



Longevity Bond Annuity Provider's Perspective



Possible perspectives for assessing attractiveness of a longevity bond



- Evaluate bond from the perspective of a general investor...
- ...then add in benefits from risk reduction / capital release from perspective of Annuity Writer
- Alternatively, calculate the company's new business rate for an annuity based on the same lives...
- ... and calculate the profitability of new business backed by a longevity bond under the company's pricing assumptions (making allowance for any reduction in reserves)
- Weigh up other considerations, e.g. aftermarket conditions



Perspective of general investor

How will the return I get vary with changing Life Expectancy?

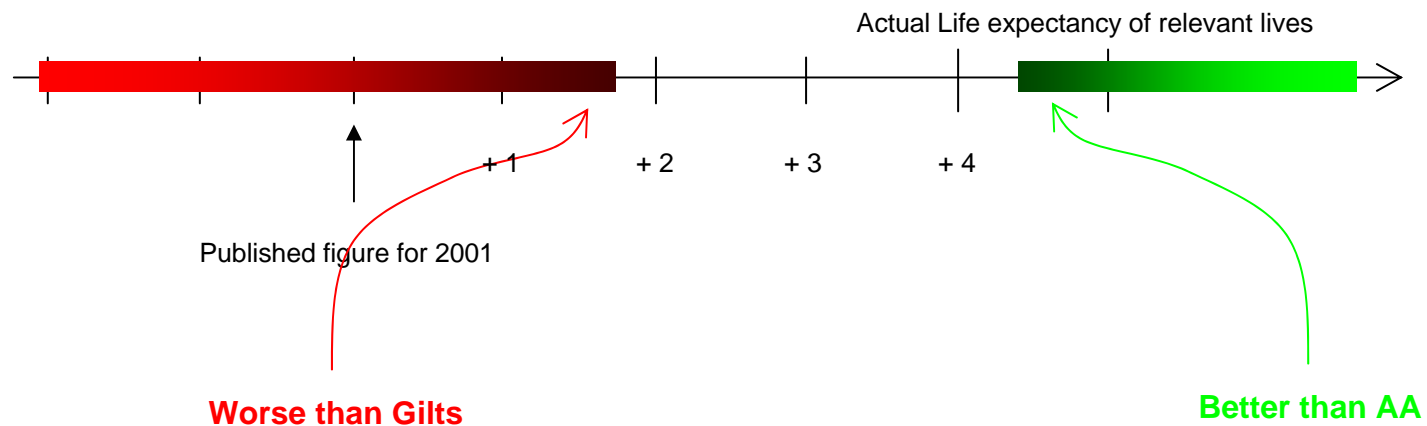
<u>Age</u>	<u>1981</u>	<u>1991</u>	<u>2001</u>
65	13.0	14.2	16.0
75	7.7	8.5	9.6
85	4.3	4.7	5.1

England and Wales population data; no allowance for future mortality improvement



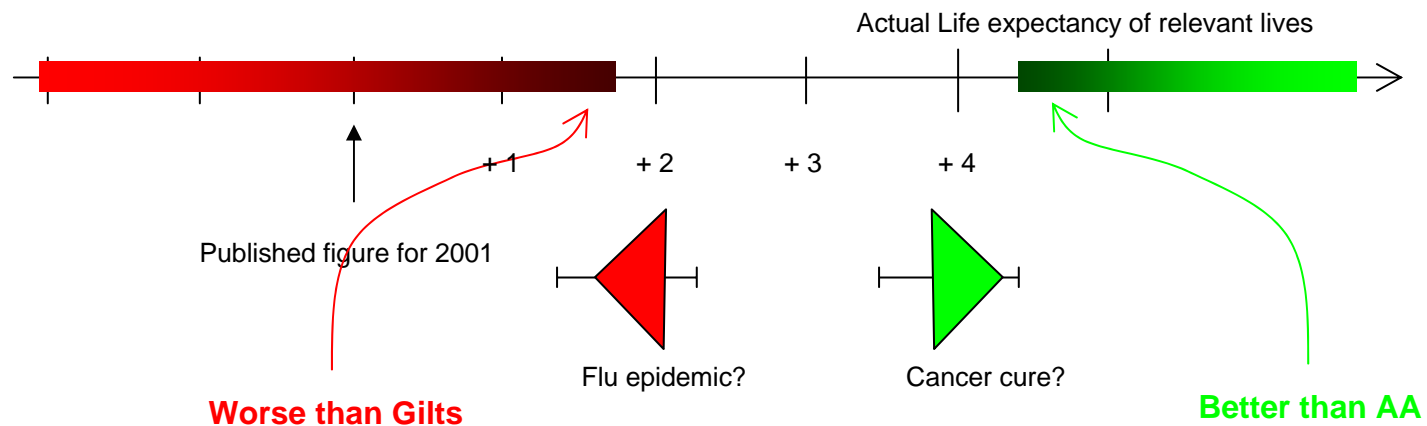
Perspective of a general investor

- Needs a convenient / widely understood measure of mortality (e.g. Life Expectancy) and relationship of returns on bonds to this measure



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Perspective of general investor

- Unlikely to put in the effort to understand the payoffs ...
- ... and unlikely to be excited if he or she did
- Won't like the lack of liquidity
- Nor find it a good way to bet on a cure for cancer, heart disease etc.

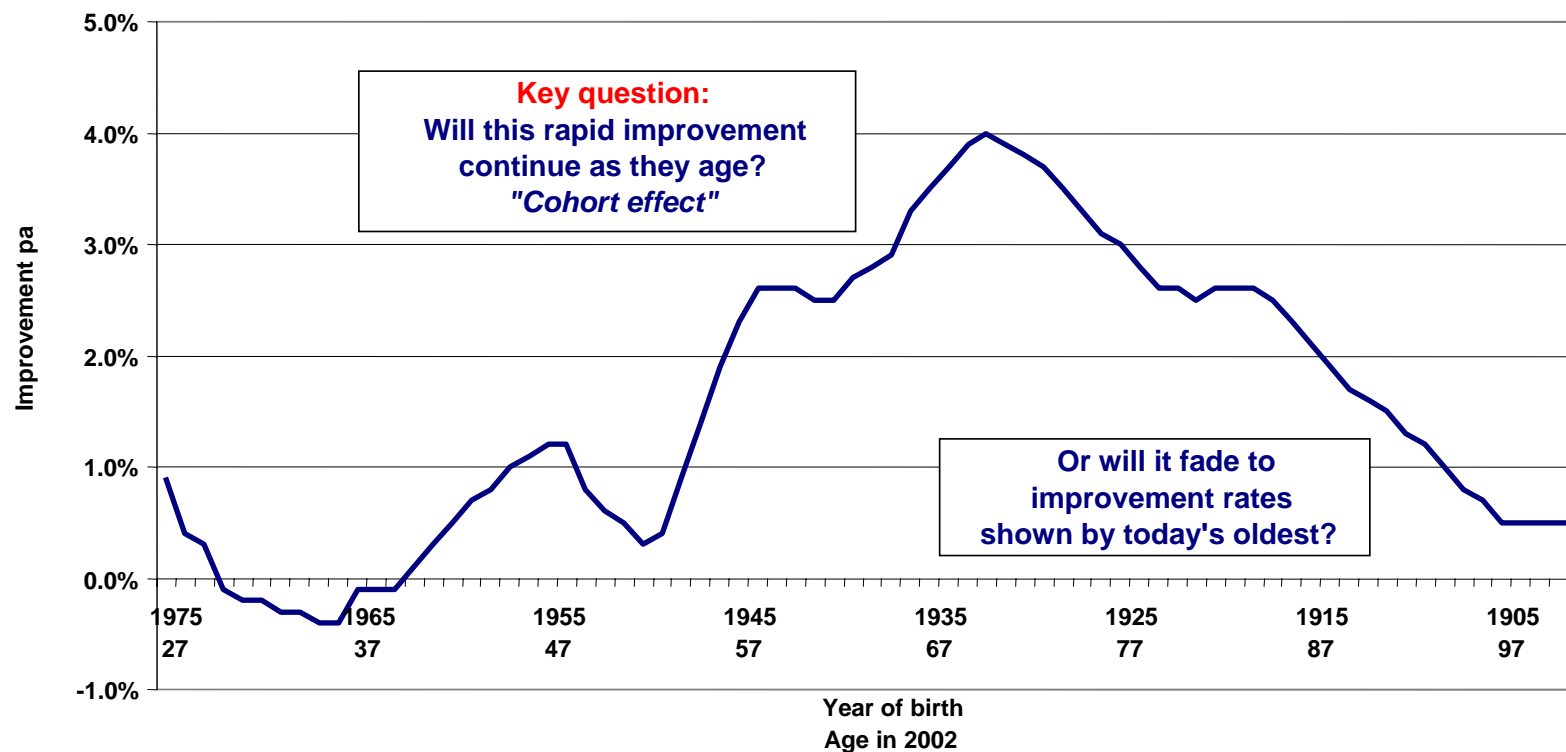


Perspective of Annuity writer

- What is the extra value to an annuity provider?
- What is the value or capital release / risk mitigation for an Annuity writer?
 - Regulatory capital?
 - Market / rating agency views?
 - Company's internal view of risk mitigation?

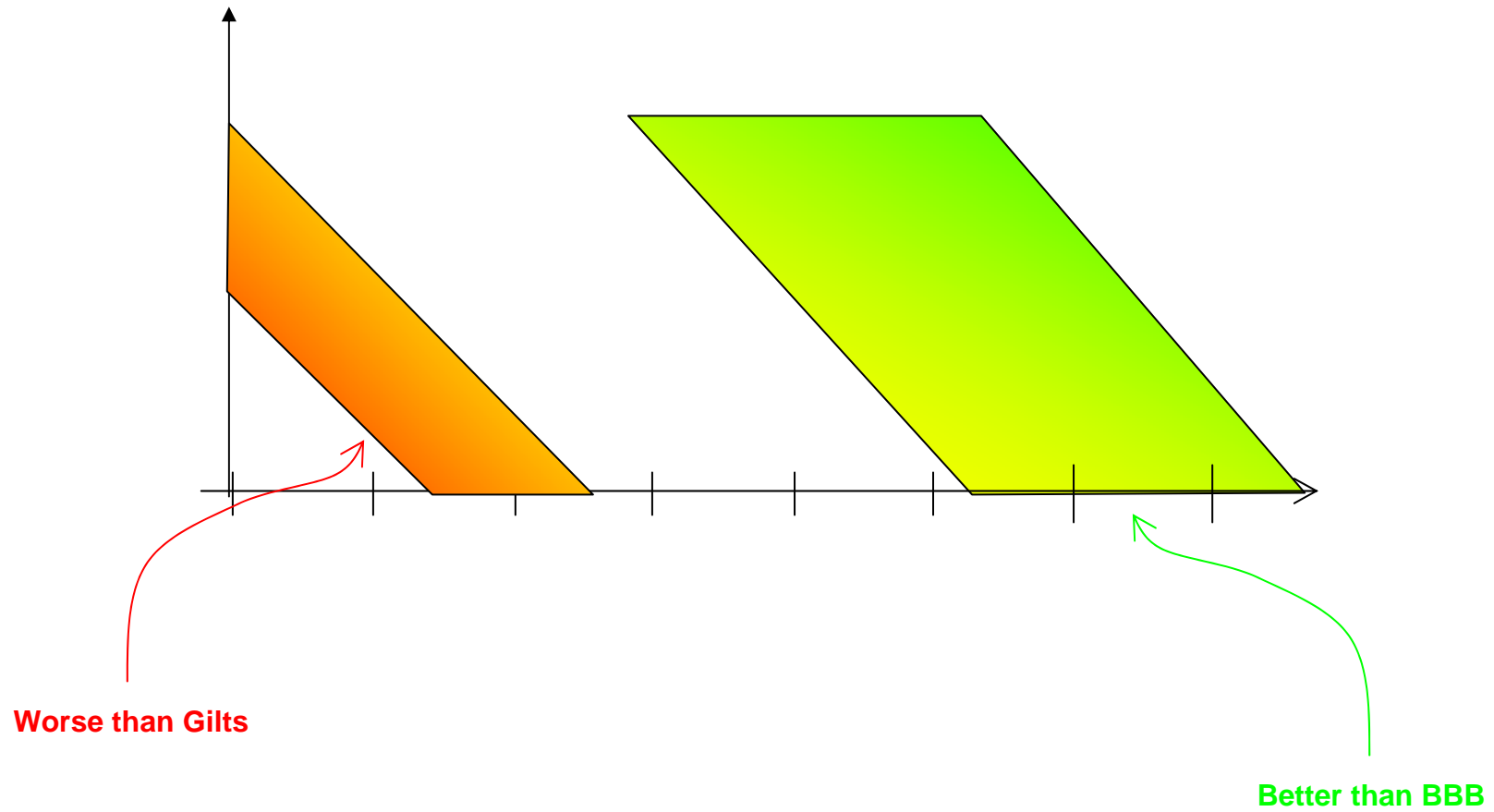
Perspective of Annuity Writer

Male mortality improvement 1993 - 2001



Based on England & Wales population mortality 2001. Population improvement for period 1993 to 2001

Perspective of Annuity Writer



How has the Actuarial profession reacted?

1. Annuity pricing / reserving has always made allowance for mortality improvement.
2. In 1998 & 1999 CMIB published revised standards for mortality improvement.
3. In 2002, CMIB proposed three cohort based tables for improvement, based on population data for 1993 to 1999:
 - Short cohort : cohort effect fading away by 2010
 - Medium cohort: by 2020
 - Long cohort: by 2040
4. Institute of Actuaries : 3 papers in April 2004 on mortality improvement. Emphasis on causes and durability of cohort effect.
5. CMIB expected to publish revised improvement tables in Spring 2005.

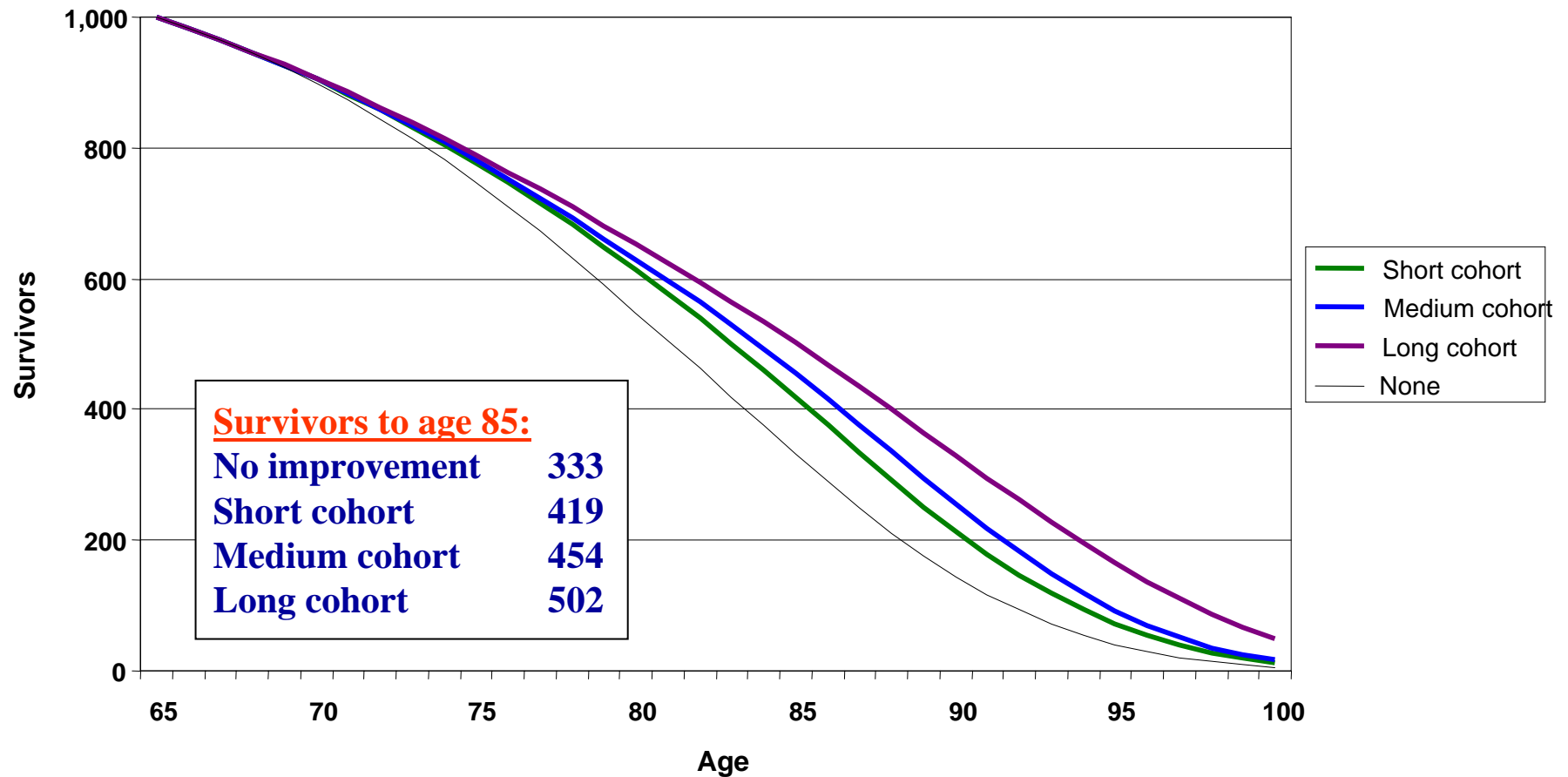
Impact of mortality improvement Male age 65



<u>Improvement table</u>	<u>Life expectation</u>
No improvement	16.0
	-
Short Cohort	17.5
Medium Cohort	18.1
Long Cohort	19.4
Level 3% p.a.	19.3

Based on England & Wales population mortality 2001. Population improvement for period 1993 to 2001

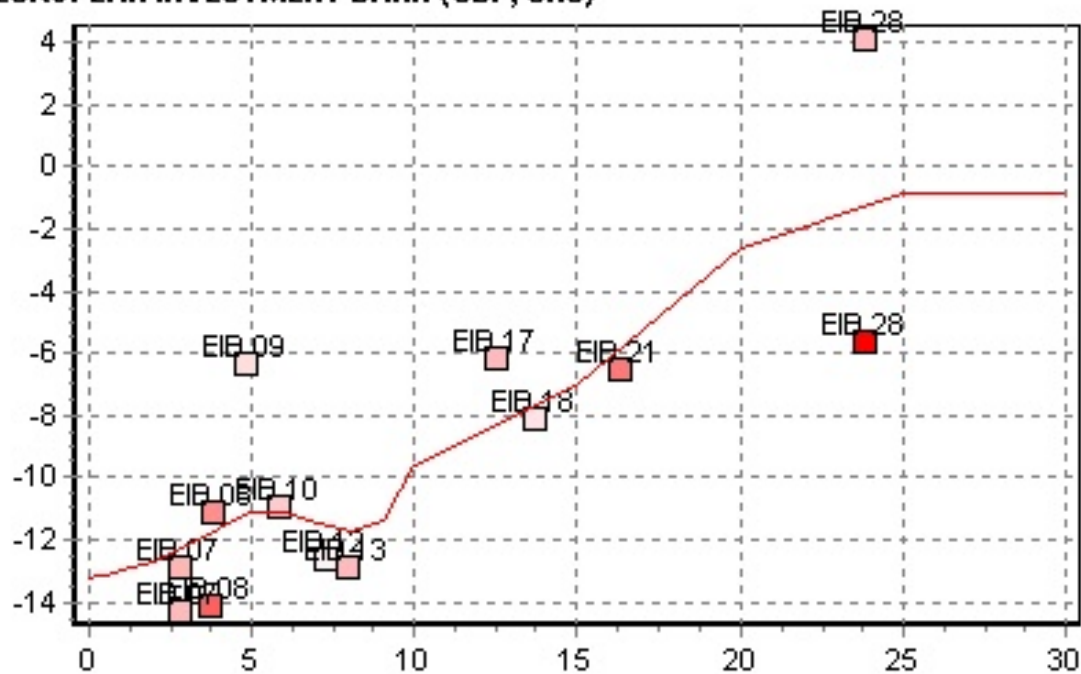
Projected survivors from 1000 males age 65 in 2002



Based on England & Wales population mortality 2001. Population improvement for period 1993 to 2001

Discount using issuer curve, e.g.

EUROPEAN INVESTMENT BANK (GBP, UNS)

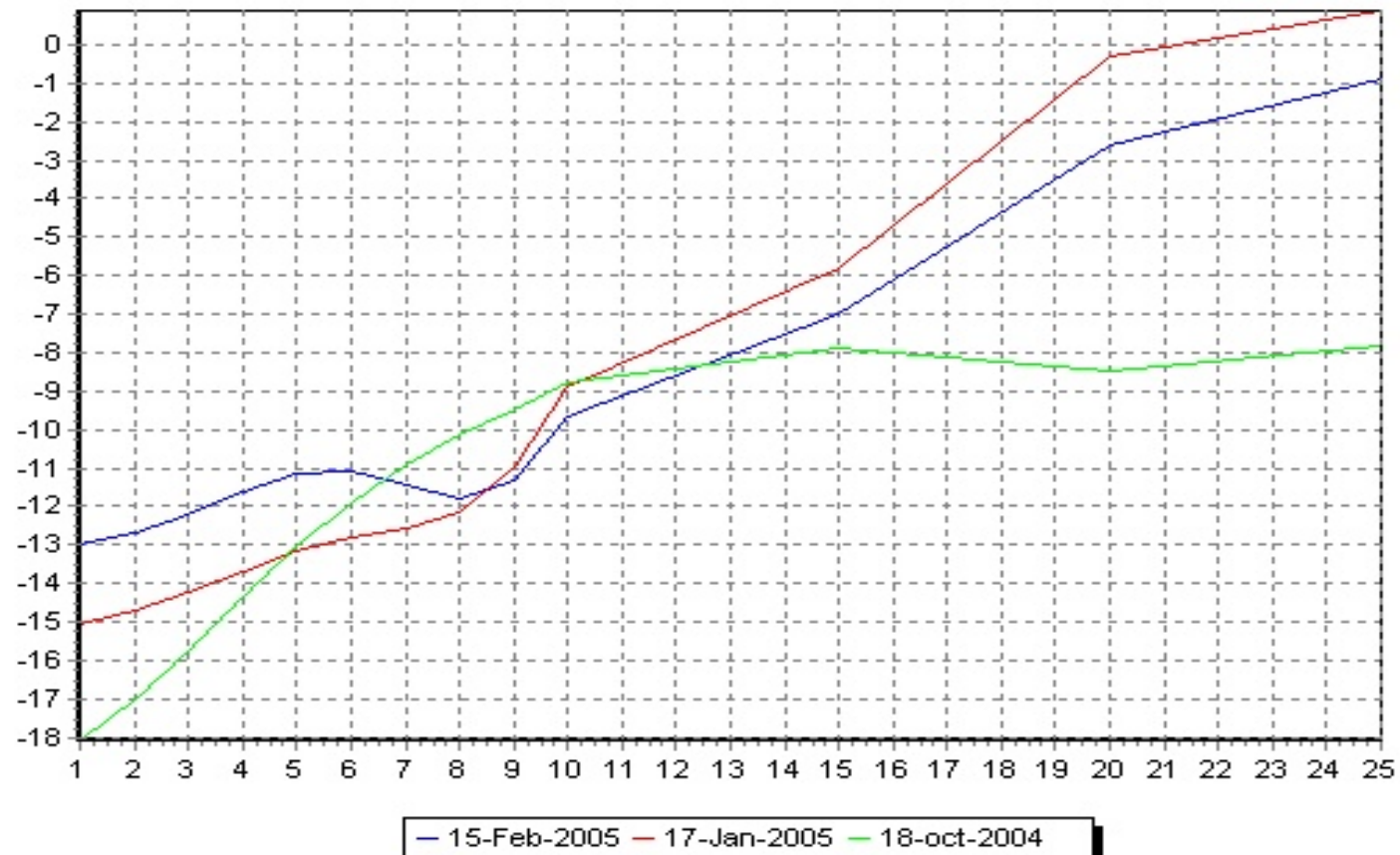


Source: CreditDelta, UBS

Coupon	Maturity	ASM	Crv. Adj. S	Liquidity Sc
7.625%	Dec 2007	-14	-13	29.4
4.5%	Dec 2007	-15	-14	28
4.5%	Oct 2008	-15	-14	61.6
6.25%	Dec 2008	-12	-11	44.8
9.5%	Dec 2009	-7	-6	13.1
4.25%	Dec 2010	-11	-11	21
4.75%	Jun 2012	-13	-13	5.6
4.5%	Jan 2013	-13	-13	28
8.75%	Aug 2017	-9	-6	28
4.75%	Oct 2018	-9	-8	11.2
5.375%	Jun 2021	-9	-6	52.5
0.0%	Dec 2028	2	4	27
6.0%	Dec 2028	-10	-6	100
4.625%	Oct 2054	-15	-11	5.6

Shape of issuer curve will influence results

EUROPEAN INVESTMENT BANK (GBP, UNS) over LIBOR (GBP)



Source: CreditDelta, UBS

Result of computations...

- Can calculate what mortality would be required to give an identical return to an investment to the purchase of a strip of bonds from the same issuer, + sensitivities
- Significant sensitivity to Issuer Curve
- Sensitivity to Longevity may not be as great as might be expected
- “Better” design from perspective of annuity writer would have high sensitivity to longevity, wide spread of lives
- Maybe in unfunded form...

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Secondary Market for Longevity Bonds

- Likely to be tightly held
- Offered in the market on wind-up and buy-outs
- Bid for by existing holders with spare capacity

Conclusion

- A great idea
- Traded market for longevity is in the interests of annuity writers
- Could eventually make annuities cheaper and pension schemes less risky with considerable benefits to Society in general
- Scope for innovation as the concept becomes more familiar