Agenda

Motivation and existing approaches

Risk-return profiles by means of stochastic modeling

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

Examples from practice

Conclusion and future research
Motivation and existing approaches

Government-run pay-as-you-go systems suffer from demographic changes
   – demand for private old age provision increases

Guarantees …
   – are legally prescribed in many areas and demanded by clients.

The “evolution of guarantee models“ was a key issue in product development of recent years.
   – It becomes more and more difficult to assess advantages and disadvantages of different guarantee models.
   – The question of the key characteristics is key for clients and advisors.
Motivation and existing approaches

Risk and return expectations of different products
Motivation and existing approaches

How to choose the “optimal” product? - The academic’s approach
  – using expected utility

some examples on annuitizing
  – Yaari (1965), Milevsky (1998), Milevsky et al. (2005), Gerrard et al. (2010)

vast body of literature on determining optimal (often dynamic) asset allocations, e.g.
  – Cairns et al. (2006), Boyle and Tian (2009)

Really practicable for a “typical” client?
Motivation and existing approaches

How to choose the “optimal” product? - The practitioner’s approach (1)
- sample calculations
  - Product’s maturity benefit calculated assuming a constant fund growth
  - Asset allocation neglected
  - Lack of volatility conceals path-dependant effects, reallocation of risky and riskless assets in CPPI products
Motivation and existing approaches

How to choose the “optimal” product? - The practitioner’s approach (2)

- backtestings
  - Underlying investment vehicle is projected assuming it had been invested in the past (according to some time series)
  - “Each product can win” by choosing appropriate time-series and time-frame
Motivation and existing approaches

Our Contribution

- Introduce methodology on how to derive risk-return profiles
- Quantitative analyses of common products with and without investment guarantees
- Analyze existing products under inflation risk
- Modify products in order to reduce inflation risk
Agenda

Motivation and existing approaches

Risk-return profiles by means of stochastic modeling
  – general approach & model framework
  – considered products
  – results

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

Examples from practice

Conclusion and future research
Risk return profiles by means of stochastic simulation

1) stochastic simulation of the capital market
   – Equity (modified (Heston, 1993))
   – Interest rates (Cox et al., 1985)

2) for each scenario determine the performance of the considered product
   – Modelling fund management decisions
   – Modelling products investing in various funds
   – including all product charges and product mechanisms

3) Assess product’s risk-return profile by estimating the probability distribution of maturity benefits (or returns)
Products under consideration

Products without embedded guarantees

- Investment in equity, balanced fund or zero bond

Products with “money back guarantee”

- Static option-based product (“underlying + put”)
- Zero plus Underlying
- (Dynamic) CPPI strategy on a client individual basis (iCPPI)

Products with “savings premium guarantee”

- (Dynamic) CPPI strategy implemented in a mutual fund and thus managed on a “collective” basis (CPPI high watermark fund)
Risk-return profiles

Quantitative sample results

Single premium

Regular premium
Risk-return profiles

Quantitative sample results

Frequency distribution (nominal returns)
Risk-return profiles

Quantitative sample results

Frequency distribution (nominal returns)

Nominal
Zero Bond
Zero + Underlying Option Based Product
iCPPI Equity Fund
Agenda

Motivation and existing approaches

Risk-return profiles by means of stochastic modeling

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

Examples from practice

Conclusion and future research
Risk-return profiles

Stochastic modelling of Equity (Heston, 1993), nominal interest rates (Cox et al. 1985), and inflation (Vasićek, 1977)

Assess product’s risk-return profile by estimating the probability distribution of (nominal and real) maturity benefits (or returns)

Derive maturity benefit by generating equity, interest rate and inflation scenarios, modelling fund management decisions, and modelling products investing in various funds

- 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
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

| Nominal Zero Bond | Zero + Underlying Option Based Product | iCPPI Equity Fund |
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
Product modifications significantly reduce the risk of negative real returns.
Using a market based floor adjustment appears to yield better results (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.
Agenda

Motivation and existing approaches

Risk-return profiles by means of stochastic modeling

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

Examples from practice

Conclusion and future research
Current trends and examples from different markets

New and upcoming transparency rules in many markets
- Sometimes combined with an illustration of product risks
- Disclosure of charges
- Calculation of “risk indicators” or risk classes
- Calculation of Risk return Profiles making chances and risks from a client’s perspective transparent
- Examples follow

<table>
<thead>
<tr>
<th>Risiko</th>
<th>chance</th>
<th>chance</th>
<th>chance</th>
<th>chance</th>
<th>chance</th>
<th>chance</th>
<th>chance</th>
<th>chance</th>
<th>chance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 0%</td>
<td>0%–2%</td>
<td>2%–5%</td>
<td>5%–8%</td>
<td>≥ 8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0,0%</td>
<td>31,7%</td>
<td>52,7%</td>
<td>13,1%</td>
<td>2,6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbildungs- und Berechnungs-MFP Finanzberatungs AG

-0%  0%  1%  2%  3%  4%  5%  6%  7%  8%  9%  10%  11%  12%  13%  14%  15%  215%

0,0%  31,7%  22,7%  13,1%  2,6%
Current trends and examples from different markets

Example 1 from GERMANY
  – Risk-return profiles are communicated by distributors (example of MLP)
    • as support for the broker (left)
    • Vis-à-vis the client – this is part of the consultation documentation (right)
Current trends and examples from different markets

Example 2 from GERMANY

- Risk classes are used by distributors (example of AWD)
  1. Risk categorization of products
  2. Risk categorization of clients
  3. Mapping of clients and products
Current trends and examples from different markets

Example 3 from GERMANY

- Risk classes and risk-return-profiles are calculated by distribution software tools (example of Morgen & Morgen Volatium)
Current trends and examples from different markets

Example 4 from GERMANY

- Upcoming transparency rules for government subsidized products (Riester products)
  - Draft of a new regulation: Altersvorsorge-Produktinformationsblätter-Verordnung AVPIBVO
  - Expected content is compulsory information about the chances and risks of a product, including the calculation of risk classes
Current trends and examples from different markets

Example 5 from NETHERLANDS

- AFM - the Netherlands Authority for the Financial Markets: A quantitative risk indicator for financial products
Current trends and examples from different markets

Example 6 from UK

- Barrie & Hibbert wealth manager & wealth scenario generator
- Source: Barrie & Hibbert, AVIVA

Source:
Current trends and examples from different markets

Example 7 from Italy

- CONSOB: Regulation implementing Italian Legislative Decree No. 58 of 24 February 1998, concerning the discipline of issuers
- Requirement to provide certain return probabilities by means of stochastic simulation

«The following table shows the probabilistic scenarios of the financial investment at the end of the recommended investment time horizon based on a comparison of the possible results of the investment in a financial asset without risk at the end of that horizon. The probability of occurrence (probability) and the final counter-value of the invested capital that represents the scenario (central values) are shown for each scenario.»

Note the probabilistic scenarios of the financial investment of the fund/sub-fund at the end of the recommended investment time horizon as shown in the following table.

<table>
<thead>
<tr>
<th>PROBABILISTIC SCENARIOS OF THE FINANCIAL INVESTMENT</th>
<th>PROBABILITY</th>
<th>CENTRAL VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>The return is negative</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>The return is positive but less than that of the financial asset without risk</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>The return is positive and in line with that of the financial asset without risk</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>The return is positive and higher than that of the financial asset without risk</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

Include the following disclaimer:

«Disclaimer: The values noted in the above table are shown to aid comprehension of the risk profile of the financial investment only.»
Agenda

Motivation and existing approaches

Risk-return profiles by means of stochastic modeling

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

Examples from practice

Conclusion and future research
Conclusion and further research

Conclusion

- Existing approaches for financial planning are not practicable or provide insufficient information.
- Introduced methodology of risk-return profiles provides appropriate assessment of product’s risk-return profile (under nominal and real returns).
- 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.
Conclusion and further research

Further research

- Extension to retirement phase products?
- 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
  - How to communicate the information appropriately?
Thank you for your attention

Contact details

Alexander Kling

a.kling@ifa-ulm.de

+49 (731) 50 31242

References


Backup – Model and parameters

\[ r(t) = \kappa_r (\theta_r - r(t))dt + \sigma_r \sqrt{r(t)} dW^r(t) \]
\[ di(t) = \kappa_i (\theta_i - i(t)) dt + \sigma_i dW^i(t) \]
\[ dS(t) = S(t) \left( (r(t) + \lambda_S) dt + \sqrt{V(t)} dW^S(t) \right) \]
\[ dV(t) = \kappa_V (\theta_V - V(t)) dt + \sigma_V dW^V(t) \]

<table>
<thead>
<tr>
<th>$\theta_r$</th>
<th>$\kappa_r$</th>
<th>$\sigma_r$</th>
<th>$r(0)$</th>
<th>$\kappa_V$</th>
<th>$\theta_V$</th>
<th>$\sigma_V$</th>
<th>$V(0)$</th>
<th>$\rho_V$</th>
<th>$\lambda_S$</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>4.5%</td>
<td>7.5%</td>
<td>4.5%</td>
<td>475%</td>
<td>(22%)^2</td>
<td>55%</td>
<td>(22%)^2</td>
<td>-57%</td>
<td>3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\kappa_i$</th>
<th>$\theta_i$</th>
<th>$\sigma_i$</th>
<th>$i(0)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>2%</td>
<td>1%</td>
<td>2%</td>
</tr>
</tbody>
</table>