Index-linked longevity risk transfer
reduced basis risk with sociodemographic parameter

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Model of longevity risk profile of a young pension plan evaluated with actual $e_x$

- Hedging of Interest risk and Inflation risk is common
- What about longevity risk?
Xpect Indices of Deutsche Börse are published monthly

XPECT DE COHORT 1920 - 1939 M
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Kursinformationen
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Modeling the Xpect generation life table is based on the last 30 years $q_x$ trend. Only realised $q_x$ per age from the last 30 years are considered for modeling the Xpect generation life table.
These actual $e_x$ represents longevity changes of the population near-time.

Remaining life expectancy for all respectively 65 year old men in Germany

Remaining life expectancy for all respectively 65 year old women in Germany
Parametric Indices as underlying support longevity risk transfer, but basis risk is still an issue

Hedging on indemnity risk

- = tailored hedge
- = cash flow hedge
- = expensive (structural costs)

Hedging on a parametric index

- = standardised index hedge
- = value hedge
- = cheaper, more liquid

Xpect Indices
We selected the CHAID approach to get sociodemographic segment $q_x$ indices

- To get the relevant attributes a chi-square independence test is applied
- 400,000 dead records in relation to 70 mio live records – comparison of deads with alives per year of birth
- The parameter with the highest ratio (chi square ratio) is selected
- Result: cohort and gender specific $q_x$ prognosis based on residential quarter parameters
Female born 1943-1947 (61-65 years old)

Relevance of parameter value to $q_x$ prognosis

| Priority 1 | ▪ Geldanleger ↓ |
| Priority 2 | ▪ AC Nielsen Freizeitmilieus_Wahrscheinlichkeit Traditionelle ↑ |
|            | ▪ Anzahl Gewerbehäuser ↓ |
| Priority 3 | ▪ Technik ↑ |
|            | ▪ Wohnadresse ist Senioren- oder Pflegeeinrichtung ↑ |
|            | ▪ Distanz zur nächsten Autobahn ↓ |
|            | ▪ Distanz zum nächsten Kernkraftwerk ↓ |
|            | ▪ Direktversicherte ↓ |
| Priority 4 | ▪ TV Lotto ↑ |
|            | ▪ TV-Magazin ↑ |
|            | ▪ Lifestyle ↑ |
|            | ▪ Anzahl Haushalte ↑ |
|            | ▪ Distanz zum nächsten Park ↑ |
| Priority 5 | ▪ Yellowpress ↑ |
|            | ▪ Distanz zum nächsten ICE-Bahnhof ↓ |
|            | ▪ AC Nielsen LOHAS Typologie_Reife LOHAS ↓ |
|            | ▪ Familienanteil ↓ |
|            | ▪ Arbeitslosenquote (Gemeindeebene) ↑ |
|            | ▪ Einwohnerdichte ↓ |
|            | ▪ Finanzinteressierte ↓ |
|            | ▪ AC Nielsen Freizeitmilieus_Wahrscheinlichkeit Intellektuelle ↓ |

↑ the higher the parameter value, the higher $q_x$
↓ the higher the parameter value, the lower $q_x$
Index results: Male, 64 years old, born 1944

Adjustments were based on the assumption that the effects are weaker before the point of measurement and stronger afterwards.
Index Forward Curves (with or without sociodemographic parameter) are the underlyings for Longevity Index Products e.g Forwards, zerobonds

Xpect Forward Cohort DE M 1920-1939

- A change in $q_x$ resp. $e_x$ per cohort changes the index forward curve.
- In other words: a monthly change in $q_x$ resp. $e_x$ changes the index representing the longevity liabilities of a portfolio.
Thank you for your attention

Questions?

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