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Valuation and hedging of the ruin-contingent life annuity (RCLA)

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This paper analyzes a novel type of mortality contingent-claim called a ruin-contingent life annuity (RCLA). This product fuses together a path-dependent equity put option with a "personal longevity" call option. The annuitant's (i.e. long position) payoff from a generic RCLA is \$1 of income per year for life, akin to a defined benefit pension, but deferred until a pre-specified financial diffusion process hits zero. We derive the PDE and relevant boundary conditions satisfied by the RCLA value (i.e. the hedging cost) assuming a complete market where No Arbitrage is possible. We then describe some efficient numerical techniques and provide estimates of a typical RCLA under a variety of realistic parameters.

The motivation for studying the RCLA on a stand-alone basis is two-fold. First, it is implicitly embedded in approximately \$1 trillion worth of U.S. variable annuity (VA) policies; which have recently attracted scrutiny from financial analysts and regulators. Second, the U.S. administration - both Treasury and Department of Labor - have been encouraging Defined Contribution (401k) plans to offer stand-alone longevity insurance to participants, and we believe the RCLA would be an ideal and cost effective candidate for that job.

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