Mortality Forecasting of Small Pension Fund Population with Gaussian Processes in a Sub Population Framework

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Abstract

In order to assess the financial condition of a pension fund, one needs to take into account the mortality forecast so the longevity risk is considered in a consistent way on future cash flows. Usually, the forecast of mortality rates is performed with national or country population data. Even in the presence of basis risk when applying it for pension funds sub-populations (selected populations), for most of the countries this may not be a meaningful problem. However, for countries with relevant social inequalities and a heterogeneous population, national mortality rates may be quite different and more severe than the ones observed in selected sub-populations. In this paper, we use Gaussian processes in a spatial covariance framework applied to sub-population frameworks such that reference populations are used. The applications are performed with a time series of a Brazilian small pension fund population along with the annual country mortality table and also with the use of a public non-periodic insurance industry mortality table. Our aim is to coherently forecast longevity scenarios for the pension fund population. The GP models were implemented in *Stan* in a Bayesian approach in *R* statistical package.

Keywords: sub-population mortality forecast; selected population; Gaussian processes.