



Improving pension product design

Konicz, Agnieszka Karolina; Mulvey, John M.

Published in:

The 17th International Congress on Insurance: Mathematics and Economics July 1-3, 2013 Copenhagen

Publication date:

2013

[Link back to DTU Orbit](#)

Citation (APA):

Konicz, A. K., & Mulvey, J. M. (2013). Improving pension product design. In *The 17th International Congress on Insurance: Mathematics and Economics July 1-3, 2013 Copenhagen: Abstracts* (pp. 89-89)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Improving pension product design

Agnieszka Karolina Konicz¹, John M. Mulvey²

¹*DTU Management Engineering, Management Science,
Technical University of Denmark,
2800 Kgs. Lyngby, Denmark*

²*Department of Operations Research and Financial Engineering,
Bendheim Center for Finance,
Princeton University,
Princeton, New Jersey 08544*

Abstract

Pension products characterized by linking an individual's savings directly to market returns represent the most popular, growing pension domain globally. These products are widely sold in contribution-defined pension schemes, labor market pensions, and individual schemes. For instance, in Denmark, there are almost 53 billion EUR invested in these products. However, available products are designed with a tendency to assume greater risk the longer it is until retirement, but are not adjusted to individual preferences and circumstances.

This paper develops an optimal asset allocation strategy, retirement benefits and insured sum for a defined contribution plan by adjusting to individual needs, such that the expected utility of total retirement benefits and the utility of leaving money upon death are maximized. The benefits consist of three sources of payments: state pension, labor market pension and private pension. We argue that the controlled processes should not only depend on the plan member's age (or time left to retirement), nor only on her risk preferences, but should capture personal characteristics. Among other factors, we include current wealth, expected lifetime salary progression (mandatory pension contributions), voluntary pension contributions, expected social benefits, choice of assets, type of retirement distribution schedules, marital status and bequest motive.

The problem is solved via a model that combines two optimization approaches: stochastic optimal control and multi-stage stochastic linear programming (SLP). The first method is common in financial and actuarial literature, but results in theoretical values. However, SLP, which is characteristic for operations research, has highly practical application. As an example of an optimal pension product design, we present the operations research methods, which have potential to stimulate new thinking and add to actuarial practice.
