Coherent Mortality Modeling for a Group of Populations

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Abstract

Men and women in a country or people in nearby countries share comparable living conditions and are likely to have similar mortality behaviors, i.e., period effect. Combining mortality experience for a group of populations with similar mortality behaviors might increase the stability of mortality modeling and solve the problem when mortality data is insufficient. In this research, we study the coherent mortality modeling by combining a group of populations with similar period effects. The group of populations shares the same period effect in projecting the future mortality rate. We employ the Lee-Carter model (Lee and Carter 1992) to illustrate the feasibility of coherent mortality modeling. We use U.S. and Canadian data from the Human Mortality Database (HMD) to evaluate whether the coherence exists and if it can increase the stability of mortality modeling. The goodness fits for evaluating the coherence also is based on Akaike information criterion (AIC) and Bayesian information criterion (BIC). We found that combining countries with the same gender has better results than combining genders in a country. In addition, we also use annuity products to evaluate the performance of the coherent forecast, by simulating the confidence intervals of the future dynamics of mortality and annuity price.