Monte Carlo Valuation of Future Annuity Contracts

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Abstract The systematic improvements of health conditions in most industrialized countries led the insurance sector to carefully evaluate and manage the so-called longevity risk. In particular, the implementation of de-risking strategies for pension providers, e.g. buy-ins and buy-outs, involves the valuation of annuity contracts at future time horizons. In this paper, we propose a methodology for valuing such contracts based on the Least-Squares Monte Carlo (LSMC) approach. This method, originally applied for valuing American-type options, was then used in many other contexts, e.g. estimating solvency capital requirements for insurance companies. Its popularity relies essentially on its flexibility, as it is implementable regardless of model complexity. Specifically, we evaluate the distribution of future annuity values. We adopt, as first step, a simplified computational framework where just one risk factor is taken into account, i.e. longevity risk. We give a detailed description of the valuation algorithm and provide several numerical illustrations. Furthermore, to test the efficiency of the proposed methodology, we compare our results with those obtained by applying a straightforward and time-consuming approach based on nested simulations. This comparison seems to suggest that the LSMC method provides accurate estimates of all the relevant quantities.

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