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The Impact of Inflation Risk on Financial Planning and Risk-Return Profiles

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Motivation

- Government-run pay-as-you-go systems suffer from demographic changes

  → demand for private old age provision increases
- How to choose “optimal” products?
  - Vast body of literature on determining optimal (often dynamic) asset allocations mostly using expected utility approaches
  - Really practicable for “typical” client?
  - Graf et al. (2012) introduce risk-return profiles of old age provision products by means of stochastic modelling focussing on nominal returns
  - But: **Purchasing power of benefits more relevant than nominal returns**.

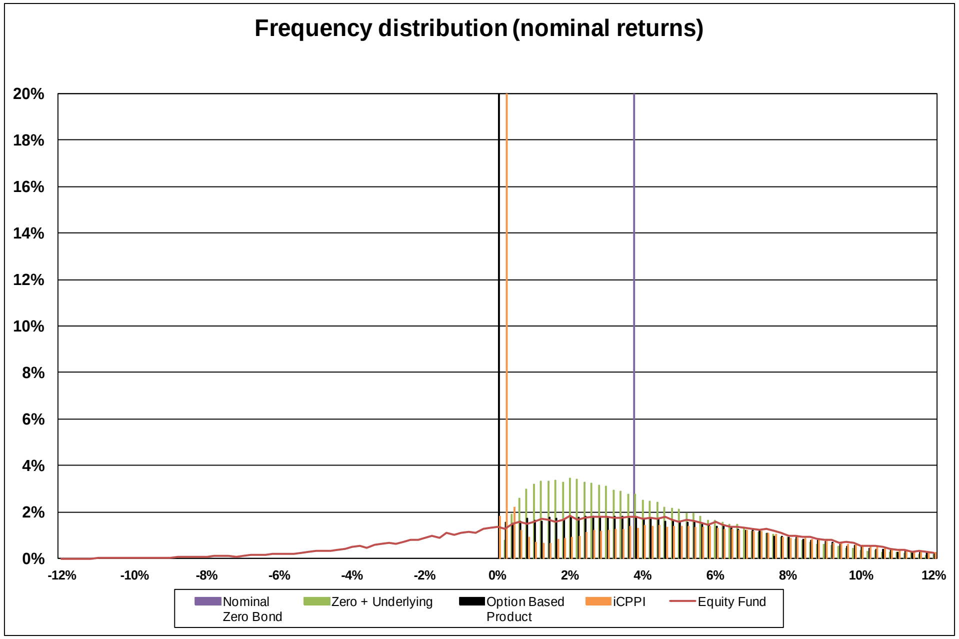
Products under consideration

„Standard“ products

- Equity Fund
- Zero-Bond
- Different products with nominal guarantee
  - Option based
  - Zero plus Underlying
  - iCPPI

Nominal risk-return profile

Nominal risk-return profiles in the model of Graf (2012)



Contribution

– Extend the model of Graf et al. (2012) by including stochastic modelling of inflation

– Quantitative analysis of real returns especially focussing on (existing) products equipped with nominal investment guarantees

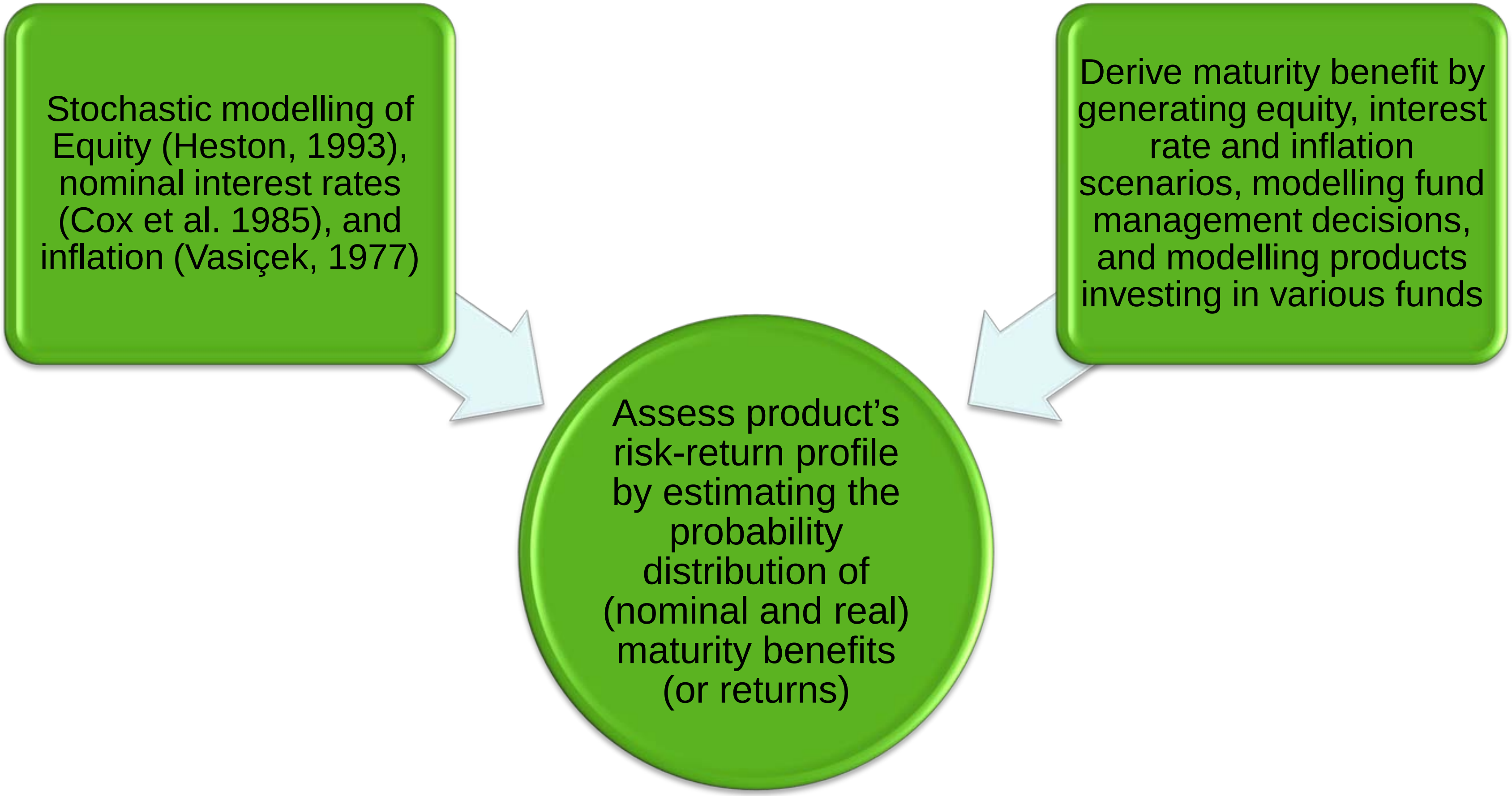
– Proposal of product modifications taking inflation risk into account

Products under consideration

„Modified“ Products („Inflation-linked“ products)

- Inflation-linked bond
- Modified versions of Zero plus Underlying and iCPPI
  - Adjustment of floor based on realized inflation
  - Market based adjustment of floor
  - Inflation-linked bond as a safe asset

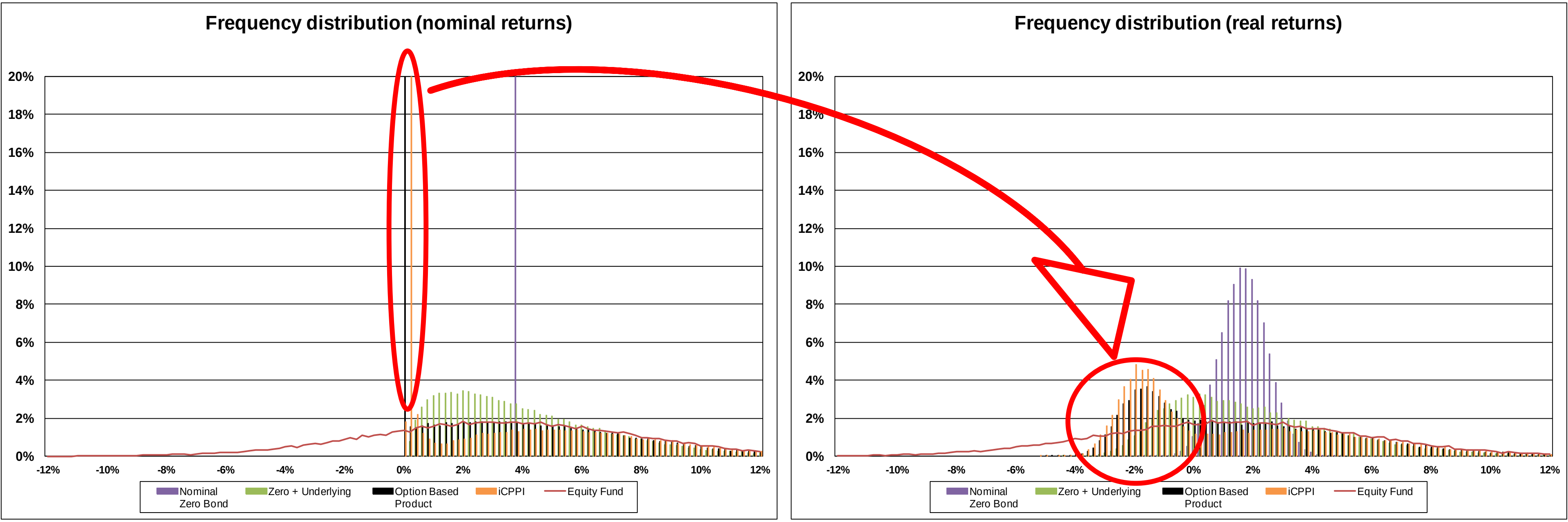
Risk-return profiles



- In the paper, we analyze the risk-return profiles of all considered products for single and regular premium payment and perform a large number of sensitivity analyses.
- In this presentation, we look at single premiums and a „base case“ scenario only.

Nominal vs real risk-return profiles of standard products

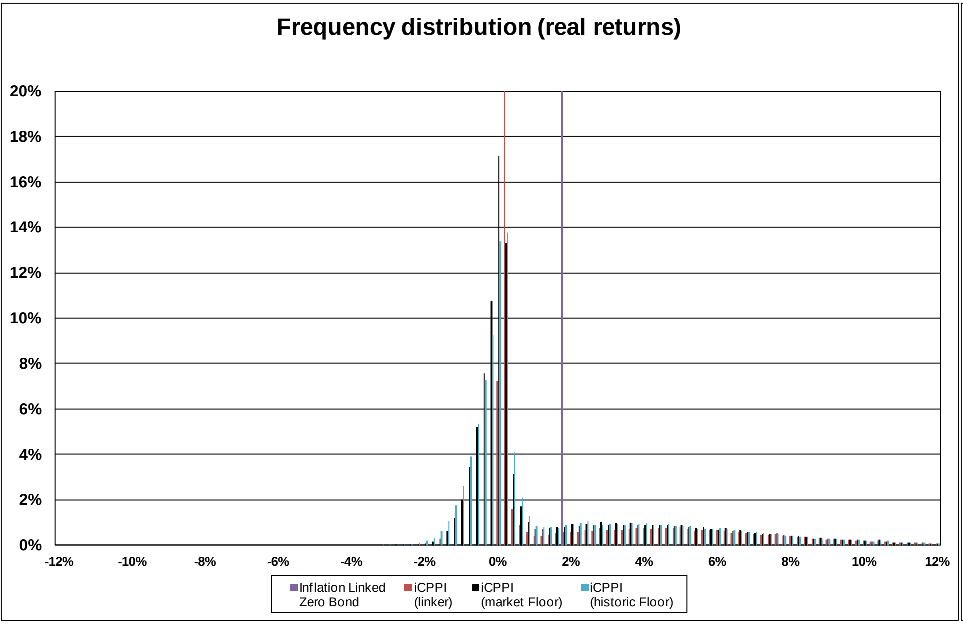
Single premium with 30y investment horizon

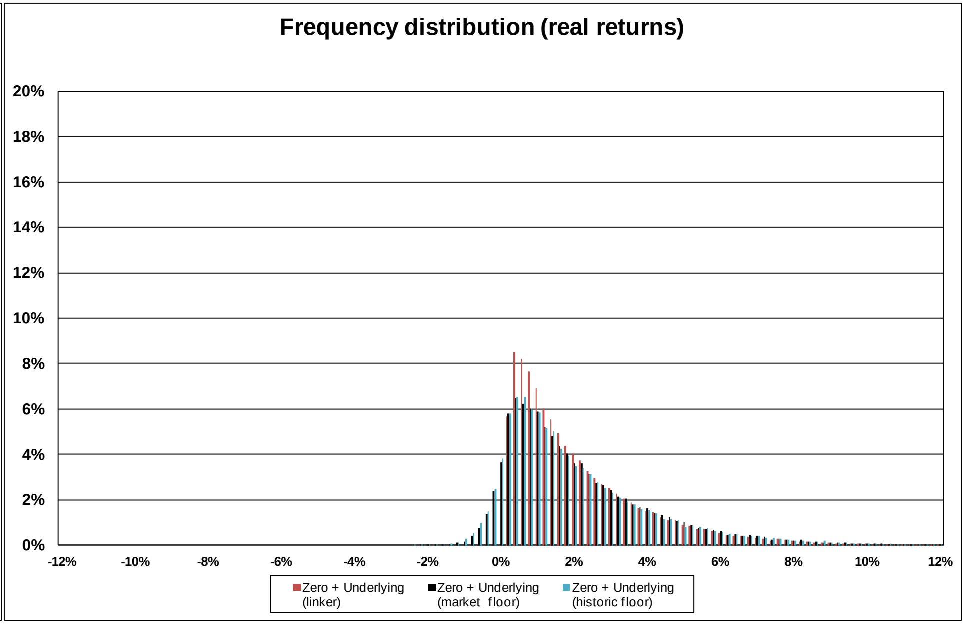


- Popular products with nominal guarantees often have a significant probability mass at the guaranteed amount
- This results in a high probability of negative real returns
- Product designs with an investment strategy that takes inflation into account are desirable

Real risk-return profiles of modified products

Single premium with 30y investment horizon





- Product modifications significantly reduce the risk of negative real returns
- Using a market based floor adjustment appears to yield better resutls (changes are picked up more quickly)
- The Zero plus Underlying products are more conservative, the iCPPI products yield more upside potential but also more risk.
- This products and „combinations in between“ might provide a good starting point for offering products with some form of inflation protection.

Conclusion and further research

Conclusion

- Inflation risk has significant impact on existing old age provision products, in particular products that are perceived as safe due to nominal guarantees.
- Proposed product modifications reduce inflation risk significantly.
- We constructed different modified products for clients with different risk aversion

Further research

- Measure and manage inflation risk in the payout phase of different types of annuities
- Derive policy implications and educate governments, regulators, financial advisors and clients about inflation risk.
    - E.g. the German case: Government provides certain tax benefits only for products with nominal guarantees + intended legal obligation to show nominal risk return profiles

Thank you very much for your attention

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Backup – Model and parameters

$$r(t) = \kappa_r\big(\theta_r - r(t)\big)dt + \sigma_r\sqrt{r(t)}dW^r(t)$$

$$di(t) = \kappa_i(\theta_i - i(t))dt + \sigma_i dW^i(t)$$

$$dS(t) = S(t)\left((r(t) + \lambda_S)dt + \sqrt{V(t)}dW^S(t)\right)$$

$$dV(t) = \kappa_V\big(\theta_V - V(t)\big)dt + \sigma_V dW^V(t)$$

θ_r	κ_r	σ_r	$r(0)$	κ_V	θ_V	σ_V	$V(0)$	ρ_V	λ_S
20%	4.5%	7.5%	4.5%	475%	$(22\%)^2$	55%	$(22\%)^2$	−57%	3%

κ_i	θ_i	σ_i	$i(0)$
20%	2%	1%	2%