



Longevity 8 Conference 2012

Waterloo ON, Canada

Advances in the Life Settlement Market and their Relevance to  
the Macro Longevity Investor



**Circadian Capital**  
Longevity Expertise

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  - and why do the macro guys hate us?
- Four flavours of longevity risk in life settlements
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- From pricing policies to pricing longevity risk
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# Personal Background

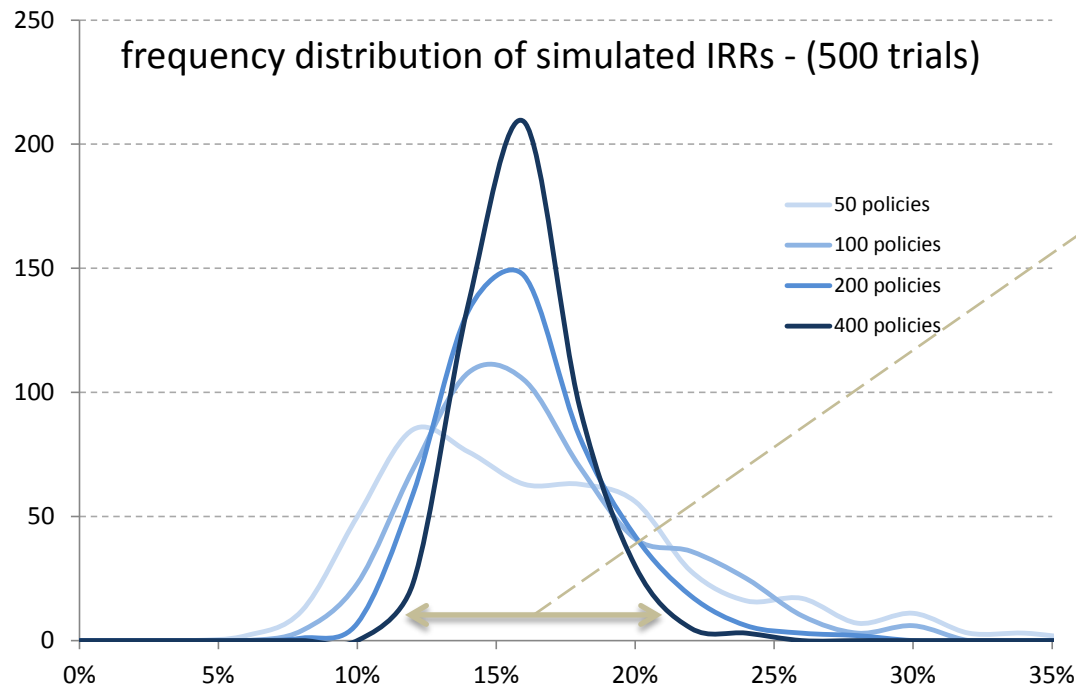
- Mizuho 2005
- Portfolio aggregation from 2005 – 2008 (c \$1.4bn)
  - Experience history, risk analysis
- Sub-Prime crisis
  - Asset management focus: data analysis
- Circadian Capital 2011
  - To provide a more statistically robust approach to micro longevity investment

# Life Settlements: What went wrong? ... in our view

- Early mortality estimates were too aggressive, leading to...
  - A slow and steady percolation of investor losses
  - STOLI
  - Egregious fee extraction by some intermediaries
- Investors relied too heavily on LE providers - some still do!
  - Would you buy bonds solely on the aggregate outlook of Moodys and S&P?
- The definition of 'risk' was abused, massively
  - This contributed to heavy retail-investor involvement

# Longevity risks – 1. Idiosyncratic Risk

- Diversification, law of large numbers



This gap gives a measure of the variance or 'volatility' of return...

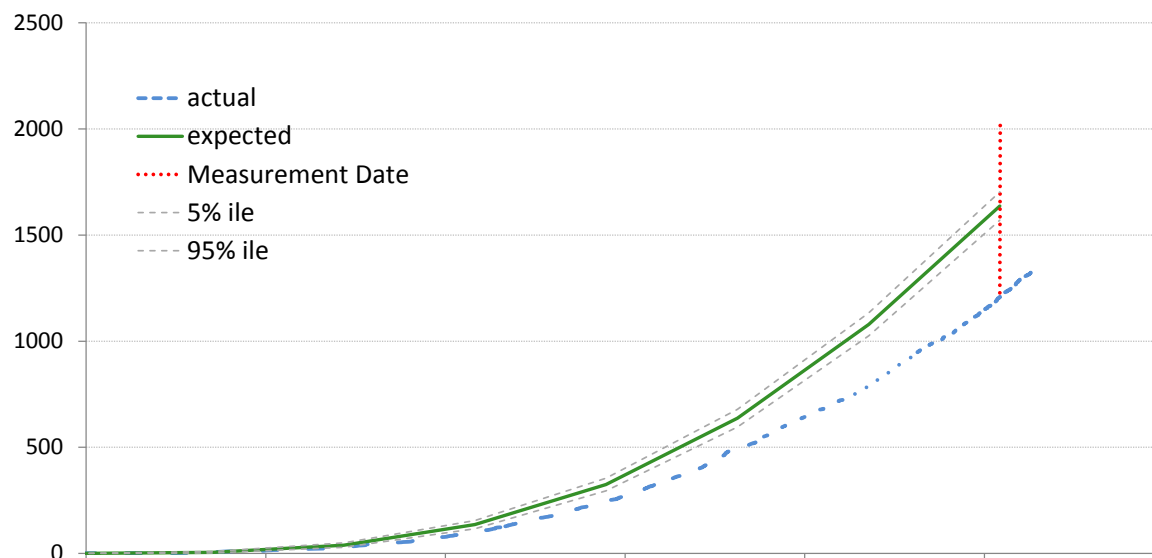
... but what type of volatility is this?  
Historic?, implied?...

... no, neither, it is model variance.

- This risk is easily calculable and can be over-emphasised
- Sophisticated measures from this framework can divert attention from more serious forms of longevity risk

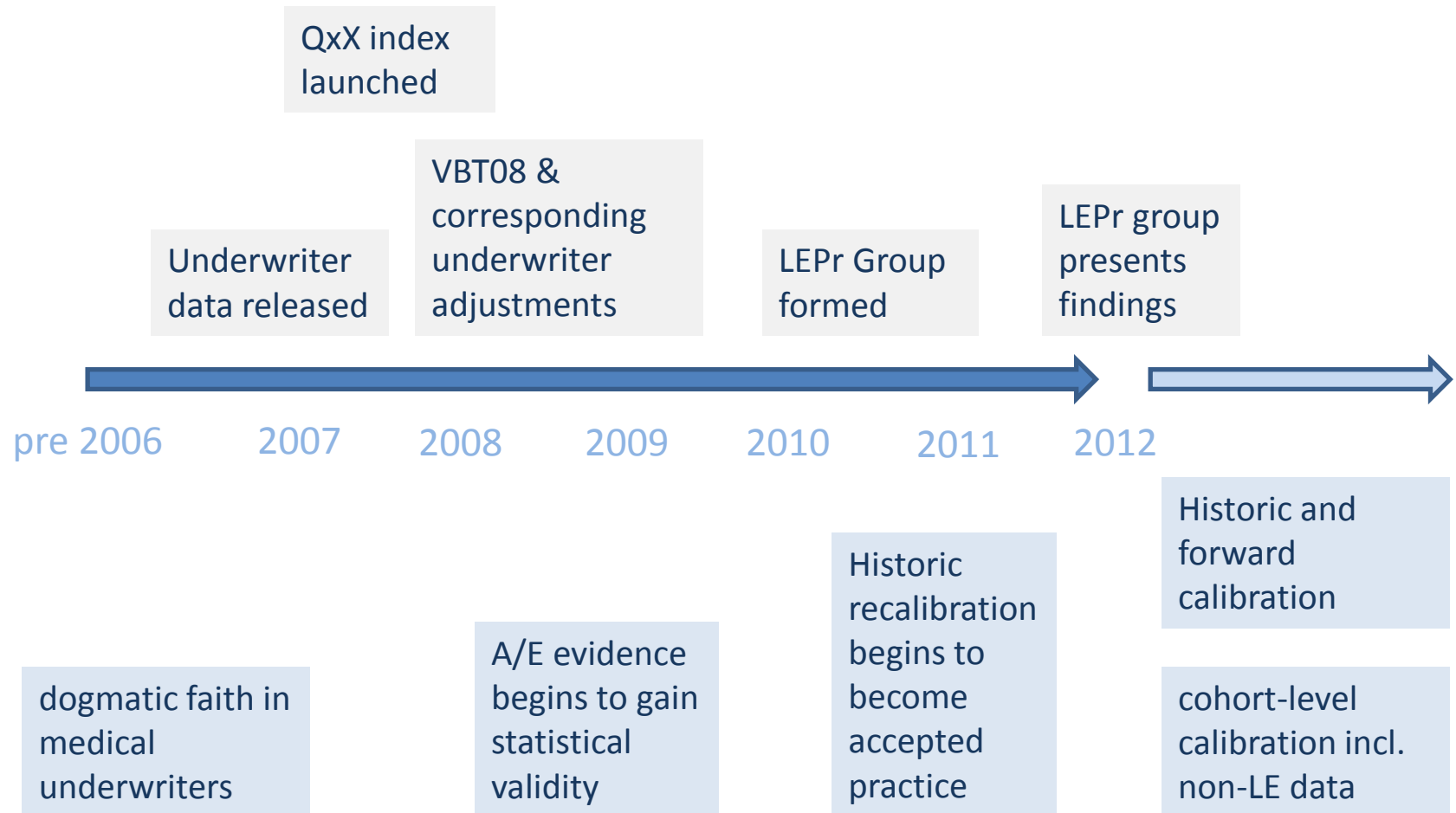
## Longevity risks – 2. Cohort Calibration Risk

- Calibration Risk:
  - The risk that mortality projections are inaccurate across an entire cohort
  - Probably the most important risk



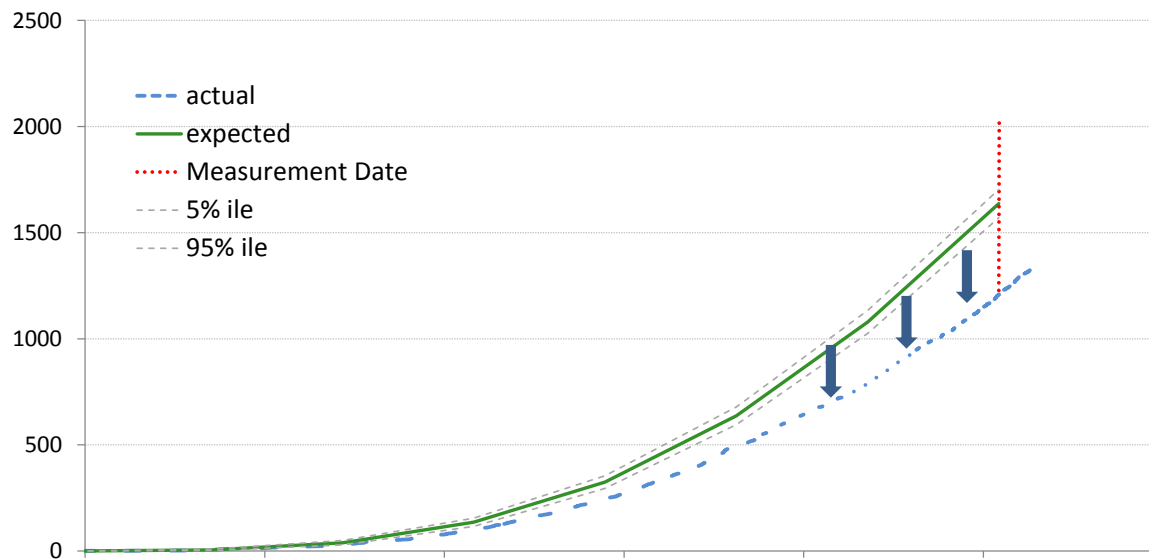
- *“life settlements offer a low-risk...”* : **False**
- *“life settlements offer a low volatility...”* : **True**, but misses the point...
  - life settlement portfolios exhibit trend risk, **not** volatility risk

# Mortality Calibration – a (highly subjective) History



# Mortality Calibration – Historical Calibration

- The green line on the chart is derived from the survival function that discounts premiums in a probabilistic pricing model



- Applying a scaling factor to the survival function calculation will lower the green line to the blue
- This factor can then be applied to valuation and pricing



# Mortality Calibration – Historical Calibration

- Historical calibration can be applied to a specific portfolio or datasets
- Is it appropriate to model the whole pool / dataset or should it be split into cohorts?

## Underwriter sourced

Sex  
Age  
Smoking status  
Impairment level  
Impairment type  
Vintage

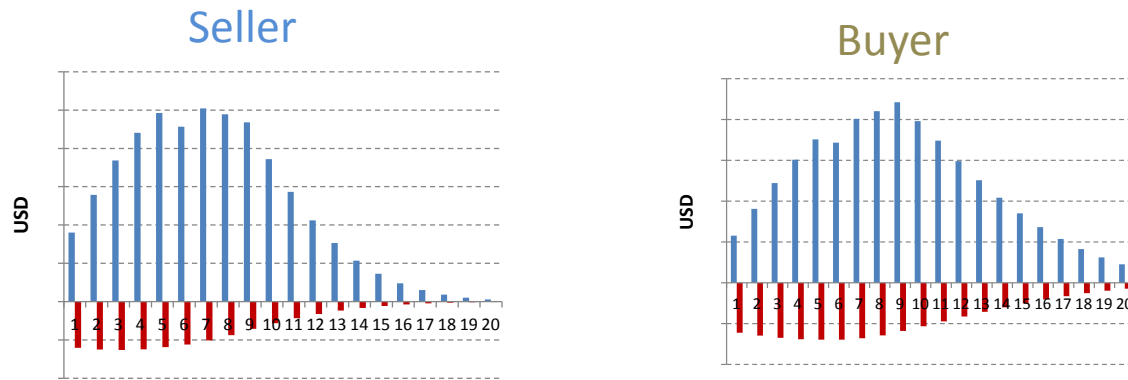
## Not underwriter sourced

Wealth effects  
- Total NDB  
- Geography  
Policy factors  
- Seasonality  
- Underwriting class  
- Table shaved  
STOLI – reverse arb

- The right hand box presents a significant problem in data collection
- The outcome of this type of recalibration analysis is that many portfolio managers have different ‘risk adjusted’ views of policy cashflows...

# Mortality Calibration – Historical Calibration

- Imagine a seller with a 'blended LE' view of the world vs. a buyer who has a risk-adjusted view



Seller: \$1MM NDB Policy for sale - 18% IRR, \$107,000

Buyer: \$107k = 6.5% IRR; my hurdle is 12%\* IRR so 48k bid

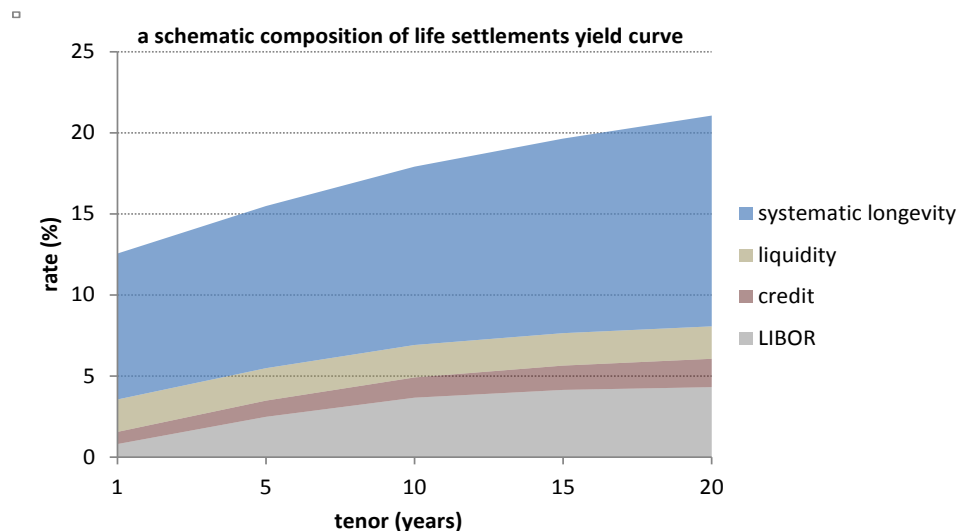
Seller: \$48k is a 37% IRR !!!

- This example uses a real policy and one of Circadian's adjustments
- Is the market IRR useful as an average?

*\*This is lower than the prevailing 18% mkt. rate because the risk adjustment increases certainty about cashflow timing and therefore lowers the risk premium demanded*

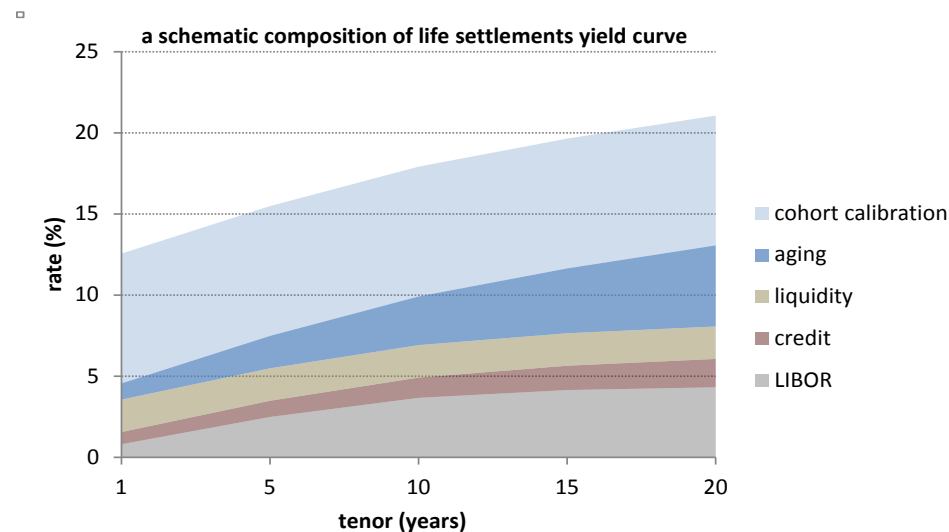
## Longevity risks – 3. Aging

- Aging - or forward improvement risk - is often an afterthought
- In a low-LE environment it is a second-order risk
  - Compare multiplying  $qx$  by  $0.99^n$  with halving  $qx$  for a mortality correction
- In a pool with longer LE's it can start to have a meaningful effect
- It is a crucial link with the pension world where sophisticated stochastic modeling is used



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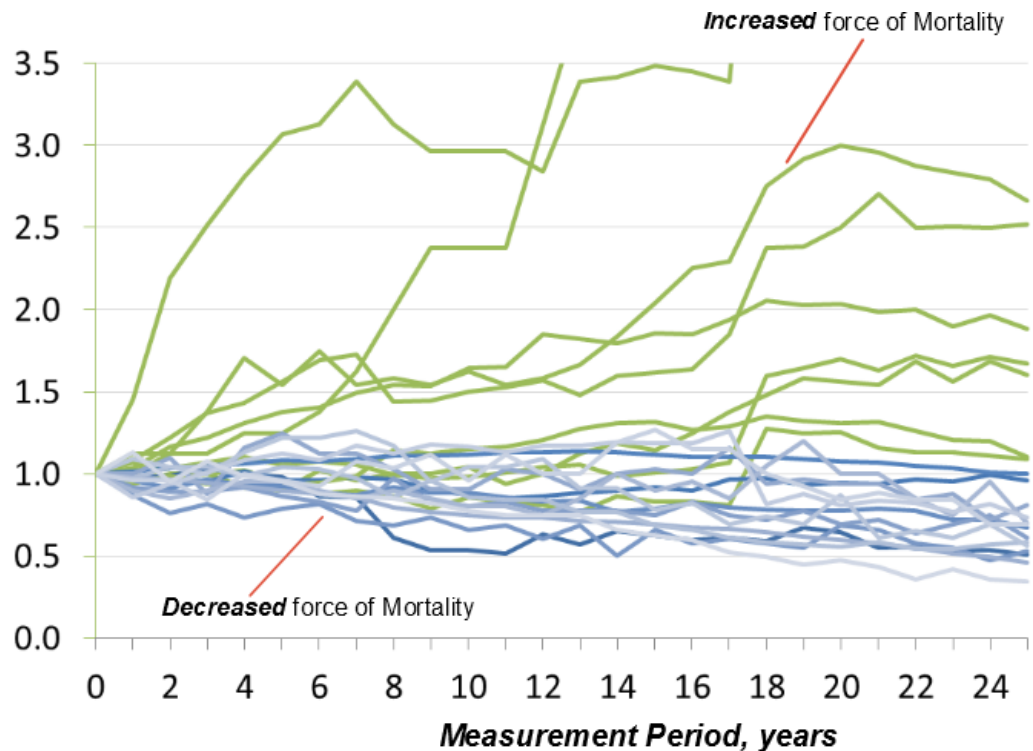
# Longevity risks – 3. Aging

Another way of examining the development of mortality is to look backward - to the historic improvements that we have seen over an extended period of time across the US.

Here we take a look at the major causes of death in the US over a recent period covering 25 years.

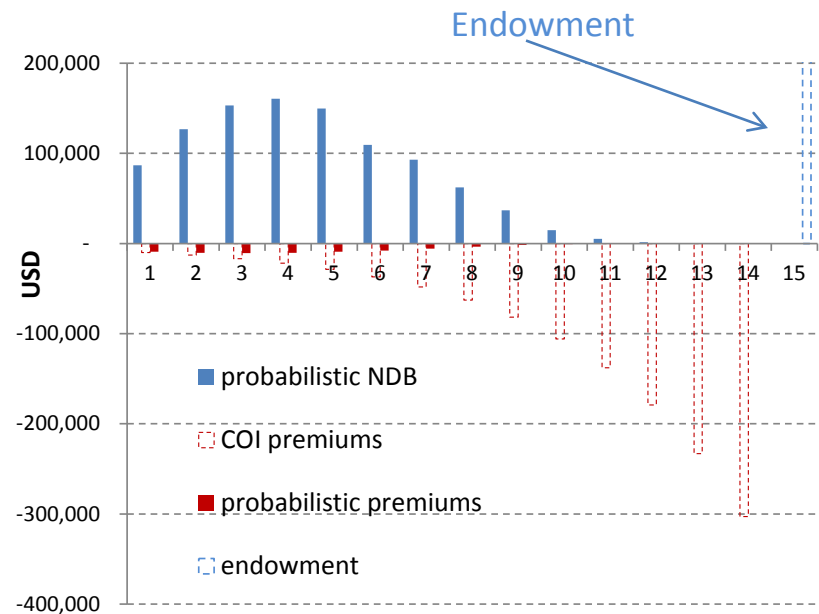
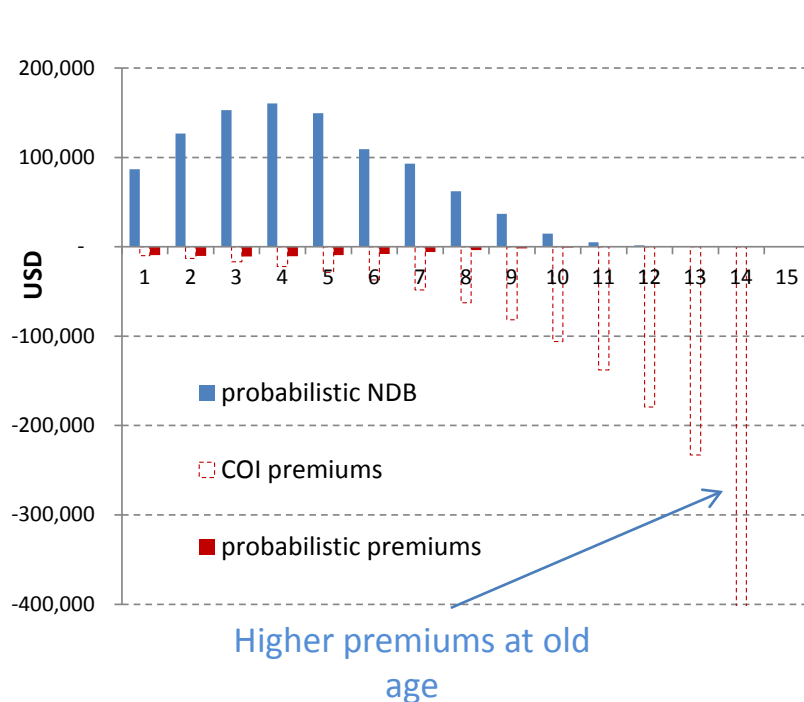
We have unitised each cause so that all start with a score of 1.0.

For any impairment that starting number is meaningless, but any decrease to it over the period represents an improvement, and a lessening of the fatality of that particular impairment.



# Longevity risks – 4. Structural Policy Risk

- Two policies on the same insured: same price; same risk?



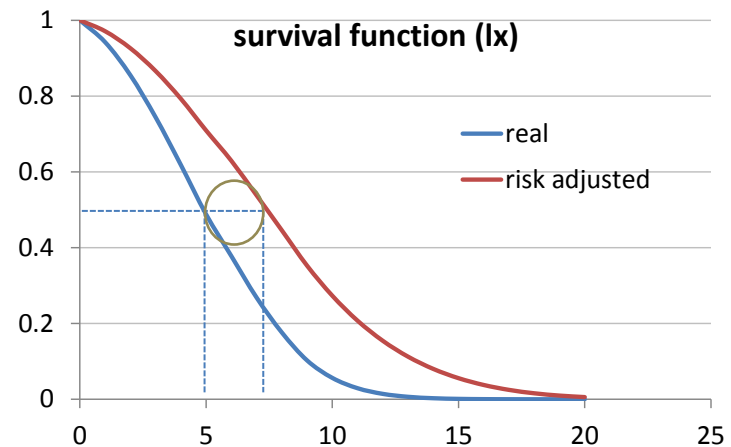
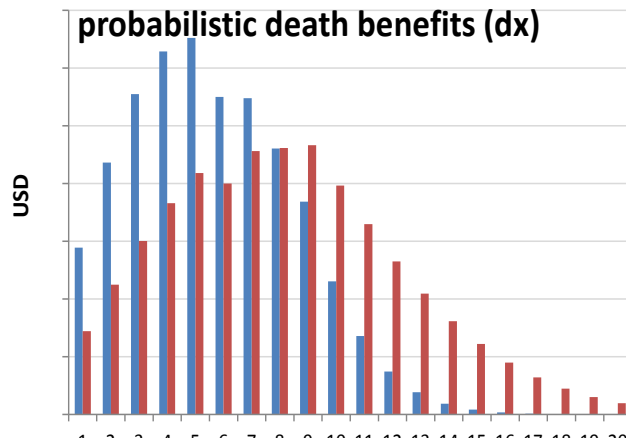
- The probabilistic cashflows are identical so any preference for the right-hand case implies a higher price and therefore lower IRR

# Longevity Risks – Implication for Mark to Market

- Life settlements are exposed to different types of longevity risk
  - Aggregating a large pool does not mitigate all types.
- The myriad combinations of these risks have important implications for valuation / mark-to-market
- It is highly unlikely that any two cases have the same risk mix therefore, against any given cashflow regime, any two cases must command different returns (IRRs)...
- ... so a benchmark yield approach to IRR does not make sense
- Without a practical mark-to-market framework, how is performance or track record demonstrated?

# A Model to Capture the Risk/Return Dynamic

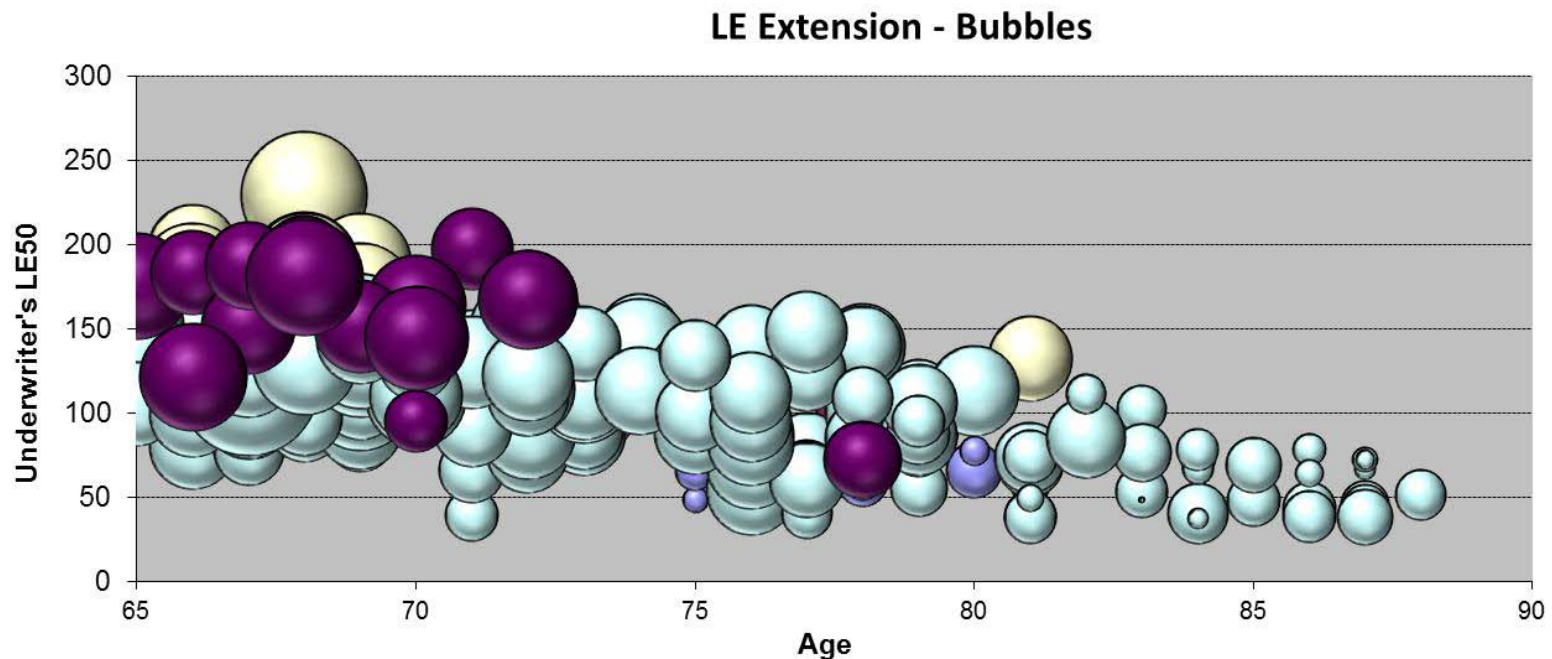
- Eliminate cohort calibration risk via. mortality adjustment
- Hold market price fixed and adjust mortality until  $IRR = LIBOR$ 
  - Alternatively, say:  $LIBOR + \text{carrier credit} + \text{liquidity}$
- Measure the difference in the two distributions
  - This example uses the shift in LE50





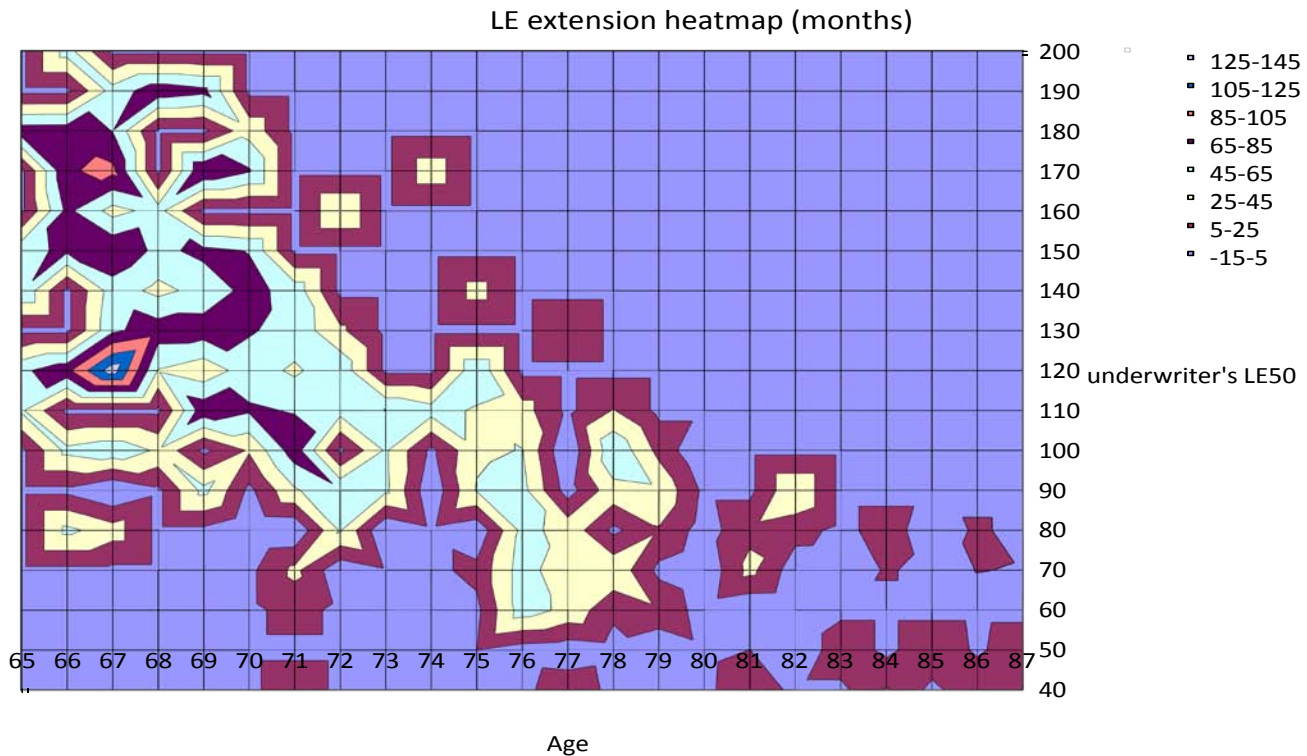
# Expressing Policies as Relative Longevity Risks

- Each bubble shows a policy's *relative* tolerance to longevity risk given the price it was traded at
- Two axes are used to distinguish old/healthy from young/sick
- This chart is for males; a separate one is used for females



# A Pricing Surface

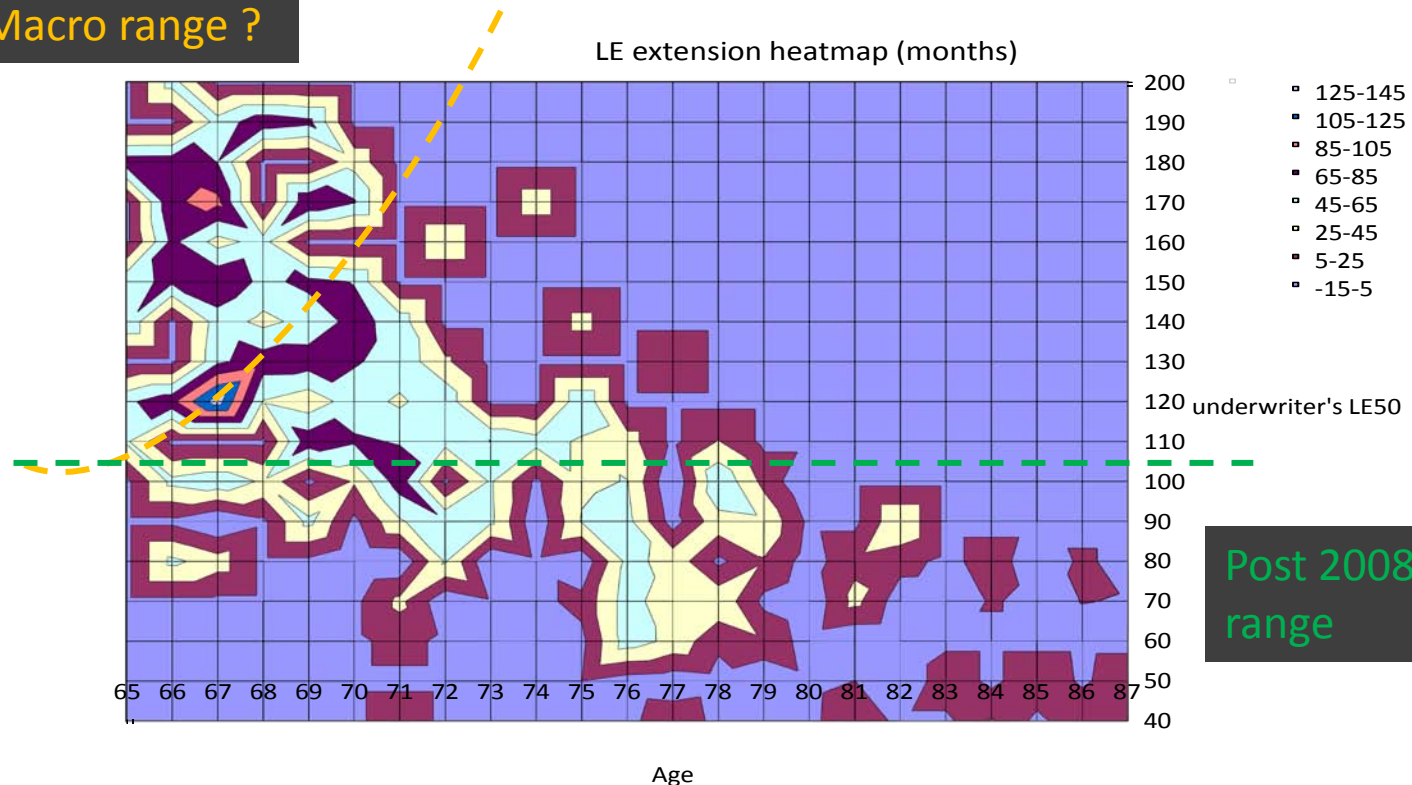
- Same data as previous slide but maximums plotted only
- The chart effectively shows the 'longevity-risk efficient surface'



## A Pricing Surface cont'd

- Same data as previous slide but maximums plotted only
- The chart effectively shows the 'longevity-risk efficient surface'
- Post 2008, micro buyers currently focus on shorter LEs

Macro range ?



## Conclusions

- Life settlements are not necessarily volatile but they are risky
- The chief risk – longevity – manifests in a number of ways pointing to a need for high quality professional asset managers
- The wide spectrum of risk profiles makes an IRR-based mark-to-market framework difficult
- Re-thinking the pricing model along risk-neutral lines changes the game from ‘pricing policies’ to ‘pricing longevity risk’
- This view feels closer to the macro world even if the underlying cohorts are *currently* distinct



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