Pricing Mortality-linked Securities with Dependent Lives under the Multivariate Threshold Life Table

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Abstract

In the standard insurance industry practice, actuaries usually assume independence of lives when valuing mortality-linked securities that more than one life, say, couples, are involved with. Empirical studies, however, have illustrated a significant dependence between joint lives. Another pitfall in traditional insurance pricing is that life tables are usually closed at an earlier age due to the inaccuracy and unavailability of data. The increasing number of supercentanarians makes the old-age mortality modeling crucial to life insurance industry. In this paper, we adopt copulas to capture life dependency, and establish the multivariate threshold life table for dependent lives. We use last-survivor annuities and reverse mortgages as pricing examples to illustrate the effectiveness of our model framework. Assuming independence of lives overestimates annuity values, while using traditional life table underestimates annuity values.