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Risk Measurement of a Guaranteed Annuity Option under a Stochastic Environment

We address the problem of setting capital reserves for a guaranteed annuity option (GAO). The modelling framework for the loss function of GAO is developed. A one-decrement actuarial model is considered in which death is the only decrement, and the interest and mortality risk factors follow correlated affine structures. Risk measures are determined using moment-based density method and benchmarked with the Monte-Carlo simulation. Bootstrap technique is utilised to assess the variability of risk measure estimates. We establish the relation between a desired level of risk measure accuracy and required sample size under the constraints of computing time and memory. A sensitivity analysis of parameters is further conducted, and our numerical investigations provide practical considerations for insurers in meeting certain regulatory requirements.