

Analyses of pan-European Personal Pension Products (PEPP)

A note on the quantitative requirements for risk-mitigation techniques and the “Basic PEPP” for pan-European Personal Pension Products

- Alexander Kling
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Analyses of pan-European Personal Pension Products (PEPP)

Executive Summary

Legal background

- Regulation (EU) 2019/1238 on a pan-European (PEPP)
 - Objective (recital 8): *This Regulation enables the creation of a personal pension product which [...] will be simple, safe, reasonably-priced, transparent, consumer-friendly and portable Union-wide [...].*
- Delegated regulation of 18. December 2020: regulatory technical standards (RTS)
 - concrete quantitative specifications on
 - requirements on a risk-mitigation technique and a “Basic PEPP”
 - derivation of risk and return indicators

Main question

- Under which conditions can the requirements be met?

Main results

- In the current capital market environment, none of the products considered meets all the requirements for a risk-mitigation technique.
 - in particular, probability of outperforming the annual rate of inflation not sufficient for any product

Background and further reading

- results based on analyses which ifa has performed in cooperation with the Austrian Insurance Association (Verband der Versicherungsunternehmen Österreichs, VVO)
- submitted as letter to the European Actuarial Journal
- similar German version published in the journal “Versicherungswirtschaft”
- working papers available under <https://www.ifa-ulm.de/index.php?id=251>

Analyses of pan-European Personal Pension Products (PEPP)

Overview of the requirements on a risk-mitigation technique and a Basic PEPP

Requirements on a risk-mitigation technique

- RTS, article 14 (2) a): „**expected loss not higher than 20%**“
 - two possible interpretations of the term “expected loss”: Value at Risk (VaR) and Tail Value at Risk (TVaR)
- RTS, article 14 (2) b): „**outperforming the annual rate of inflation with a probability of at least 80%**“

Requirements on a Basic PEPP

- RTS, article 14 (3): „**probability of recouping the capital at least 92.5%**“
 - Two possible interpretations of the term “recouping the capital”:
 - “Gross”: Use of the premiums paid by the client as a reference figure
 - “Net”: Use of premiums paid less all costs as a reference figure

Risk and return indicators (RTS, appendix III)

- III (2): Risk indicator based on the probability of outperforming the annual rate of inflation
- III (4): Risk indicator based on an expected shortfall measure
- III (6): Return indicator based on the median of the (nominal) maturity benefit

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Specifications of the RTS on stochastic models and their implementation

RTS, appendix III requires

- the application of a stochastic model
- in particular, stochastic modelling of inflation
 - Vasicek model required
- proposal of a modular approach for nominal interest rates, defaultable bonds (credit spreads) and equity returns
 - (non-binding)

Implementation in our analyses

- following the stochastic model used in the German and Austrian industry standard for category 4 PRIIPs
 - extension of this approach to include stochastic modelling of inflation
- Implementation of a so-called cascade model
 - 1st cascade
 - (stochastic) inflation (Vasicek-model)
 - real interest rates (G2++-model)
 - 2nd cascade
 - nominal interest rate = real interest rate + inflation
 - 3rd cascade
 - equity returns
 - generalized Black-Scholes-model
 - expected return = nominal interest rate + risk premium

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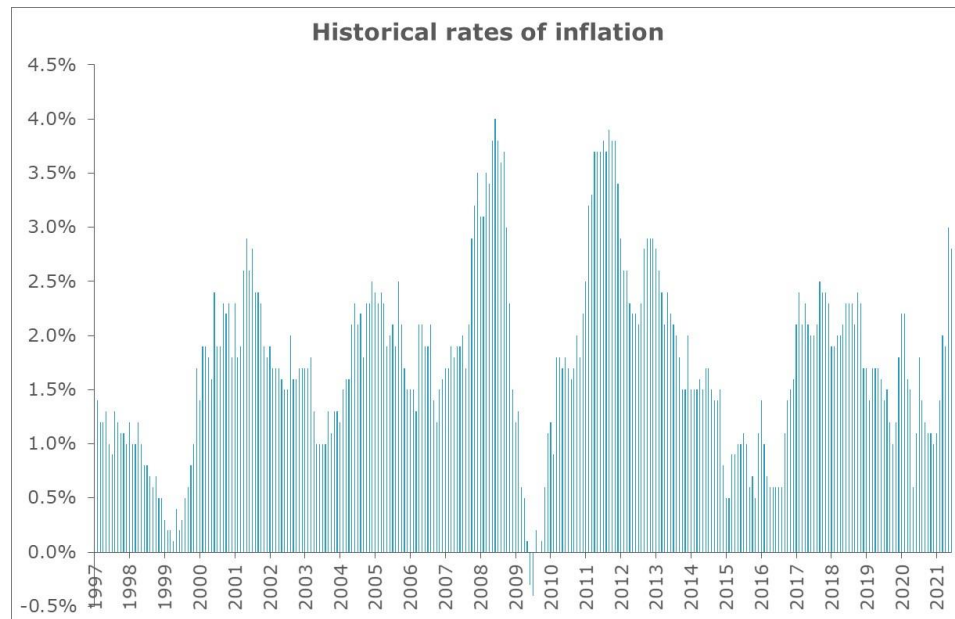
Calibration of the capital market model

Based on **monthly data from Eurostat for inflation in Austria**, we have determined the **parameters of the Vasicek process** by means of so-called maximum likelihood estimation.

- assumption of an **expected (long-term) inflation rate of 2% p.a.**
- calibration as of June 2021 (**before the recent increase in inflation rates**)

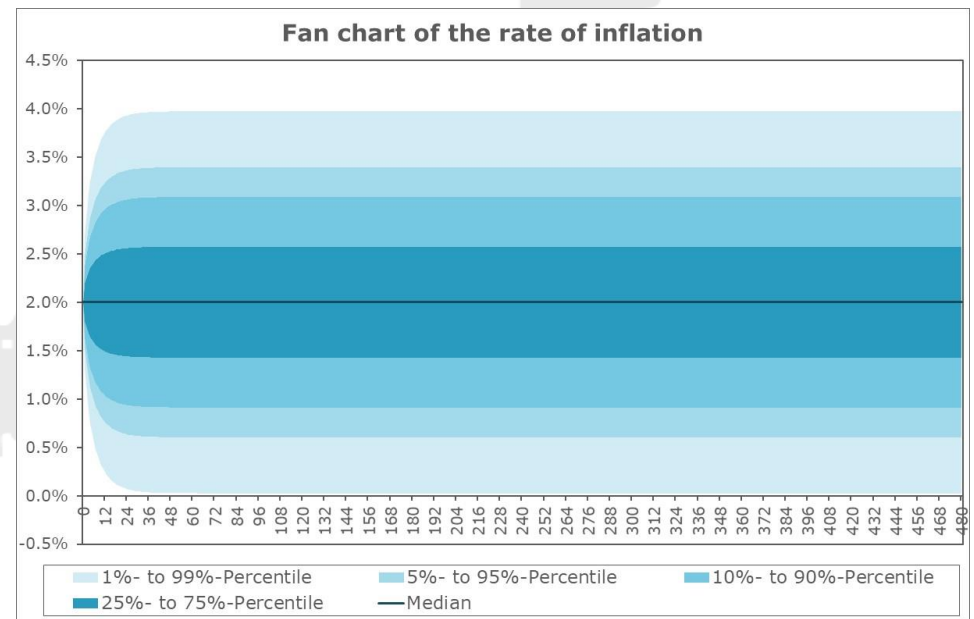
Historical data for Austria

- cf. „PRC_HICP_MANR“ via Eurostat



Fan chart of modelled inflation rates

- projection period: 40 years (monthly display)

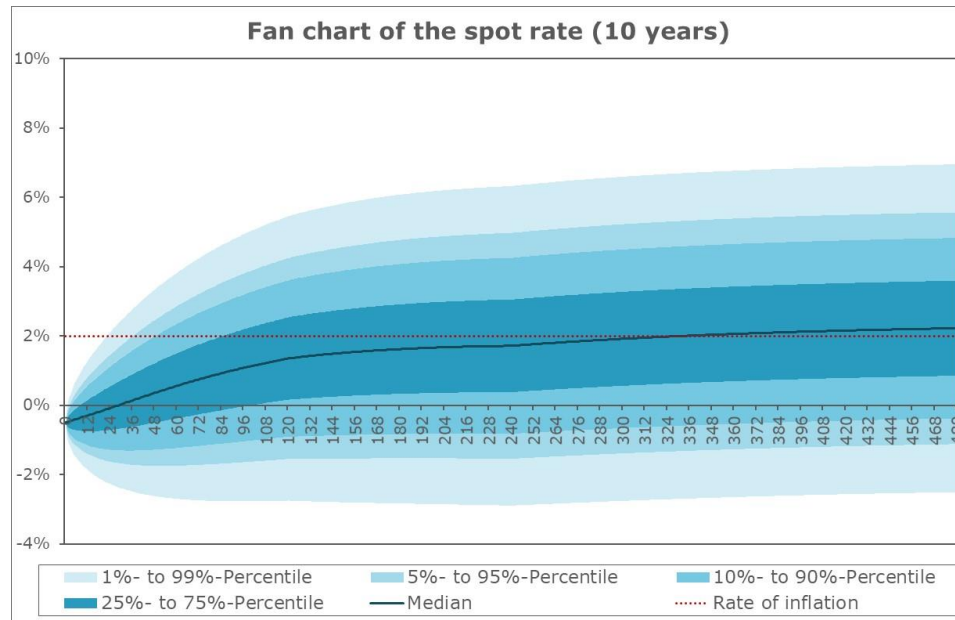


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Calibration of the capital market model

We plot the distribution of (nominal) 10-year interest rates ("spot rate") and average log-returns of equity (p.a.).

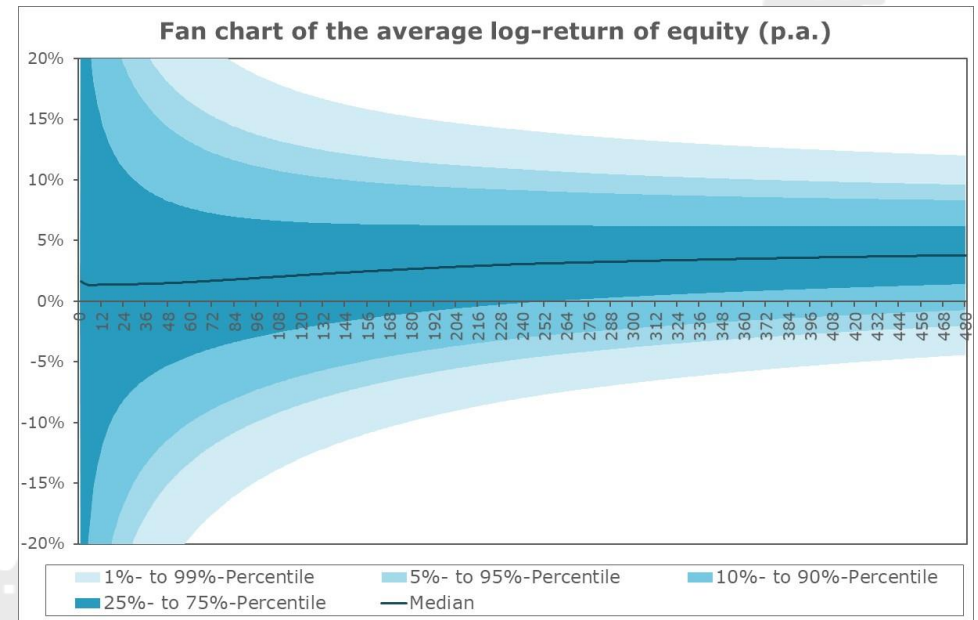
■ distribution of 10-year spot rates



■ Note: This chart shows the development of the 10-year interest rate in the model.

- The projection thus assumes increasing interest rates.

■ distribution of log-returns of equity



■ equity risk premium

- 4% expected excess return over the risk-free nominal interest rate

Analyses of pan-European Personal Pension Products (PEPP)

Products

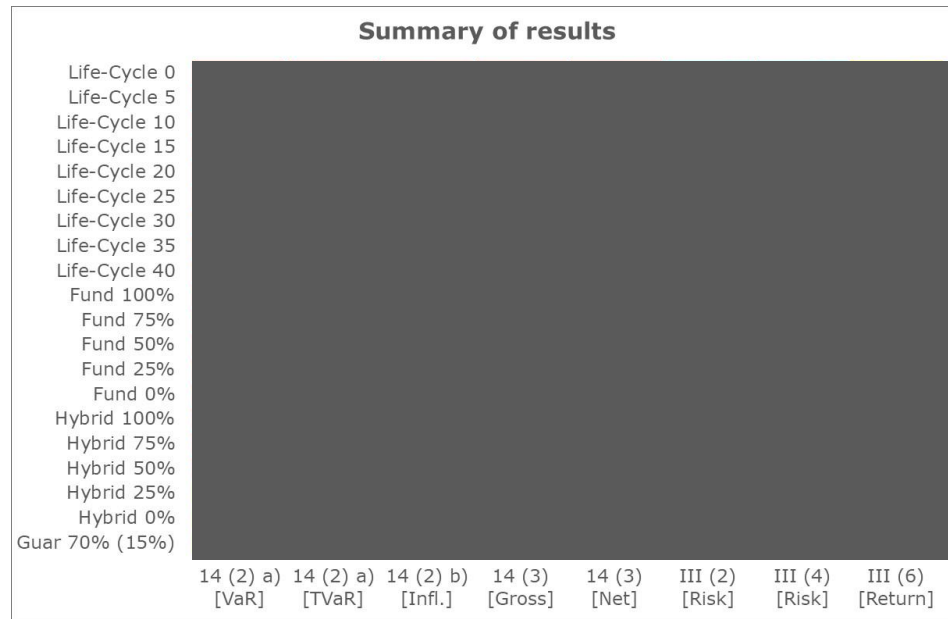
In our analyses we have considered a **variety of different products**:

- insurance products: **hybrid products**
 - investment in the insurer's general assets and an equity fund according to some fund quota
 - **Variation of the fund quota**: 0%, 25%, 50%, 75%, 100%
 - additionally: consideration of a specific fund quota which implies a guarantee of 70% of contributions paid
 - labels (exemplary):
 - **Hybrid 25%**: hybrid product with a fund quota of 25% (i.e., 75% invested in the general assets)
 - **Guar 70% (15%)**: hybrid product with a guarantee of 70% of contributions, fund quota 15% (i.e., 85% invested in the general assets)
- direct investment in balanced funds
 - balanced funds consist of equity and fixed income investments
 - labels (exemplary):
 - **Fund 25%**: balanced fund with a constant equity quota of 25%
- direct investment in life-cycle funds
 - balanced fund with decreasing equity quota
 - The life-cycle fund starts with 100% investment in equity and reallocates into fixed income investments over the „**duration of the life-cycle phase**“.
 - labels (exemplary):
 - **Life-Cycle 10**: Equity quota 100% until 10 years to maturity, then linear decrease to 0% afterwards

Analyses of pan-European Personal Pension Products (PEPP)

How are the results displayed?

In the following, we summarize the results for different constellations in the results **dashboard**.



The dashboard should be read as follows:

- y-axis (vertical): **different products**
- x-axis (horizontal): **different metrics**; labels following the corresponding articles in the RTS

Metrics in the respective columns

- columns 1, 2: „*expected loss not more than 20%*“
- column 3: „*outperforming the annual rate of inflation with a probability of at least 80%*“
- columns 4, 5: „*probability of recouping the capital at least 92.5%*“
- column 6: risk indicator, appendix III (2)
- column 7: risk indicator, appendix III (4)
- column 8: return indicator, appendix III (6)

Analyses of pan-European Personal Pension Products (PEPP)

Results, calibration: base, term: 40 years, fees: 1% p.a.

Summary of results

Life-Cycle 0	-44%	-57%	66%	81.7%	88.0%	34% [4]	-38% [4]	145% [1]
Life-Cycle 5	-40%	-53%	64%	81.7%	88.4%	36% [4]	-36% [4]	136% [1]
Life-Cycle 10	-37%	-48%	62%	81.9%	88.9%	38% [4]	-34% [4]	127% [1]
Life-Cycle 15	-34%	-45%	60%	81.8%	89.5%	40% [4]	-32% [4]	118% [1]
Life-Cycle 20	-31%	-42%	57%	81.9%	90.1%	43% [4]	-31% [4]	112% [1]
Life-Cycle 25	-29%	-39%	54%	82.0%	90.7%	46% [4]	-30% [4]	106% [1]
Life-Cycle 30	-27%	-37%	51%	81.8%	91.4%	49% [4]	-29% [4]	101% [1]
Life-Cycle 35	-26%	-36%	47%	81.4%	91.8%	53% [4]	-28% [4]	96% [1]
Life-Cycle 40	-26%	-35%	43%	80.4%	91.9%	57% [4]	-28% [4]	92% [1]
Fund 100%	-44%	-57%	66%	81.7%	88.0%	34% [4]	-38% [4]	145% [1]
Fund 75%	-33%	-47%	64%	83.8%	90.7%	36% [4]	-32% [4]	128% [1]
Fund 50%	-26%	-37%	55%	84.3%	92.7%	45% [4]	-28% [4]	107% [1]
Fund 25%	-23%	-32%	33%	79.5%	92.7%	67% [4]	-26% [3]	86% [1]
Fund 0%	-32%	-38%	6%	52.6%	81.0%	94% [4]	-34% [4]	66% [1]
Hybrid 100%	-44%	-57%	66%	81.7%	88.0%	34% [4]	-38% [4]	145% [1]
Hybrid 75%	-34%	-44%	62%	81.9%	89.8%	38% [4]	-33% [4]	127% [1]
Hybrid 50%	-24%	-32%	56%	82.2%	92.5%	44% [4]	-29% [4]	109% [1]
Hybrid 25%	-16%	-21%	43%	82.6%	96.5%	57% [4]	-26% [3]	92% [1]
Hybrid 0%	-11%	-13%	5%	74.3%	100.0%	95% [4]	-27% [4]	72% [1]
Guar 70% (15%)	-13%	-17%	34%	82.1%	98.4%	66% [4]	-25% [3]	84% [1]
	14 (2) a) [VaR]	14 (2) a) [TVaR]	14 (2) b) [Infl.]	14 (3) [Gross]	14 (3) [Net]	III (2) [Risk]	III (4) [Risk]	III (6) [Return]

Most important insights

- expected loss only small enough for the conservative insurance products
- probability of outperforming the annual rate of inflation not sufficient for any product
 - some chance of outperforming the annual rate of inflation only for equity-heavy products
- probability of recouping the capital only sufficiently high for net consideration and conservative products



In the current capital market environment, no product meets all the requirements of a risk-mitigation technique or the Basic PEPP.

All products have the highest risk indicator (4) and the lowest return indicator (1).

Analyses of pan-European Personal Pension Products (PEPP)

Results, calibration: base, fees: 0% p.a.

sensitivity
no fees

Summary of results

Life-Cycle 0	-33%	-49%	75%	87.3%	87.3%	25% [4]	-35% [4]	185% [2]
Life-Cycle 5	-29%	-44%	73%	87.9%	87.9%	27% [4]	-33% [4]	173% [2]
Life-Cycle 10	-25%	-40%	73%	88.5%	88.5%	27% [4]	-31% [4]	163% [1]
Life-Cycle 15	-21%	-35%	72%	89.2%	89.2%	28% [4]	-29% [4]	150% [1]
Life-Cycle 20	-18%	-31%	71%	89.9%	89.9%	29% [4]	-28% [4]	142% [1]
Life-Cycle 25	-15%	-28%	70%	90.5%	90.5%	30% [4]	-26% [3]	135% [1]
Life-Cycle 30	-13%	-26%	68%	91.2%	91.2%	32% [4]	-25% [3]	128% [1]
Life-Cycle 35	-12%	-24%	66%	91.6%	91.6%	34% [4]	-24% [3]	122% [1]
Life-Cycle 40	-11%	-23%	63%	91.7%	91.7%	37% [4]	-23% [2]	116% [1]
Fund 100%	-33%	-49%	75%	87.3%	87.3%	25% [4]	-35% [4]	185% [2]
Fund 75%	-20%	-36%	75%	90.1%	90.1%	25% [4]	-30% [4]	162% [1]
Fund 50%	-10%	-24%	72%	92.3%	92.3%	28% [4]	-24% [3]	135% [1]
Fund 25%	-7%	-18%	58%	92.5%	92.5%	42% [4]	-21% [2]	106% [1]
Fund 0%	-18%	-26%	22%	80.7%	80.7%	78% [4]	-25% [3]	81% [1]
Hybrid 100%	-33%	-49%	75%	87.3%	87.3%	25% [4]	-35% [4]	185% [2]
Hybrid 75%	-20%	-33%	73%	89.0%	89.0%	27% [4]	-30% [4]	161% [1]
Hybrid 50%	-8%	-18%	70%	92.0%	92.0%	30% [4]	-24% [3]	138% [1]
Hybrid 25%	3%	-4%	62%	96.3%	96.3%	38% [4]	-19% [1]	115% [1]
Hybrid 0%	9%	7%	29%	100.0%	100.0%	71% [4]	-16% [1]	89% [1]
Guar 70% (30%)	0%	-7%	64%	95.3%	95.3%	36% [4]	-20% [1]	120% [1]
	14 (2) a) [VaR]	14 (2) a) [TVaR]	14 (2) b) [Infl.]	14 (3) [Gross]	14 (3) [Net]	III (2) [Risk]	III (4) [Risk]	III (6) [Return]

Most important insights

- expected loss small enough for the more conservative products
 - exception: pure fixed income fund (Fund 0%)
- even without any fees probability of outperforming the annual rate of inflation not sufficient for any product
- probability of recouping the capital only sufficient for conservative insurance products



Even without any fees, no product would meet all the requirements of a risk-mitigation technique in the current capital market environment.

- probability of outperforming the annual rate of inflation not sufficient for any product, even without any fees

Analyses of pan-European Personal Pension Products (PEPP)

Results, calibration: higher interest rates and risk premium, fees: 1% p.a.

sensitivity
interest rates and
risk premium

Summary of results

Life-Cycle 0	23%	-10%	92%	97.0%	98.5%	8% [1]	-29% [4]	406% [4]
Life-Cycle 5	22%	-9%	92%	97.0%	98.6%	8% [1]	-28% [4]	364% [4]
Life-Cycle 10	21%	-6%	91%	97.3%	98.8%	9% [1]	-26% [3]	323% [4]
Life-Cycle 15	23%	-2%	91%	97.7%	99.1%	9% [1]	-24% [3]	287% [4]
Life-Cycle 20	24%	1%	90%	97.9%	99.3%	10% [1]	-22% [2]	257% [4]
Life-Cycle 25	25%	4%	90%	98.1%	99.5%	10% [1]	-21% [2]	233% [3]
Life-Cycle 30	26%	6%	90%	98.4%	99.6%	10% [1]	-20% [1]	211% [3]
Life-Cycle 35	27%	7%	90%	98.6%	99.6%	10% [1]	-19% [1]	194% [2]
Life-Cycle 40	26%	7%	89%	98.7%	99.7%	11% [1]	-18% [1]	179% [2]
Fund 100%	23%	-10%	92%	97.0%	98.5%	8% [1]	-29% [4]	406% [4]
Fund 75%	34%	4%	93%	98.0%	99.2%	7% [1]	-24% [3]	307% [4]
Fund 50%	36%	13%	93%	98.7%	99.6%	7% [1]	-20% [1]	220% [3]
Fund 25%	27%	11%	87%	99.0%	99.9%	13% [1]	-16% [1]	150% [1]
Fund 0%	-1%	-10%	50%	94.9%	99.3%	50% [4]	-18% [1]	100% [1]
Hybrid 100%	23%	-10%	92%	97.0%	98.5%	8% [1]	-29% [4]	406% [4]
Hybrid 75%	24%	-2%	91%	97.5%	99.1%	9% [1]	-24% [3]	331% [4]
Hybrid 50%	25%	5%	90%	98.2%	99.7%	10% [1]	-20% [1]	255% [4]
Hybrid 25%	24%	10%	87%	99.1%	100.0%	13% [1]	-16% [1]	181% [2]
Hybrid 0%	15%	8%	58%	99.5%	100.0%	42% [4]	-13% [1]	104% [1]
Guar 70% (15%)	23%	11%	83%	99.4%	100.0%	17% [3]	-15% [1]	151% [1]
	14 (2) a) [VaR]	14 (2) a) [TVaR]	14 (2) b) [Infl.]	14 (3) [Gross]	14 (3) [Net]	III (2) [Risk]	III (4) [Risk]	III (6) [Return]

Most important insights

- expected loss small enough for all products
- probability of outperforming the annual rate of inflation sufficient for almost all products
 - Exception: pure fixed income investment (Fund 0%) and pure conventional product (Hybrid 0%)
- probability of recouping the capital sufficient for all products



With a 200 bp higher interest rate level and at the same time a 200 bp higher risk premium for equities, almost all products meet the requirements.

Analyses of pan-European Personal Pension Products (PEPP)

Summary and conclusion

Summary of the most important results in the **current capital market environment**

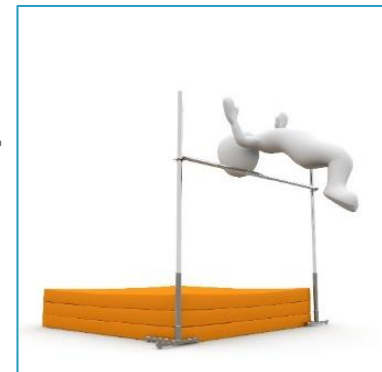
- No product meets all the requirements for a risk-mitigation technique or the Basic PEPP.
- In particular, probability of outperforming the annual rate of inflation is not sufficient for any product.
- Even with a benevolent interpretation of the RTS and for products without any fees, these findings would remain.
- All products have the highest risk indicator (4) and the lowest return indicator (1).

The interplay of absolute specifications in the RTS and a calibration of the models to the respective current capital market environment ...

- ... leads to a predictable **high fluctuation of the results** over time.
 - Depending on the calibration, all or none of the products meet the requirements.
- ... does **not provide any meaningful differentiation** between the products.

Summary of the most important results in the **(fictive) capital market sensitivities**

- Even with a 200 bp higher interest rate level, only a few products narrowly meet the requirements for a risk-mitigation technique.
- With a 200 bp higher risk premium for equities, no product meets all the requirements.
- With a 200 bp higher interest rate level and at the same time a 200 bp higher risk premium for equities, almost all products meet the requirements.



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Literature

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What we do

Life



product development
biometric risks
life settlements/TEPs

Non-Life



product design ▪ pricing
reserving ▪ DFA
risk management

Health



actuarial modeling
claims management
portfolio analyses

Actuarial Consulting

Solvency II ▪ embedded value ▪ asset liability management
ERM ▪ value- and risk-based management ▪ data analytics

project management ▪ market entries ▪ inforce management ▪ strategic consulting

Actuarial Services

large-scale actuarial projects ▪ actuarial tests
support in case of capacity constraints

Research



Education



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