

Modeling old-age mortality risk for the populations of Australia and New Zealand: An extreme value approach

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Abstract

Old-age mortality for populations of developed countries has been improving rapidly since the 1950s. This phenomenon, which is often referred to as ‘rectangularization’ of mortality, implies an increased survival at advanced ages. With this increase comes different challenges to actuaries, economists and policy planners. A reliable estimate of old-age mortality would definitely help them develop various demographic and financial projections. Unfortunately, data quality issues have made the modeling of old-age mortality difficult and we need a method that can extrapolate a survival distribution to extreme ages without requiring accurate mortality data for the centenarian population. In this paper, we focus on a method called the threshold life table which systematically integrates extreme value theory to the parametric modeling of mortality. We apply the threshold life table to model the most recent period (static) mortality rates for the populations of Australia and New Zealand. We observe a good fit to the raw data for both populations. We then extend the model to predict the highest attained age, which is commonly referred to as ‘omega’ or ω in the actuarial literature, for the populations of Australia and New Zealand. On the basis of the threshold life table, the central estimates of ω for Australia and New Zealand are 112.20 and 109.43, respectively. Our estimates of ω are reasonably consistent with the validated supercentenarian in these countries.

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1. Introduction

Old-age mortality for populations of developed countries has been improving rapidly since the 1950s. This phenomenon, which is often referred to as ‘rectangularization’ of mortality, implies an increased survival at advanced ages. In Australia, the number of centenarians have increased by 8.5% per year over the past 25 years [17]. At the time of the 2006 Census, there were 3154 centenarians in Australia, 797 men (25%) and 2357 women (75%). This number is expected to increase to 17,408 by 2028, according to the population projections made by the Australian Bureau of Statistics.

With this increase comes different challenges to the public health and pension systems as they try to meet people’s needs. A reliable estimate of mortality at advanced ages would help policy planners better adapt current systems to suit future demands. In the insurance industry, the rapid increase in the number of centenarians may lead to low-frequency,

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