Projection of Mortality Rates at Advanced Ages in Canada with a New Lee-Carter Type Model

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Abstract

Proper mortality forecast at advanced ages is an important challenge for demographers and actuaries. For this particular population, it has been shown that logistic models for the force of mortality (such as Perks' and Kannisto's models) usually provide very good modeling and forecasts (Thatcher, Kannisto and Vaupel, 1998). However, these models are not frequently used in actuarial practice. In demography, the Lee-Carter model, which offers a simple methodology, has been preferred (Lee and Carter, 1992) for forecasting.

In this paper, we will show that the modeling and forecasting of advanced age population can be improved by combining features of the logistic model for the force of mortality, and the Lee-Carter model. This combination has been inspired by a linear reparametrization of the logistic models taken in Doray (2008). In particular, our model will be applied to the Canadian male population aged 70 to 99 years old and to the Canadian female population aged 80 to 105 years old. The results of our model will be compared to those of two well-known models, the original Lee-Carter model for each sex, and the logistic model of Lee-Carter (Lee, 2000) for each sex. For both sexes, we found that the use of our model presents values closer to the observations and that the forecasts are quite realistic.