

North American Actuarial Journal >

Volume 23, 2019 - [Issue 1](#)

279 | 3 | 0
Views | CrossRef citations to date | Altmetric

Feature Articles

A General Semi-Markov Model for Coupled Lifetimes

Min Ji  & Rui Zhou

Pages 98-119 | Published online: 15 Feb 2019

 Cite this article  <https://doi.org/10.1080/10920277.2018.1513370>

 Check for updates

Sample our
Mathematics & Statistics
Journals
>> **Sign in here** to start your access
to the latest two volumes for 14 days

-  Full Article  Figures & data  References  Citations  Metrics
-  Reprints & Permissions [Read this article](#) [Share](#)

Abstract

Joint-life annuities with a high last survivor benefit play an important role in the optimal annuity portfolio for a retired couple. The dependence between coupled lifetimes is crucial for valuing joint-life annuities. Existing bivariate modeling of coupled lifetimes is based on outdated data with limited observation periods and does not take into account mortality improvement. In this article, we propose a transparent and dynamic framework for modeling coupled lifetime dependence caused by both marital status and common mortality improvement factors. Dependence due to marital status is captured by a semi-Markov joint life model. Dependence due to common mortality improvement, which represents the correlation between mortality improvement patterns of coupled lives, is incorporated by a two-population mortality improvement model. The proposed model is applied to pricing the longevity risk in last survivor annuities sold in the United States and the United Kingdom.

Discussions on this article can be submitted until October 1, 2019. The authors reserve the right to reply to any discussion. Please see the Instructions for Authors found online at <http://www.tandfonline.com/uaj> for submission instructions.

Notes

¹The abbreviation “RP” represents retirement plans.

²Source: U.S. Census Bureau, 2014 American Community Survey 1-Year Estimates, <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>.

³Source: U.S. Department of Treasury.

⁴While the unisex pricing regulation applies to employer-sponsored pension plans or government pension plans in the United States, it is not compulsory in the U.S. private annuity market.

⁵Source: Bloomberg and Bank calculations.

Additional information

Funding

The authors acknowledge the financial support from the Natural Science and Engineering Research Council of Canada.

Related research

People also read

Recommended articles

Cited by
3

[Doubly Enhanced Annuities \(DEANs\) and the Impact of Quality of Long-Term Care under a Multi-State Model of Activities of Daily Living \(ADL\)](#) >

Information for

[Authors](#)
[R&D professionals](#)
[Editors](#)
[Librarians](#)
[Societies](#)

Opportunities

[Reprints and e-prints](#)
[Advertising solutions](#)
[Accelerated publication](#)
[Corporate access solutions](#)

Keep up to date

Register to receive personalised research and resources by email



[Sign me up](#)



Open access

[Overview](#)
[Open journals](#)
[Open Select](#)
[Dove Medical Press](#)
[F1000Research](#)

Help and information

[Help and contact](#)
[Newsroom](#)
[All journals](#)
[Books](#)

Copyright © 2026 Informa UK Limited [Privacy policy](#)

[Cookies](#) [Terms & conditions](#) [Accessibility](#)

Registered in England & Wales No. 01072954
5 Howick Place | London | SW1P 1WG



Taylor & Francis
by **informa**•••