



Coming to Terms with Reality

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Younger Members Convention
Tuesday 6 December 2005

Agenda

- Actuaries and interest rates
- Actuaries and the long term
- Actuaries and behavioural finance
- Actuaries and value added
- Wrap up

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A review of the facts

- Commutation functions were neat
- Excel spreadsheets are easy
- Compound interest is used in the daily lives of thousands of finance professionals
- Actuaries learn only three useful things about compound interest...

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Where did it all go wrong?

- Commutation functions became our millstone – we hung on to flat interest rate term structures for too long
- Because of our focus on flat structures we failed to recognise interest rate risk properly
 - Hedging duration and convexity belongs in flatland
 - In flatland you can hedge both with any two instruments
 - In excel-land we hedge principal components, pivots etc
 - Better still we hedge each cash flow
- Divorced from reality interest rates became abstract – we forgot the roots in hedging and began inventing discount rates based on “actuarial judgement”.

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...but didn't we invent immunisation

- Yes, a truly great idea in the 1950s
- The irony is that we recognised the impact of convexity but didn't use this insight
- It was left to financial economists in the 1980s to develop the maths of arbitrage free term structure modelling
- It wasn't until the mid to late 1990s that actuaries began to apply these models

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Who are the stars of the interest rate world today?

- The swaps desks of investment banks use what should be regarded as “actuarial mathematics” every day
 - To be long a plain vanilla swap is to be long a coupon bond
 - All the mathematics of coupon bonds is used every day
 - Zero coupon swaps effectively give us pure discount bonds
- The inflation swaps market is particularly neat:
 - Long a zero coupon index linked bond worth £100 today
 - Short a pure discount bond worth £100 today
 - Value of contract at inception is nil
 - Difference in proceeds is actual inflation v breakeven inflation on a notional amount equal to the real proceeds of the linker

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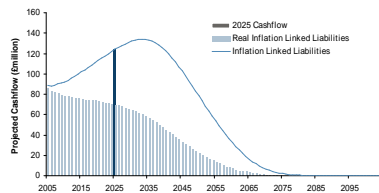
Reasons to be cheerful (only joking)

- Our valuation models are over simplistic
- Our risk analysis and hedging is rooted in flatland
- Only younger actuaries (mainly) understand term structure models
- Swaps have pulled the rug from any mystery over long term liabilities (real or inflation linked) by reducing the liability to a labor deposit

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Uncloaking the mystery of “real liabilities” – inflation swaps

- Considering a projected inflation linked pension payment in year 2025 (say)



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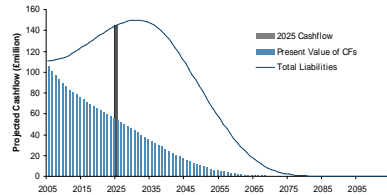
The maths of inflation swaps

- The payment of £120 million in 2025 is based on the breakeven inflation rate (say 3% p.a.)
- More fundamentally it is a payment of £66.5 million **in real terms**, this is the so called **inflation swap notional**
- Under an inflation swap:
 - Scheme pays bank expected inflation uplift (£53.5 m) on £66.5 m
 - Bank pays Scheme actual inflation uplift (unknown) on £66.5 m
- So as long as the Schemes assets deliver £120 million in year 20, the Scheme can pay the actual (real) obligation

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Uncloaking the mystery of the long term – interest rate swaps

- Now consider the total projected cash flow in year 2025



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The maths of interest rate swaps

- The payment of £140 million in 2025 is based breakeven inflation rate (say 3% p.a.) "locked" by the inflation swap
- Suppose **present value** of the payment, on libor discount factor is £53 million (5% pa), this is the **swap notional**
- Under a **zero coupon** interest swap:
 - Scheme pays bank interest at the 3 month deposit rate on £53m
 - Bank pays Scheme interest at the fixed 20 year rate on £53m
 - The payment by bank is known at the outset and is £53 million $\times (1.05^{20} - 1) = £87m$ (in this example).
- As long as assets deliver 3 month bank deposit rate on today's present value Scheme can pay £140 m in 2025.

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The long term as a USP

- The nice thing about the long term is:
 - Nobody will be around to know anyway
 - It is a great apple pie and motherhood card to play
 - Nobody wins arguments by saying they take a short term view
- Unfortunately
 - Swaps and other financial instruments have removed any mystique from liabilities that are merely "long duration"
 - Until very recently actuaries completely misunderstood the fundamental principles institutional investment

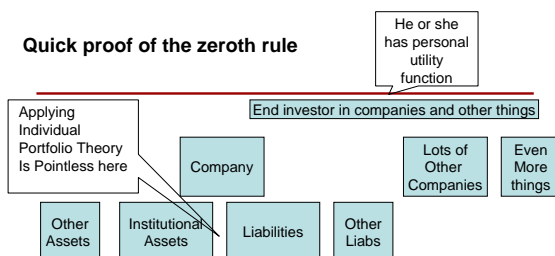
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The zeroth rule of institutional investment

- Institutions are not end investors
- Consequences of the zeroth rule
 - Portfolio selection theory (efficient frontiers etc) is irrelevant
 - Debate over time diversification of risk is irrelevant
- Put another way, although
 - Efficient frontier analysis tends to be arbitrary and non robust
 - Time diversification in the way it is explained by most actuaries is a total fallacy
- It doesn't really matter anyway!

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Quick proof of the zeroth rule



- Actuaries should apply the branch of financial economics known as "the theory of the firm" not "portfolio selection theory" to most institutional investment problems.
- With one or two rare (and declining) exceptions

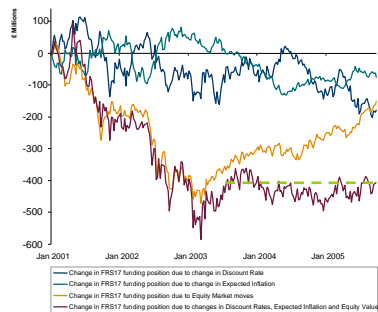
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More reasons to be cheerful (joking again)

- Even in the few products where actuaries can create discretion in savings products, the world is moving towards transparency and defined promises
 - With profit
 - Defined benefit schemes
- There is little evidence of any particular long term aptitude in the profession anyway , and much evidence of behavioural bias...

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Hindsight bias?



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The great hope?

- Some actuaries have advanced behavioural finance as a reason to reject the disciplines of neo classical financial theory
- In fact behavioural finance is largely complementary to the classical approach and does not justify rejection of key principles (such as the zeroth law)
- Agency theory plays a similar role in explaining anomalies – with debate over the relative merits of these two auxiliary theories

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The Candidates for behavioural bias

- As a first approximation high net worth successful investors are likely to be the least prone to behavioural bias
 - Warren Buffet
 - George Soros
- Likewise people deciding how to spend other peoples money are possibly the most prone to bias as they don't get toasted as quickly when they are wrong

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Oh dear

- Are actuaries free from bias themselves?
 - Anchoring
 - Loss aversion
 - Hindsight bias
 - Over confidence
 - ...
- There is no reason why actuaries should be free of these biases
- Try spotting a few next time your colleagues express opinions on markets

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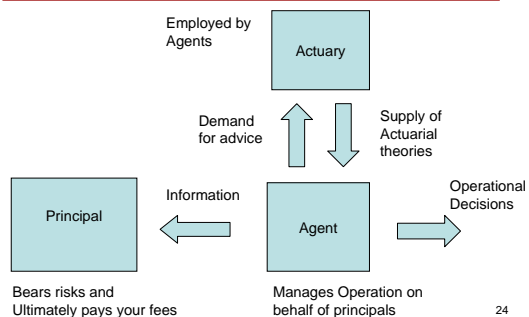
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Adding value with core skills

- Although actuaries have lost the battle on interest rates there is less obvious competition mortality tables
- The good news is thanks past actuarial advice to companies there s a lot of longevity risk about!
- Aside from specialisation in this area there is still a role for actuaries in valuation
 - Providing transparent and clear advice
 - Free from behavioural bias
- But we need to understand the principal-agent conflict

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Principal agent conflict 101 for actuaries



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Wider fields – a personal view

- There is a danger that wider fields have involved chasing after other mis-applications of mathematics to meet agent demand
- The most enjoyable application of our skills is bringing clear thought and cynicism to de bunk erroneous concepts
 - There are lots of flawed metrics and pseudo science around
 - For example the widespread mis application of “cost of equity”
- The problem is that for every theory popular with the buyers there is a consultant willing to sell for (“short term?”) gain
- It is up to the younger members of the profession to choose the right (“long term?”) path for the future.

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Wrap up

- We have no unique expertise in discounting. Modern financial instruments make short work of long duration.
- The zeroth law combined with the demise of discretionary products has killed the long term as a USP.
- Actuaries are also prone to behavioural bias, especially in their confidence about the long term
- The real long term versus short term issue arises through principal agent conflict – what do we want to sell?

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The Actuarial Profession

making financial sense of the future

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