

Calculating capital requirements for longevity risk
in life insurance products.
Using an internal model in line with Solvency II

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ABSTRACT

The payments of life insurance products depend on the evolution of future survivor probabilities. The literature has devoted considerable attention to the development of statistical models to forecast future mortality improvements. However, using such statistical models to determine solvency requirements, can be highly time consuming. This is the case in particular when the distribution of discounted cash flows needs to be simulated for a future point in time, and conditional on the information available at that time. The goal of the paper is twofold. First, using an internal model which is in line with the Solvency II proposal we derive a closed form approximation for the capital requirements for different portfolios of life insurance products, in case mortality rates are forecasted by means of the Lee and Carter (1992) model. The approximated distribution reduces computer time. In case of the Cost of Capital approach, where the number of simulations is exponential in the number of years to maturity of the life insurance contract, the approximated distribution allows us to calculate solvency requirements for several life insurance products. Specifically, using a market-to-model model, we calculate the market value of the liabilities and the capital reserve that is needed in order to limit the probability of shortfall within a year to 0.5%. We consider the case where the market value of the liabilities is determined by means of the Cost of Capital approach. Second, using the internal model we quantify the effects of different simplifications made in the Solvency II proposal on the capital requirements.