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Analysis of survivorship life insurance portfolios with stochastic rates of return

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Abstract

A general portfolio of survivorship life insurance contracts is studied in a stochastic rate of return environment with a dependent mortality model. Two methods are used to derive the first two moments of the prospective loss random variable. The first one is based on the individual loss random variables while the second one studies annual stochastic cash flows. The distribution function of the present value of future losses at a given valuation time is derived. For illustrative purposes, an AR(1) process is used to model the stochastic rates of return, and the future lifetimes of a couple are assumed to follow a copula model. The effects of the mortality dependence, the portfolio size and the policy type, as well as the impact of investment strategies on the riskiness of portfolios of survivorship life insurance policies are analyzed by means of moments and probability distributions.

Keywords: Survivorship life insurance, Insurance portfolio, Stochastic rate of return, Dependent mortality Model, Frank's Copula.

1. Introduction

Insurance organizations offer contractual promises to provide a contingent payment on the death of an individual (death benefit), in return for a series of periodical payments (premiums). These life insurance contracts are designed to protect against the serious financial impact that results from an individual's death. An important variation of the single life insurance is the survivorship life insurance (a.k.a. last-to-die) which covers two or more lives. Under such a contract, a death benefit is paid out only on the last death. Survivorship life insurance is used to protect a business, preserve an estate, give to a charity or leave an inheritance. It is a popular insurance product, particularly in the affluent market. For example, in 2009, John Hancock LIC led the industry with survivorship sales of \$147.9 million in premium¹.

¹<http://www.johnhancock.com/about/news.php> (April 2010)

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