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# Guarantees in retirement planning: How can we help consumers to want what they need

Part 1: Some thoughts on guarantees in life and pensions products

■ Jochen Ruß, Stefan Schelling

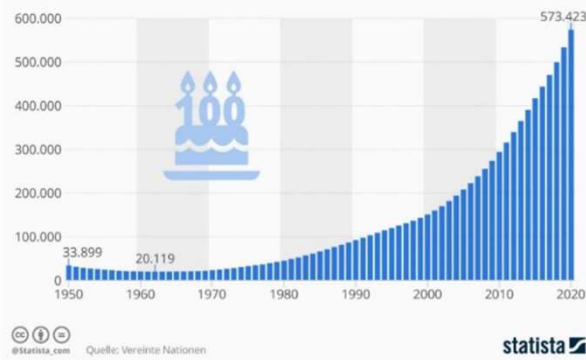
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# Introduction

## As we all know:

- Demographic change
  - problem for PAYG-retirement-systems
  - need for consumers to additionally safe for their retirement
    - But how?
- Specific aspect: chance of reaching a very high age increases at exponential rate.



Left: number of people aged 100+ worldwide (Source: Statista);  
Right: oldest person who ever lived (died at age 122)

## Which guarantees should consumers use in retirement savings?

- „type“ of guarantee
- „amount“ of guarantee

specific focus on the impact of the uncertainty of future inflation

- Guarantees offered are typically nominal.
- But real risk is the relevant risk.

# „Type“ of guarantee

## Types of guarantee in retirement savings products

- Saving: permanent (year by year) or maturity only (point to point); Retirement: lifelong income (annuity)

## Simplified (!) basic concept

 <p><b>„Nest egg“ (Savings for a rainy day)</b></p>	 <p><b>Money for consumption in several (many) years</b></p>	 <p><b>Money intended to finance the desired standard of living</b></p>
<p><b>nominally save, liquid (accept low or no return)</b></p> <p><b>Here, permanent guarantee makes sense.</b></p>	<p><b>assets with return potential (chance to beat inflation)</b></p> <p><b>Diversification is the preferred “risk management tool”.</b></p> <p><b>If desired/needed: maturity only guarantee</b></p>	<p><b>Before retirement: As 2)</b></p> <p><b>In most cases: annuitization optimal (uncertainty of lifespan) (cf. Ruß &amp; Schelling, 2018)</b></p> <p><b>assets with return potential also in annuity phase (inflation will not stop when you retire)</b></p>

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**Bedarfsgerecht, aber unbeliebt**

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Nutzen und Akzeptanz der lebenslangen Rente

- Jochen Ruß und Stefan Schelling
- Juni 2018

Free download (German language only)  
[www.ifa-ulm.de/Studie-Rente.pdf](http://www.ifa-ulm.de/Studie-Rente.pdf)

## Amount of guarantee

### The role of inflation

#### What we all know:

- Increasing the guarantee reduces the share of risky assets.
- Hence increasing the guarantee reduces expected return and reduces (nominal!) risk.

#### But: Guarantees are typically nominal; relevant risk is real (inflation adjusted) risk.

- Over long time horizons, we have a positive correlation between inflation and stock returns.
  - Boudoukh und Richardson (1993): „In conjunction with (i) the evidence across subperiods, (ii) the consistency in results using both ex ante and ex post inflation, and (iii) the similarities using different sets of instruments, this paper provides strong support for a positive relation between nominal stock returns and inflation over long horizons.“
  - Lothian und McCarthy (2001): „The puzzle therefore is not that equities fail the test as inflation hedges, as had been quite widely believed, but that they take so long to pass.“
  - Rapach (2002): „Overall, our results indicate that inflation does not erode the long-run real value of stocks.“

#### Consequence: Two effects:

- The risk of random market fluctuations decreases with increasing guarantees.
- Inflation risk (particularly risk from the uncertainty of future inflation) increases!
- We have performed quantitative analyses in a model with positive long-term correlation between stock market returns and inflation.



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## Amount of guarantee

### Typical results

risk/return profile of a typical product for different levels of guarantee



#### Left: Nominal returns

- Increasing guarantee reduces expected return and upside potential.
- Increasing guarantee also reduces risk

#### Right: Real returns

- Increasing guarantee reduces expected return and upside potential.
- Increasing guarantee reduces risk to significantly lesser extent and only up to a certain guarantee level.

#### Consequences:

- In a low interest environment, the additional return resulting from a reduction of guarantees is particularly high.
- Moderate reduction of guarantee increases relevant (real) risk barely (if at all)
  - Lower guarantees also suitable for very risk averse consumers.
  - Too much (nominal) guarantee can increase (real) risk!
  - **Safety ≠ Guarantee**
- But: very risk averse consumers should not completely give up guarantees.

Academic paper on this issue intended for ICA 2023.

## Summary of part 1

### Saving for retirement becomes more and more important.

in many cases „optimal“:

- Low or no guarantee in savings phase
  - if guarantee, then maturity only
- annuitization thereafter

### Subjective desire often deviates from objective needs.

- In part 2:
  - What causes the gap between subjective desire and objective needs?
  - How can this gap be overcome using insights from behavioral economics?
    - approaches that have been implemented successfully in practice
  - Remarkable: In most cases:
    - No change in product design.
    - Only change in presentation / explanation of the product!



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# Guarantees in retirement planning: How can we help consumers to want what they need

Part 2: Applying insights from behavioral economics

- Jochen Ruß, Stefan Schelling

**Note:**  
Slides cover only part of the content of Part 2



## How do long-term investors perceive and evaluate investments?

### Motivation

*"I visualized my grief if the stock market went way up and I wasn't in it - or if it went way down and I was completely in it. So I split my contributions 50/50 between stocks and bonds."*

- Harry M. Markowitz

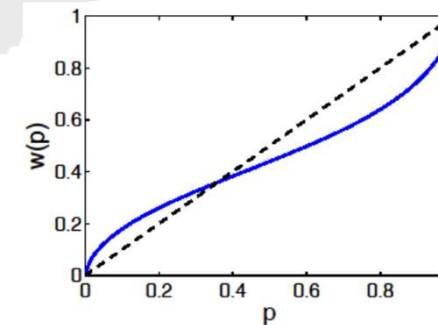
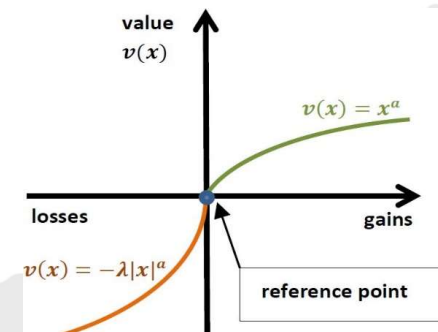
- **Narrow Framing** causes that (long-term) investors reevaluate their investment decision on short evaluation periods.
  - Myopic loss aversion (Benartzi & Thaler, 1995): Combination of loss aversion and short investment evaluation periods can explain the popularity of very safe investments.
- Studies even find evidence that frequent information alone affects the decision, e.g., Bellemare et al. (2005).
  - Long-term investors receive annually a financial statement.
- These findings strongly indicate **that long-term investors tend to take into account future annual value changes** already when making the investment decision.



# Multi Cumulative Prospect Theory

## From CPT to MCPT

- Based on this, we have proposed a model that considers a long-term investor whose investment decision is based on the **distributions of all future annual value changes** rather than on the distribution of the terminal outcome, (Ruß & Schelling, 2018).
- The model is based on **Cumulative Prospect Theory (CPT)** introduced by Tversky & Kahneman (1992).
- Main components of the CPT preference function:
  - **S-shaped value function ( $v$ )**
    - Reference-dependence
    - Different treatment of gains (concave) and losses (convex).
    - Loss aversion ( $\lambda$ ) w.r.t. a reference point.
  - **Probability distortion function ( $w$ )**
    - Tail events with small probabilities are overweighted.



## Multi Cumulative Prospect Theory

### Definition

- The **Multi Cumulative Prospect Theory (MCPT)** value (Ruß & Schelling, 2018)
  - at  $t_0 = 0$  (time of decision making)
  - of investment  $A$  with maturity  $T$  and
  - annual value changes  $\{X_t\}_{t=1}^T$  with  $F_t(x) = P(X_t \leq x)$

is defined by

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

where  $\eta$  denotes the subjective time preference coefficient and

$$CPT(X_t) = \int_{-\infty}^0 v(x) d(w(F_t(x))) + \int_0^{\infty} v(x) d(-w(1 - F_t(x))).$$

- The **Partial Multi Cumulative Prospect Theory (PMCPT)** is a combination of MCPT and CPT

$$PMCPT(A) := s \cdot MCPT(A) + (1 - s) \cdot CPT(X)$$

where  $X$  denotes the total value change.

## Multi Cumulative Prospect Theory

### Popularity of year-to-year guarantees

- Expected Utility Theory (as well as CPT), which only takes the terminal value into account is not able to explain the demand for year-to-year guarantees.
  - That is, objectively it does not seem to be rational to buy products with year-to-year guarantees (cf., part 1)
- In contrast, **MCPT is able to explain the demand for year-to-year guarantees** (Ruß & Schelling, 2018).
  - That is, year-to-year guarantees are (subjectively) highly attractive for long-term investors.
- **Problem:** High year-to-year guarantees are expensive and significantly reduce the long-term return potential.
  - This is particularly true in a low interest rate environment.
  - Life insurers have to develop new product designs (with no guarantees or lower and/or different types of guarantees).
- **Question: How can we meet the subjective desire of many consumers avoiding high short-term losses without limiting the long-term upside potential too much?**
  - Life insurers to pool assets and liabilities of a heterogeneous portfolio of contracts and perform return smoothing in the collective cover fund.
  - **Can return smoothing alone increase the attractiveness? (Ruß & Schelling, 2021)**

# Return smoothing in life insurance from a client perspective (Ruß & Schelling, 2021)

## Framework

- Collective investment products with smoothed returns:
  - We apply a **stylized smoothing approach** (Korn & Wagner, 2018):
    - $R_t^I$  denotes the annual return from  $t$  to  $t - 1$  of an investment  $I$  with fixed fraction  $\theta$  invested in a stock and  $1 - \theta$  in a rolling-bond investment.
    - The return of the **smoothed products w/o guarantee (SP)** is calculated by using

$$R_t^S := \sqrt[3]{\prod_{i=0}^2 (1 + R_{t-i}^I)} - 1$$

(slightly adjusted such that the contract is fair at  $t_0 = 0$ ).

- We compare the smoothed product without guarantee (SP) with several other common product types:
  - smoothed products with guarantees
  - purely market-based products with and w/o guarantees

## Return smoothing in life insurance from a client perspective (Ruß & Schelling, 2021)

### Selected results

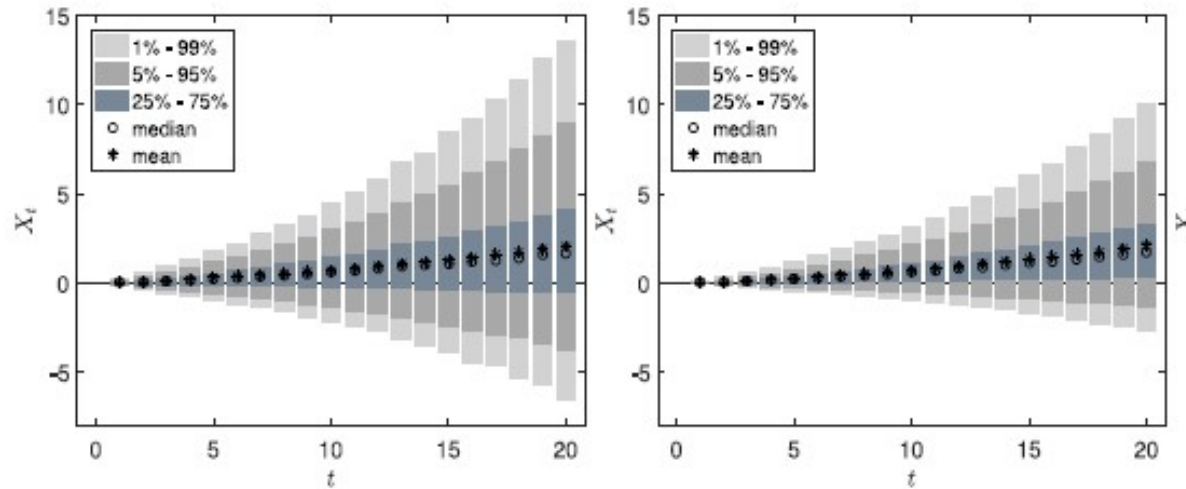
- By comparing the **distribution of the terminal value** for balanced funds (BF) and corresponding smoothed products without guarantee (SP), we observe that the **applied smoothing approach only leads to small changes in this distribution**.

Stock ratio Product	Without guarantee					
	0.1		0.5		0.9	
	BF	SP	BF	SP	BF	SP
$\mathbb{E}(\cdot)$	31.89	31.87	37.18	37.22	43.65	43.79
std( $\cdot$ )	2.64	2.48	12.30	12.23	29.07	29.24
5th-%ile	27.78	27.98	21.46	21.61	15.28	15.47
25th-%ile	30.03	30.13	28.46	28.54	24.86	24.98
50th-%ile	31.76	31.77	35.08	35.20	36.11	36.25
75th-%ile	33.62	33.49	43.45	43.54	53.21	53.69
95th-%ile	36.43	36.09	60.18	59.92	97.24	97.12

## Return smoothing in life insurance from a client perspective (Ruß & Schelling, 2021)

### Selected results

- By comparing the **distribution of the annual value changes** for balanced funds (BF) and corresponding smoothed products without guarantee (SP), we observe that **smoothing** compresses the entire distribution of annual returns and in particular **significantly reduces the probability of annual losses while the expected values and the medians remain almost unchanged**.



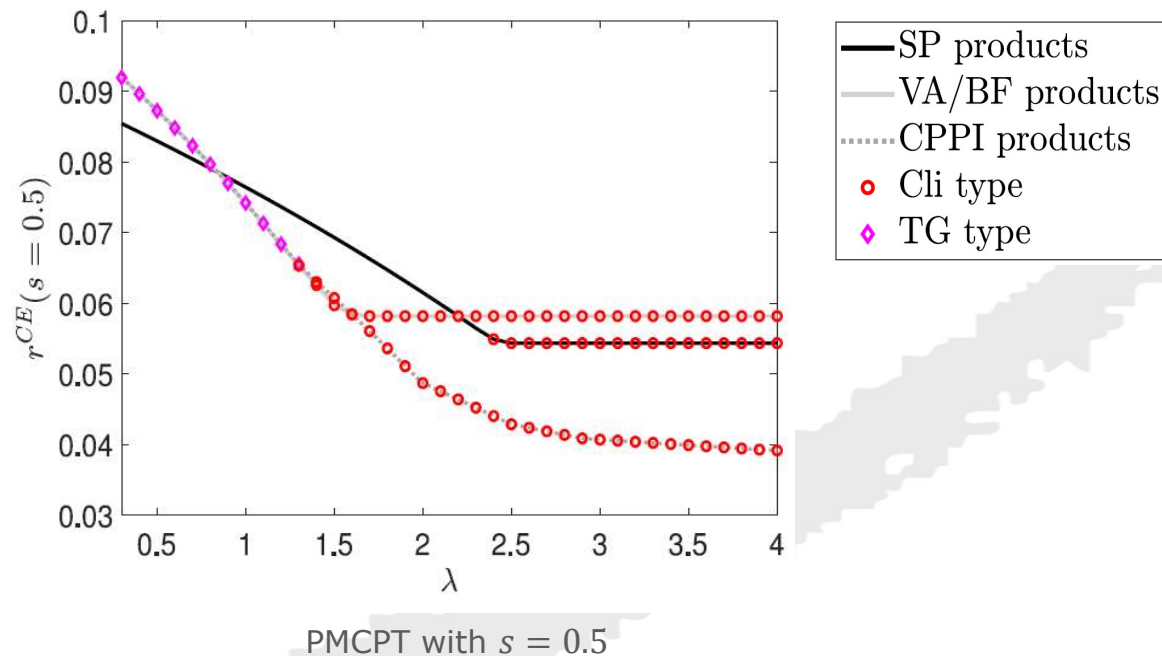
(a) Balanced fund ( $\theta = 50\%$ )

(b) SP ( $\theta = 50\%$ )

# Return smoothing in life insurance from a client perspective (Ruß & Schelling, 2021)

Selected results

## ■ Subjective attractiveness?



For consumers, whose subjective evaluation is influenced by the distribution of both, the terminal value and potential annual value changes, **return smoothing is a highly attractive feature – even if it comes without a guarantee** (and even if potential annual value changes only have a rather low influence on the decision).

# The Benefits of Return Smoothing in Insurer's Cover Funds

## Selected results

- In **Ruß, Schelling, & Schultze (2022a)** we consider a similar setting
  - where an insurer offers **several segregated cover funds** with different asset allocation which make use of collective smoothing mechanisms but come without guarantees.
  - These cover funds can be offered standalone or as a **“building block” within more complex products**.
  - We compare these products with various purely market-based products.
- The results show that ...
  - products in form of CPPI-strategies based on the insurer's cover fund have a significantly higher return potential compared to dynamic market-based products with the same risk characteristics.
  - in most cases, products based on cover funds outperform all market-based products in terms of **objective** utility as well as **subjective** attractiveness.
    - Unfortunately, not the same product design is at the same time objectively optimal and subjectively preferable.
      - How to identify a suitable compromise product? → Ruß, Schelling, & Schultze (2022b)



**Suitably designed products based on insurer's cover funds with return smoothing elements can serve the consumers' desire for safety (in particular, avoiding high short-term losses) without limiting the long-term return potential.**



## Summary

### Accumulation phase

#### **Behavioral patterns can heavily impact consumers' decisions in the accumulation phase.**

- Important examples are loss aversion and narrow framing.
- Changing the presentation/explanation can often help to increase the subjective attractiveness of objectively better products.

#### **Models like EUT and CPT seem not appropriate to adequately describe consumers' decisions making w.r.t. long-term investments.**

- Consumers tend to take into account possible short-term value changes when choosing the product.
  - Multi Cumulative Prospect Theory (MCPT)

#### **Return smoothing elements can serve the consumers' desire for avoiding high short-term losses without limiting the long-term return potential.**

- Ruß & Schelling (2021) and Ruß, Schelling, & Schultze (2022a/b)

#### **Next:**

- Annuitization decision

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