North American Actuarial Journal ›
Volume 15, 2011 - Issue 1

Original Articles

The Valuation of Guaranteed Lifelong Withdrawal Benefit Options in Variable Annuity Contracts and the Impact of Mortality Risk

Gabriella Piscopo Ph.D. & Steven Haberman

Pages 59-76 | Published online: 27 Dec 2012

Cite this article https://doi.org/10.1080/10920277.2011.10597609

Abstract

In light of the growing importance of the variable annuities market, in this paper we introduce a theoretical model for the pricing and valuation of guaranteed lifelong withdrawal benefit (GLWB) options embedded in variable annuity products. As the name suggests, this option offers a lifelong withdrawal guarantee; therefore, there is no limit on ...use if the account ...ues to receive ...t value at the time ...ecific fram...he hypothe...al amount is always e...n the decompo...kes use of the standard no-arbitrage models of mathematical finance, which extend the Black-

Scholes framework to insurance contracts, assuming the fund follows a geometric Brownian motion and the insurance fee is paid, on an ongoing basis, as a proportion of the assets. We develop a sensitivity analysis, which shows how the value of the product varies with the key parameters, including the age of the policyholder at the inception of the contract, the guaranteed rate, the risk-free rate, and the fund volatility. We calculate the fair fee, using Monte Carlo simulations under different scenarios. We give special attention to the impact of mortality risk on the value of the option, using a flexible model of mortality dynamics, which allows for the possible perturbations by mortality shock of the standard mortality tables used by practitioners. Moreover, we evaluate the introduction of roll-up and step-up options and the effect of the decision to delay withdrawing. Empirical analyses are performed, and numerical results are provided.