

Index-based swaps - are they a viable alternative?

Should the industry be worried about basis risk or
can index-based swaps provide a simpler solution?



Deutsche Börse Group, 23 May 2012

What do you want to do?



Pension scheme risk manager Paul

- Paul wants to hedge against longevity
- his focus: male pensioners born between 1940-1944 with pensions above 10.000 GBP p.a.
- his best estimate is that 61% of that group will be alive and entitled to receive pension in the year 2022



Investment fund manager Ian

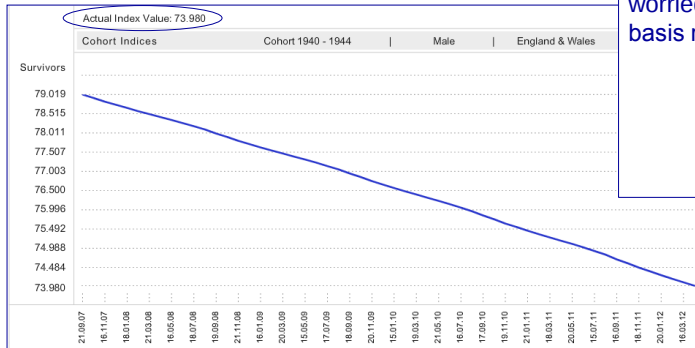
- Ian is looking for a good yield investment
- keen on low correlation to other markets to diversify his portfolio
- prefers liquid, highly standardised products that may easily be sold before maturity

Index-based longevity swap

- ✓ Paul's longevity risk is taken by Ian
- ✓ Ian has a liquid and attractive investment

What is the most suitable index for your swap?

- Xpect® longevity indices count down the number of survivors
- Survivors represent the pension scheme's liabilities
- Separate population indices for cohort groups, by gender and country
- One figure per month to keep it simple



Paul might be worried about basis risk...

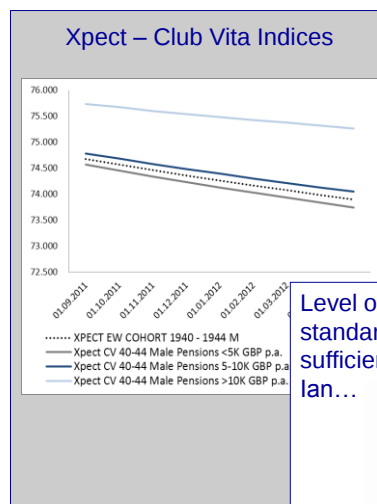


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How about using a socio-demographic index?

- three different pension groups to reflect scheme specific risk
- solution for both pensioners and deferred members
- affordable for all sizes of schemes
- standardized concept to maximise flexibility and liquidity
- based on Club Vita's analysis of >140 UK pension schemes



Level of standardisation sufficient for Ian...

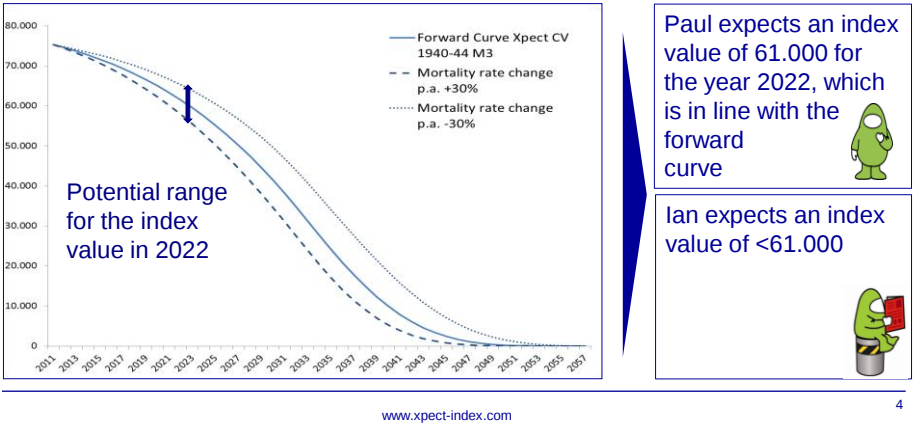


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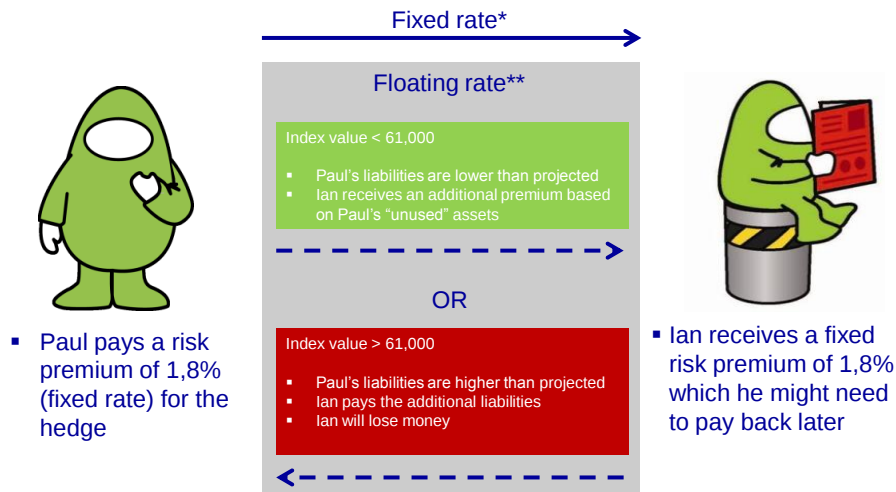
What is your expectation about future mortality?

- Xpect indices measure historic mortality
- Xpect forward curves help to assess future mortality
- Forward curves serve as price indication for longevity risk and risk transfer



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What does the swap look like?



*Due every year until maturity in 2022.

**Due at maturity/settlement date.

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Where does the data come from?

Country: DE	Reporting y: 2011	Reporting m: Dec	Gender: W	Cohort: 1981	Crude		
x	qx	px	lx	dx	LLx	exlx	ex
0	0.01014	0.98986	100.000	1.014	99.493	8.796.727	87.97
1	0.00077	0.99923	98.986	76	98.948	8.697.234	87.86
2	0.00040	0.99960	98.910	40	98.890	8.598.286	86.93
3	0.00032	0.99968	98.870	32	98.854	8.499.396	85.97
...	...	...	...	...	...	...	...
15	0.00017	0.99983	98.822	17	98.653	7.314.380	74.14
16	0.00025	0.99975	98.822	25	98.633	7.215.726	73.15
17	0.00029	0.99971	98.297	29	98.606	7.117.094	72.17
18	0.00033	0.99967	98.592	33	98.575	7.018.488	71.19
19	0.00036	0.99964	98.559	35	98.541	6.919.912	70.21
...	...	...	...	...	...	...	...
28	0.00025	0.99975	98.322	25	98.309	6.034.021	61.37
29	0.00029	0.99971	98.297	29	98.282	5.935.712	60.39
30	0.00025	0.99975	98.268	25	98.255	5.837.430	59.40
31	0.00027	0.99973	98.243	27	98.229	5.739.174	58.42
32	0.00028	0.99972	98.216	27	98.202	5.640.945	57.43
...	...	...	...	...	...	...	...
64	0.00310	0.99690	93.590	290	93.445	2.545.310	27.20
65	0.00343	0.99657	93.300	320	93.140	2.451.865	26.28
66	0.00351	0.99649	92.981	326	92.817	2.358.724	25.37
67	0.00355	0.99645	92.662	326	92.490	2.265.907	24.46
68	0.00400	0.99600	92.343	326	92.141	2.173.417	23.54
...	...	...	...	...	...	...	...
88	0.05488	0.94512	66.608	66.608	66.608	474.094	6.92
89	0.06472	0.93528	62.935	62.935	62.935	407.486	6.36
90	0.07982	0.92018	58.134	58.134	58.134	344.851	5.76
91	0.10131	0.89869	52.886	52.886	52.886	286.727	5.15
92	0.11669	0.88331	50.064	5.842	47.143	233.841	4.67
...	...	...	...	...	...	...	...
106	0.74414	0.25586	80	59	50	65	0.81
107	0.80385	0.19615	20	16	12	15	0.73
108	0.85722	0.14278	4	3	2	3	0.66
109	0.90231	0.09769	1	1	1	-	0.60

- Population mortality data is collected from national statistical offices
- Generation life tables per cohort, country and sex
- Monthly update
- Delay of 4-6 month
- Modeling with Lee-Carter based on 30-years mortality rate improvement
- Calculation until the last person of the cohort is deceased

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How is the swap structured?

Portfolio

- Reproduce portfolio structure (NPVs / nominal cash flows)
➤ Apply current Xpect e_x
- Simulate portfolio-specific mortality distribution
➤ Apply Xpect q_x randomly
➤ Define your level of safety or VAR (e.g. 90%)
- Determine Δ NPV of liabilities by Δ 1bp of q_x for defined duration (e.g. 10y)

$\Delta = € 66.109,65$

Index

- Assess future q_x values (Xpect Forward Curves)
➤ Calculate fix swap rate
- Determine Δ NPV of fix rate by Δ 1bp of q_x for defined duration (10y)

$\Delta = € 595,47$

Hedge effectiveness

$$\frac{\Delta NPV \text{ liabilities} @ \Delta 1bp}{\Delta NPV \text{ fix rate} @ \Delta 1bp} = \frac{66.109,65}{595,47} = 111,02$$

Required notional of the swap € 111.020.125,16

Source: Xpect Analysis for NL pension fund with 3.500 pensioners including bereaved.

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Where are the differences between index and indemnity solutions?

	Index swap	Indemnity swap
Transaction cost	Low	
Price of the hedge	Standardised terms	
Scope of the hedge	Medium	
	Transparency reduces margins	
	Pensioners and deferred members	That's why Paul likes index swaps
Time to transact	Short	
	Data immediately available	
Flexibility	High	
	Standardised=liquid and tradable	That's why Ian likes index swaps
Basis risk	>0%	0%

Index-based swaps ARE a viable alternative!

- Industry does NOT need to be worried about basis risk
- Basis risk reduction by using socio-demographic longevity indices
 - Hedge effectiveness is a matter of price

INDEED, index-based swaps provide a simpler solution

- Solution for pensioners and deferred members
- Available on short call
- Affordable for all sizes of pension schemes
- No need for extensive analysis of scheme data
- Standardised terms reduce administrative effort

Thank you for your attention!



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