

Improving pension product design

Agnieszka Karolina Konicz¹
John M. Mulvey²

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

*contact person at:
email: agko@dtu.dk
tel.: (+1) 609 917 8506*

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

Abstract

The paper develops a pension product that can be offered in a defined contribution pension scheme as a deferred or immediate life annuity. The product is characterized by linking an individual's savings directly to market returns and differs from the products available in the market by being adjusted to individual needs. We argue that the asset allocation, the payout profile and the insured sum 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 and economical characteristics. Among other factors, we include current wealth, expected lifetime salary progression, mandatory and voluntary pension contributions, expected state retirement pension, choice of assets, subjective lifetime expectancy and bequest motive. Specifically, the asset allocation strategy, the payout profile and the level of insured sum defining the new product are optimal under the expected utility function of retirement benefits given the individual's characteristics.

The problem is solved via a model that combines two optimization approaches: stochastic optimal control and multistage stochastic programming. The first method is common in financial and actuarial literature, but results in theoretical values. However, the latter, which is characteristic for operations research, has highly practical application. We present the operations research methods with application of immediate and deferred life annuities in the Danish market, which have potential to stimulate new thinking and add to actuarial practice.