Nonzero Sum Stochastic Differential Games of the Longevity Security Market with Cointegration

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This paper considers the non-zero-sum stochastic longevity market game between two insurers. Each individual insurer allocates her wealth between a longevity security and a risk-free bond subject to the risk of paying out random liabilities of a doubly stochastic Poisson process that the intensity rate is cointegrated with the index mortality rate underlying the longevity security. In the competitive longevity market scenario, each insurer aims to beat its competitor by maximizing the expected utility of the log-difference between the terminal wealth of insurer and its competitor. We characterize the problem under a general utility, and a general stochastic interest rate and intensity rate processes. Explicit solution of the Nash equilibrium strategy is derived for the constant absolute risk adverse (CARA) utility and the Vasicek-type stochastic interest and mortality rates. The closed-form solution of the optimal objective function is provided as well. Numerical examples illustrate the consequence of a two-person competition in a nonzero sum stochastic differential game environment.

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