

“Longevity risk in portfolios of life insurance and annuity liabilities: the effect of product design, product mix and portfolio composition”

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Abstract:

It is clear that whereas the liabilities of annuity providers increase when mortality rates decrease, the opposite holds for insurers who offer death benefit insurance. Existing literature shows that the natural hedge potential that arises from combining these two types of liabilities may be substantial. The goal of our paper is to identify alternative possibilities for longevity risk management by quantifying the effect of product design, product mix, and portfolio composition (i.e. age and gender distribution) on a portfolio's sensitivity to longevity risk. We consider different types of life insurance and annuity liabilities, with and without exchange options. Exchange options, such as the option to exchange a joint life annuity for a single life annuity, or vice versa, are common in defined benefit pension schemes in the US and the Netherlands. Since the exchange has to be actuarially neutral at the time of exchange, the exchange rate depends on the development over time of mortality rates, and is therefore also subject to longevity risk. We use stochastic mortality forecast models to quantify the effect of product design, product mix and portfolio composition on longevity risk, with specific emphasis on the effect of exchange options. We find that the effect of longevity risk on the aggregate liabilities depends strongly on gender and age composition, as well as on product mix. In addition, the presence of exchange options has significant effect. This has three important implications. First, product redesign may help to mitigate the adverse effects of longevity risk for pension funds and insurers. Second, in determining solvency buffers and/or market value margins, regulators should ideally take into account gender and product mix, as well as the effect of options imbedded in the annuity contracts. Finally, in addition to swap agreements that affect product mix, reinsurance or swap contracts that affect gender and age distribution may also be efficient tools to redistribute longevity risk.