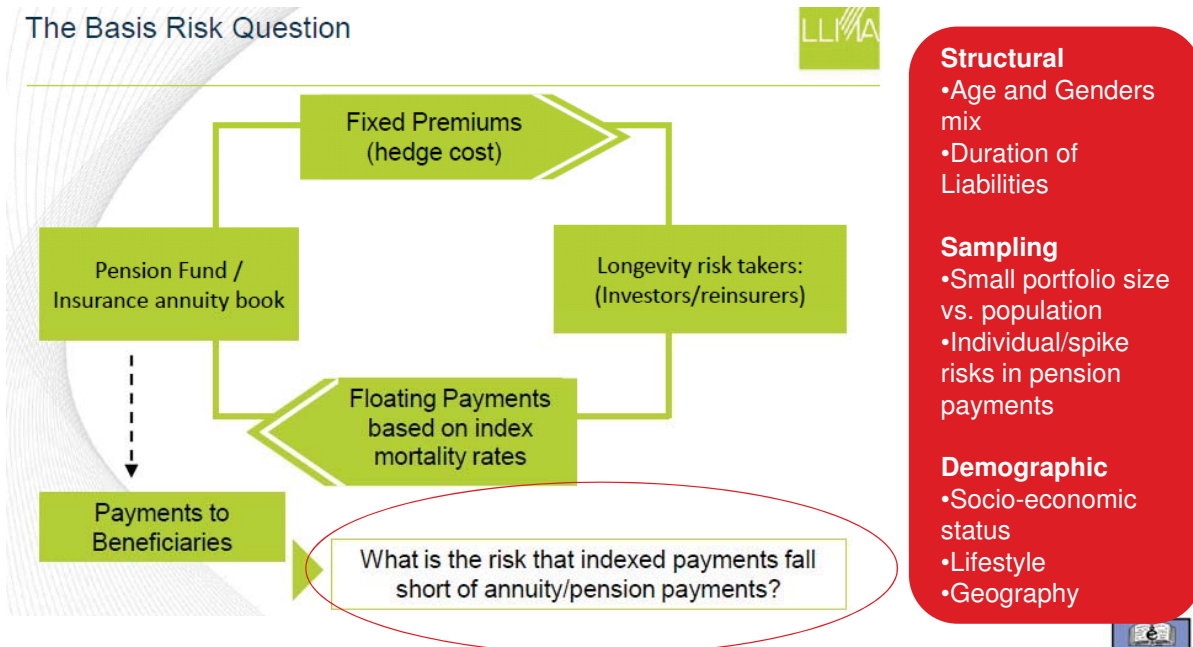
## Role of LLMA – Introducing the “S-Forward Swap”



Source: LLMA ([www.llma.org](http://www.llma.org))



## Role of LLMA – Basis Risk



Source: LLMA ([www.llma.org](http://www.llma.org))



Asia should be next?

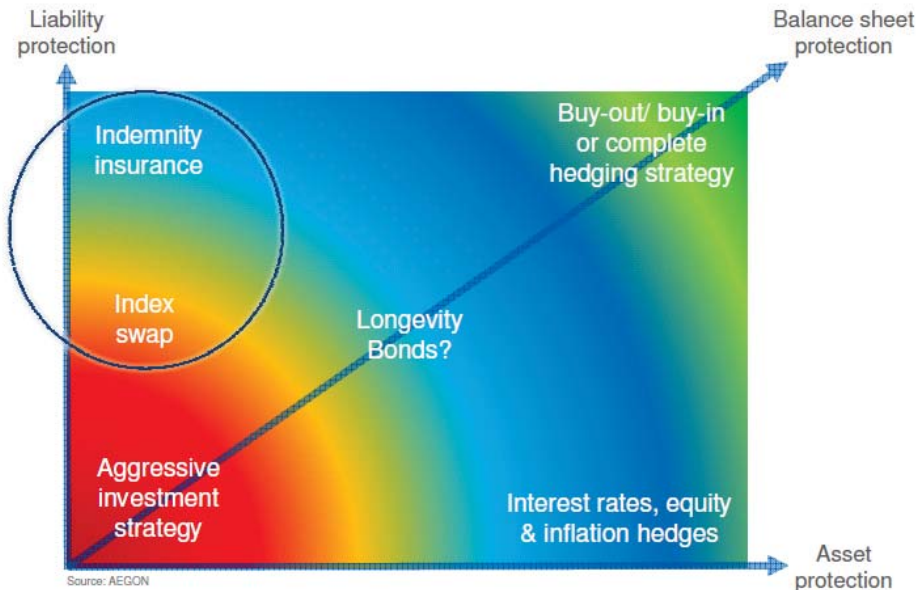


## Section 4: Current Market

# Overview

## All Available Solutions

# Targeted Longevity Risk Transfer solutions



Source: AEGON

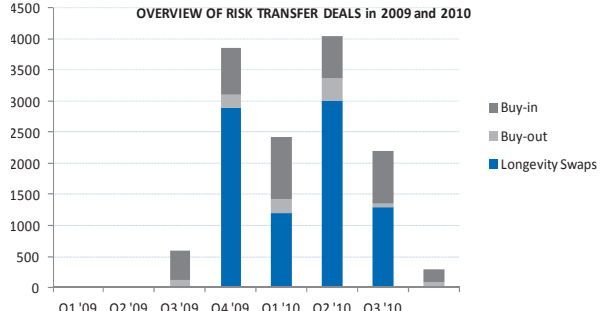
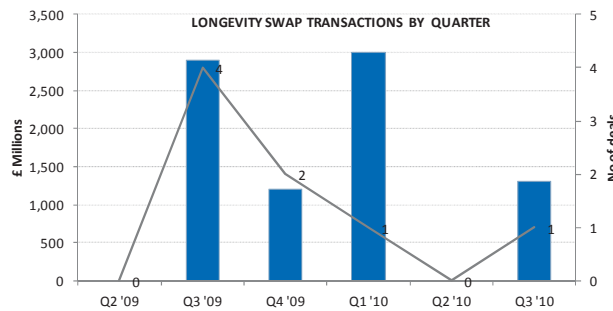
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# Overview

## Market Conditions – Longevity Swaps

- The Longevity Swap market has grown and evolved since 2009/2010 (post crisis)
  - The cumulative issuance, since the start of 2009 – 2011 now well over £8 billion
  - The graph on the right-hand side illustrates how dominant the Longevity Swap market is becoming versus the more traditional Buy-in and Buy-out markets
- The outlook for the sector remains strong with several large multi billion pound deals in the pipeline
  - Market expectation “was” that up to £15 billion of swaps would be executed by the end of 2011
  - In reality, as at 2012 (given recent deals), well over 20 billion can be reasonably estimated



Source: AonBenfield

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## Longevity Market Developments

- Interest in Longevity Risk Transfer market is not just limited to the UK. The Netherlands, Switzerland and Germany are all showing keen interest
- There is significant interest from the **major life reinsurance players with up to 15 life reinsurers currently participating in this market** and a number of new players considering entering
- **Banks are also devoting significant resources to the establishment of trading desks** and allocating capital to support the expansion of the market
- The significant number of parties (Banks and Insurers) in the longevity market are also trying to **stimulate an actively traded market in longevity risk**. The longevity swap market is seen as the next big market to develop after interest rate swaps, inflation swaps and credit default swaps
  - This has been reinforced with the development of the Life and Longevity Markets Association (“LLMA”) which was established to promote a liquid traded market in longevity and mortality risk which includes the likes of AXA, Deutsche Bank, Swiss Re and Legal & General
- In the U.S., there has been significant interest in understanding the risk transfer mechanics but there is currently a lack of genuine transaction appetite, which we believe is largely due to lack of pension benefit indexation



Source: AonBenfield

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## UK Longevity Deals to Date

Only major transaction in UK that is index linked

**AEGON** transaction in March 2012 on €12bn was also index-linked (Dutch Population Mortality)

Date	Entity	Provider	Liability Size	Notes
Feb 2013	BAE	LEGAL & GENERAL/Hannover Re	£2.7Bn	Pensioner bespoke longevity swap
May 2012	AkzoNobel	Swiss Re	£1.4Bn	Pensioner bespoke longevity swap
January 2012	Pilkington	Legal & General	£1Bn	Pensioner bespoke longevity swap
December 2011	BA	Goldman Sachs / Rothesay Life	£1.3Bn	Pensioner bespoke longevity swap
November 2011	Rolls-Royce	Deutsche Bank	£3Bn	Pensioner bespoke longevity swap
August 2011	ITV	Credit Suisse	£1.7Bn	Pensioner bespoke longevity swap
February 2011	Pall	J P Morgan	£70M	Non-pensioners index based longevity hedge
July 2010	British Airways	Goldman Sachs / Rothesay Life	£1.3Bn	Synthetic buy-in (longevity swap plus asset swap)
February 2010	BMW	Abbey Life / Deutsche Bank	£3Bn	Pensioner bespoke longevity swap
November 2009	Royal Berkshire	Swiss Re	£1Bn	Pensioner bespoke longevity swap
July 2009	RSA Insurance group	Goldman Sachs / Rothesay Life	£1.9Bn	Synthetic buy-in (longevity swap plus asset swap)
May 2009	Babcock	Credit Suisse	£1.5Bn	Pensioner bespoke longevity swap (3 schemes)



Source: AonBenfield

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## AEGON Transaction Overview

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- Deutsche Bank has completed the largest longevity swap to date (i.e. March 2012) via a huge risk transfer deal with insurer Aegon covering **EUR12bn in annuity liabilities**.
- Investment bank swap providers then offload the risk - to reinsurers and capital markets (i.e. ILS investors)
- The amount of risk transfer also suggest the large risk appetite shown by the capital markets for this new type of “diversified beta”
- Technically, the transaction would have involved more sophisticated modelling methodologies (i.e. not deterministic) stochastic modelling of the underlying risks including trends, volatility, correlations, and individual pensioner risks.
- The transaction has been based on Dutch population data which has been applied to a synthetic portfolio. This enables Aegon to hedge the liabilities on a portion of their book of annuities.
- Deutsche Bank said *that by distributing the risk of this trade in the capital markets, they were able to manage the longevity risk taken on through the transaction while at the same time offering investors access to a new, diversified asset class.*
- Deutsche Bank said *the Aegon deal was the first swap...*

Source: Deutsche Bank / Aegon

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## Kortis Capital Overview

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- **First cat bond structure** that has been used to [transfer longevity risks to the capital markets on behalf of Swiss Re](#)
- The program provides protection against mortality rates diverging unfavorably between Swiss Re’s life insurance portfolio in the U.S. and their annuitants in the United Kingdom
- Investors **are at risk of an increase in the difference between the annualized mortality improvement in a UK cohort vs. the annualized mortality improvement in a US cohort**
  - The UK cohort covers males aged between 75 and 85 and is based on data provided by the UK Office for National Statistics (“ONS”) for England and Wales only
  - The US cohort covers males aged between 55 and 65 and is based on data provided by the U.S. Centers for Disease Control and Prevention (“CDC”)
- The mortality improvements are measured over an [eight year period](#) from Jan 1<sup>st</sup> 2009 through until December 31<sup>st</sup> 2016
  - Trigger defined at the start of the transaction and based on the 8 year risk period
- The longevity risk was modeled by Risk Management Solutions using their recently released **RMS Longevity Risk Model**
  - The new approach is more transparent than a statistical model and uses a forward looking approach to mortality rather than extrapolating historical mortality rates
- The deal closed on the 22<sup>nd</sup> December 2010 for a size of \$50m and a price of LIBOR +500 bps

Source: AonBenfield

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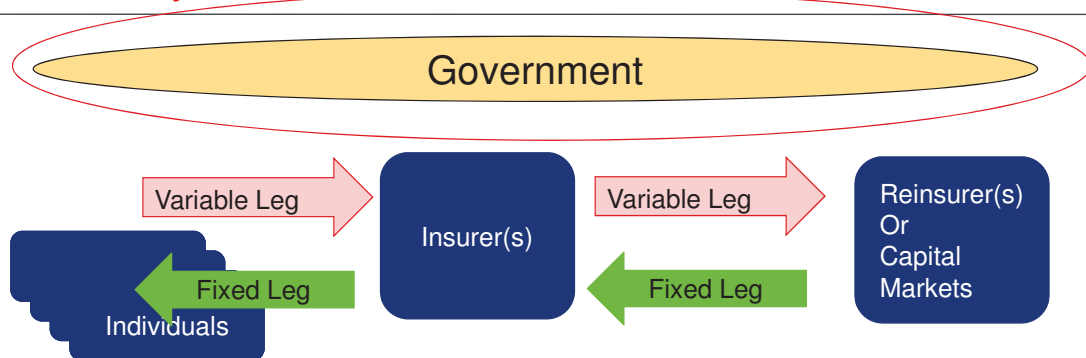




# Section 5: Role of Governments: - Hypothetical Case Study

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## The Industry Has a Vital Role



Government's role is vital in starting and maintaining the viability of this market (i.e. favourable regulatory relief, tax incentives, access to reliable data etc), protecting the ultimate end user => YOU



## Role of Governments: A Case Study

- Given the social impact of retirees running out of money in retirement, governments have been involved with how capital should be managed in the payout phase
- To combat the possibility that retirees might outlive their assets, Singapore's Central Provident Fund (CPF) – the national **compulsory savings and social security scheme** – made the bold move of mandating annuitisation
- This followed the findings of a 2007 government study examining how CPF might respond to an increasing life expectancy as the country's baby boomer generation enters retirement
- CPF ranks among the world's **largest defined contribution (DC) schemes**, with about 3.23 million members. The CPF Board, a regulatory public agency, runs this national pension fund. **By 2013**, annuitisation, rather than the current phased withdrawal, **will be mandatory for a portion of CPF retirement savings**
- Furthermore, it facilitates this with viable healthcare (i.e. MediShield) and long-term care (i.e. ElderShield)

CPF has got the *basics* covered.....  
.....but is this enough?

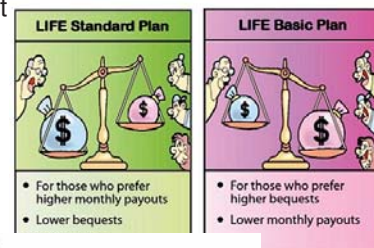


## Role of Governments: A Case Study

- From January 2013, CPF LIFE will be simplified into two plans – the LIFE Standard Plan and the LIFE Basic Plan. Each LIFE plan provides a different combination of trade-offs between the amount of monthly payouts that you would receive and the bequest your beneficiaries.

<sup>17</sup> Mortality Experience refers to the likelihood of death at various ages. If more persons live longer, the monthly payout might be lower, and vice versa.

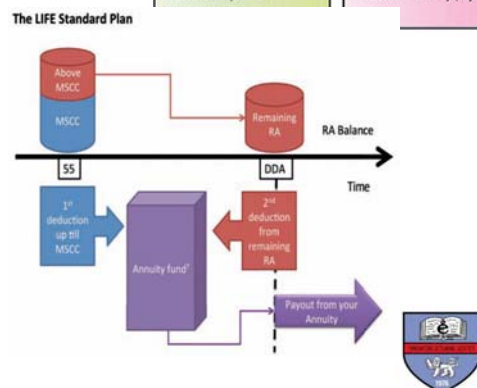
No, your monthly payout may be reviewed annually, as well as when there are net outflows from your RA.



Longevity Risk is *mitigated*, but *not guaranteed* to go away....

- ii. If you had carried out any transactions which affect your RA balances, e.g. refund of property sale proceeds, top-ups, lump sum withdrawal etc; OR
- iii. If you had opted for the LIFE Basic Plan, declining extra interest<sup>18</sup> (EI) payouts as the amount committed to CPF LIFE falls below \$60,000.

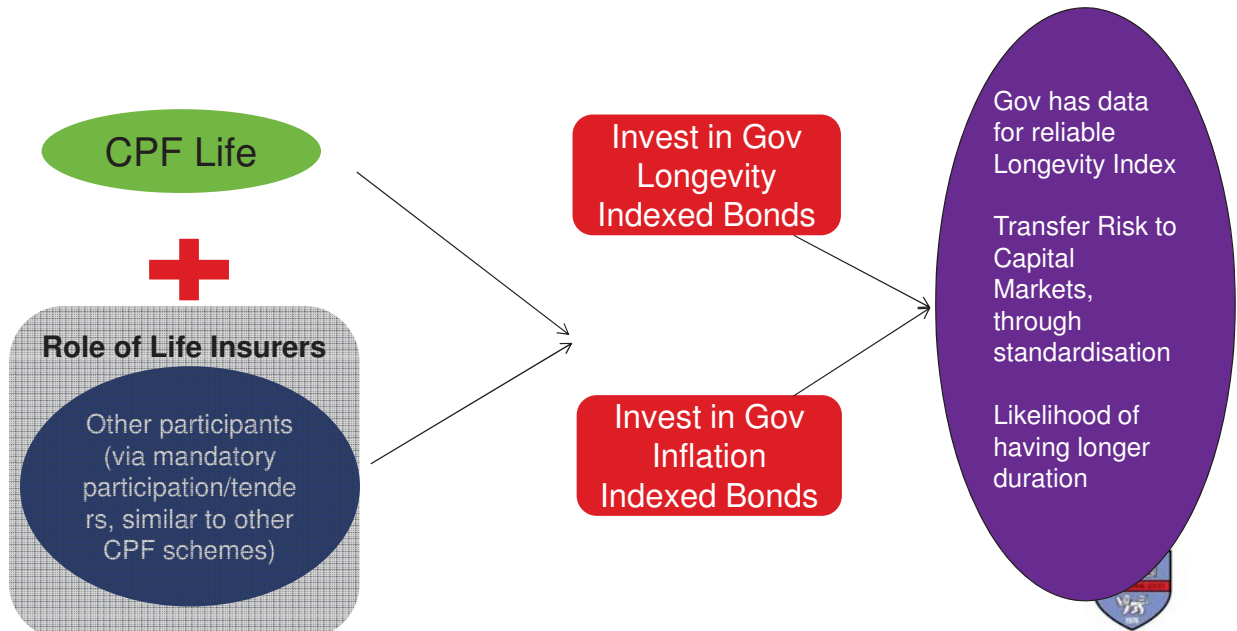
Source: CPF



## Role of Governments: A Case Study

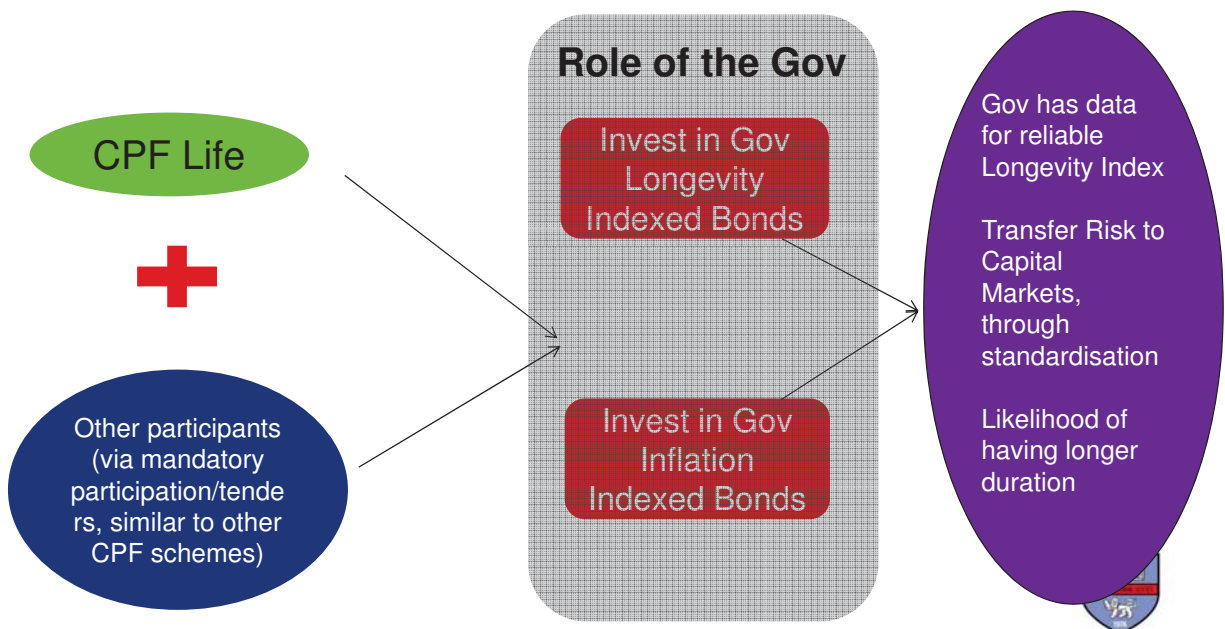
CPF Life provides the Basic provisions. Private Life insurers will provide the “top-up” options for the higher savers or individuals with higher net worth

Next Steps...



## Role of Governments: A Case Study

Next Steps...



# Section 6: Conclusion

## Conclusion

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- Longevity Risk is significant and you should be scared
- Risk identified, but solution seems limited so far – LLMA /current Longevity Market, it's a Start!
- Optimal solution will encompass government and industry, and allow for global risk sharing
- Currently CPF is primary supplier of longevity protection for individuals in Singapore – will the private sector re-enter if wider risk-transfer solutions are available?
- (Suggested) Recommendations:
  - Industry work together with CPF to consolidate data
  - Singapore join developments to establish global longevity indices (or Asia longevity indices?)
  - Discuss with major government bodies on the potential role of government to aggregate risk
  - Continue to track developments in global capital markets for longevity risk transfer
  - Work further with LLMA to integrate Asia

We're not getting any younger.....

