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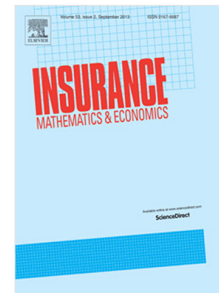
Jorge Miguel Bravo, Najat El Mekkaoui de Freitas

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Valuation of longevity-linked life annuities

Jorge Miguel Bravo* Najat El Mekkaoui de Freitas †

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Abstract

In this paper we show that the fair value of a pure longevity-linked life annuity can be decomposed into a traditional fixed annuity and a basket of European-style longevity (call and put) options of different maturities with underlying asset equal to a longevity-index and strike equal to the minimum (initial) guaranteed amount. The embedded longevity put (call) options give the annuity provider (annuitant) the right to periodically adjust the benefit payments downwards (upwards) if the observed survivorship rates are higher (lower) than those predicted at the contract initiation, transferring part of the longevity risk to the annuitant. Alternative decompositions for the payout stream of a capped longevity-linked life annuity are also explored. We incorporate capital market risk and assess how individuals with different risk aversion and subjective time preferences value the stochastic payout stream of both index-linked and participating contract structures. We discuss the valuation of the embedded longevity options using a risk-neutral simulation approach. The paper revisits and expands previous results on the problem of designing and pricing life annuity contracts which aim at sharing longevity and investment risk between annuity provider and annuitants within the context of building the post-retirement income.

JEL Code: G22, G23, C15.

Keywords: longevity-linked, life annuity, longevity options, derivatives, participating payout annuities, risk management.

*Corresponding author: Nova University of Lisbon - Information Management School (NOVAIMS), email: jbravo@novaims.unl.pt. The authors gratefully acknowledge comments and suggestions made by an anonymous referee, and by participants at the Eleventh International Longevity Risk and Capital Markets Solutions Conference held in Lyon, and the Chaire Dauphine-ENSAE-Groupama for financial support.

†University Paris-Dauphine, LEDa, IRD, UMR 225-DIAL, Paris-France, Smith School - Oxford University

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