Inference for Logistic-type Models for the Force of Mortality

Louis G. Doray, PhD, ASA*

Presented at the Living to 100 and Beyond Symposium
Orlando, Fla.
January 7-9, 2008

Copyright 2008 by the Society of Actuaries.
All rights reserved by the Society of Actuaries. Permission is granted to make brief excerpts for a published review. Permission is also granted to make limited numbers of copies of items in this monograph for personal, internal, classroom or other instructional use, on condition that the foregoing copyright notice is used so as to give reasonable notice of the Society's copyright. This consent for free limited copying without prior consent of the Society does not extend to making copies for general distribution, for advertising or promotional purposes, for inclusion in new collective works or for resale.

* Louis G. Doray, PhD, ASA , D´epartement de math´ematiques et de statistique, Universit´e de Montr´eal C.P. 6128, Succursale Centre-Ville, Montr´eal, Qu´ebec, Canada H3C 3J7. doray@dms.umontreal.ca

Abstract

Logistic-type models for the force of mortality like those introduced by Perks or Kannisto provide better fit to mortality data of people aged over 85 than Makeham's model where the force of mortality increases exponentially with age. However, the difficulty in estimating their parameters by the maximum likelihood method makes their use less popular among actuaries.

For Kannisto's model, we propose a weighted least-squares estimator which can easily be calculated with any regression software; the estimator is shown to be consistent, asymptotically unbiased and normally distributed. For Perks' model, using a Taylor's series expansion, the estimation problem is again reduced to a least-squares problem. The various estimators proposed in the paper are compared numerically using Canadian mortality data.