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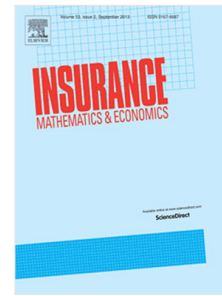
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The double-gap life expectancy forecasting model

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Abstract

Life expectancy is highly correlated over time among countries and between males and females. These associations can be used to improve forecasts. Here we propose a method for forecasting female life expectancy based on analysis of the gap between female life expectancy in a country compared with the record level of female life expectancy in the world. Secondly, to forecast male life expectancy, the gap between male life expectancy and female life expectancy in a country is analysed. We present these results for various developed countries. We compare our results with forecasts based on the Lee-Carter approach and the Cairns-Blake-Dowd strategy. We focus on forecasting life expectancy at age 0 and remaining life expectancy at age 65.

Keywords: Life expectancy forecasting; Mortality modelling; Best practice trends; Sex-gap

1 Introduction

The history of the evolution of life expectancy is of crucial importance for demographers and actuaries who want to develop more accurate forecasting models. Between 1840 and 2014 no more than seven countries have been the record holders of female life expectancy at birth; starting with the Nordic countries in the 19th century and finishing with present day Japan. The competition among countries to reduce mortality levels resulted in a remarkable linear rise as presented by Oeppen and Vaupel (2002), or a segmented linear trend as suggested by Vallin and Meslé (2009). In developed countries, the linear trend in period life expectancy has proven itself to better fit trends in human mortality than more complex mathematical models based on age-specific death rates (White, 2002). The rate of change in age-specific death rates have less regular patterns over time than life expectancy, which is an age-aggregated measure. Thus, although life expectancy loses specificity it compensates in terms of accuracy. Furthermore, data highly aggregated by age give valuable information that can be used to tackle the issue of mortality forecasting from a clearer perspective.

Torri and Vaupel (2012) built on the idea that future human longevity is given by a general life expectancy trend. Their model at first forecasts the world's record life expectancy and then the gap between the record and the current life expectancy of a particular population of interest assuming a tendency toward convergence with the predicted record level. The Torri-Vaupel approach is promising but has the drawback that populations that lag behind record life expectancy cannot become the record holder; in addition the interdependence between the sexes is not recognized. Furthermore, no population's life expectancy can exceed the forecast record.

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