Return Smoothing and Risk Sharing Elements in Life Insurance from a Client Perspective

(based on joint work with Jochen Ruß)
Motivation

- Traditional participating life insurance (TPLI) contracts have been the core business of life insurers for many years.
  - typical components of TPLI contracts:
    - provide a year-to-year (cliquet) guarantee
    - receive additionally a surplus participation
  - main difference to individual retirement savings products:
    - life insurers pool assets and liabilities of a heterogeneous portfolio of TPLI contracts which allows for return smoothing and risk sharing
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  - **main difference to individual retirement savings products:**
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  ⇒ results in rather stable investment returns
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Q: Why are TPLI contracts so popular?

▶ How do clients perceive and evaluate TPLI contracts?
▶ Which features make TPLI contracts attractive?
  ▶ role of smoothing and risk sharing elements
  ▶ role of (cliquet-style) guarantee
Decision Making of Long-term Investors

How do clients perceive and evaluate TPLI contracts?

- Decision making of humans (often) depends on heuristics which can lead to cognitive biases and systematic deviations from rational decisions.

- A popular descriptive model of decision making is Cumulative Prospect Theory (CPT):
  - introduced by Tversky and Kahneman (1992)
  - descriptive model that tries to give a more accurate description of actual decision making
  - models several cognitive biases
  - consideration of gains and losses with respect to a reference point instead of the total wealth
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Main components of CPT:

- S-shaped value function \( \nu \)
- different treatment of gains (concave) and losses (convex) \( \alpha \)
- loss aversion w.r.t. a reference point \( \lambda \)
- probability distortion function \( w \)
- tail events with small prob. are overweighted \( \gamma \)
Decision Making of Long-term Investors

Common approach in this context:

- Consideration of the distribution of the total change in wealth, i.e.,

\[ X := P_T - P_0 \]

with \( P_t \) denoting the level of wealth at time \( t \).

- The CPT (subjective) utility is then defined as

\[
CPT(X) := \int_{-\infty}^{0} v(x) d(w(F(x))) + \int_{0}^{\infty} v(x) d(-w(1 - F(x)))
\]

with \( F(s) = \mathbb{P}(X \leq s) = \int_{-\infty}^{s} d\mu_X \).

- Now, several studies (e.g., Benartzi and Thaler, 1995) indicate that long-term investors tend to take into account future annual value changes already when making the investment decision.
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Ruß and Schelling (2018) propose a model (MCPT) that considers a long-term investor whose investment decision is based on the distributions of all future annual value changes rather than solely on the distribution of the terminal outcome.

Studies (Ruß and Schelling, 2018; Graf et al., 2019) indicate that MCPT describes long-term decision making more accurately.

The MCPT value at $t_0 = 0$ of investment $A$ with maturity $T$ and annual value changes $\{X_t\}_{t=1}^{T}$ with $F_t(x) = \mathbb{P}(X_t \leq x)$ is defined by

$$MCPT(A) := \sum_{t=1}^{T} CPT(X_t),$$

where $CPT(X_t) = \int_{-\infty}^{0} v(x) \, d\left(w(F_t(x))\right) + \int_{0}^{\infty} v(x) \, d\left(-w(1 - F_t(x))\right).$
Selected Results

Percentiles of the annual changes $X_t$:

(a) Contract E: unsmoothed investment
(b) Contract F: smoothed investment returns but w/o guarantee
(c) Contract A: TPLI (smoothed returns and year-to-year guarantee)

- Insurance company serves as buffer between capital market and policyholder.
Selected Results

Percentiles of the terminal value:

A-D: TPLI contracts with different initial situations
E: unsmoothed investment
F: smoothed investment returns but w/o guarantee

- Collective investment can heavily stabilize annual changes without significantly changing the risk-return characteristics of the terminal value
Selected Results

Results for an MCPT-investor:

\[ r^{CE} \] describes the guaranteed annual return that an investor would regard equally desirable as the considered contract. \( \lambda \) denotes degree of loss aversion.

Results for contract F compared with contract E show that collective smoothing elements heavily increases attractiveness (even w/o guarantee).
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Now, we come back to figure from the beginning:
Selected Results

Results for an MCPT-investor:

- **TPLI contracts are preferred over other products for typical degrees of loss aversion** ($\approx 2$)

  $\rightarrow$ this is even true for other products with (year-to-year) guarantee features!
Summary

The results show:

- collective investment can heavily stabilize annual returns without significantly changing the risk-return characteristics of terminal value

For an MCPT-investor:

- smoothing elements significantly increase attractiveness
- TPLI products are preferred over common unit-linked products

In the context of product design:

Results indicate that products . . .

- which make use of smoothing elements of a collective investment and
- with weaker guarantee features . . .

seem promising in . . .

- providing an objectively superior distribution of terminal value . . .
- while at the same subjectively being attractive for the customer.
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The results show:

- **collective investment** can heavily stabilize annual returns without significantly changing the risk-return characteristics of terminal value.
- For an MCPT-investor:
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Results indicate that products...

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Summary

- The **results show**: 
  - **collective investment** can heavily **stabilize annual returns** without significantly changing the risk-return characteristics of terminal value
  - For an MCPT-investor:
    - Smoothing elements significantly **increase attractiveness**
    - TPLI products are preferred over common unit-linked products

- In the context of **product design**:
  Results indicate that **products** . . .
  - which make use of smoothing elements of a **collective investment** and
  - with **weaker guarantee** features . . .
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  - providing an objectively **superior distribution of terminal value** . . .
  - while at the same subjectively being **attractive** for the customer.
Thank you for your attention!

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Selected References


