

Stochastic Life Annuities

DANIEL DUFRESNE

Centre for Actuarial Studies, University of Melbourne, VIC 3010, Australia
[dufresne@unimelb.edu.au]

A problem which had some vogue in actuarial circles in previous decades was to find the distribution of the amount required to fund a life annuity; this amount was called a “stochastic life annuity.” The distribution of the stochastic life annuity may be used to answer questions such as “What is the probability that an amount F is sufficient to fund a life pension with annual amount y to a pensioner aged x , given that log-returns have mean m and volatility σ ?”

There are two sources of randomness, the survival of the pensioner, and the returns of the amount invested. I will assume that the amount invested evolves as a geometric Brownian motion, from which the annuity payments are deducted in a continuous fashion, and that the pensioner’s duration of life is independent of the Brownian motion. The main ingredients of the solution given in the talk are the known results about the integral of geometric Brownian motion, and the approximation of probability distributions by combinations of exponentials.