Temporal Evolution of Some Mortality Indicators Application to Spanish Data

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Abstract

In Spain, as in other developed countries, there have been significant changes in mortality patterns during the 20th and 21st centuries. One reflection of these changes is life expectancy, which has improved in this period, though the robustness of this indicator prevents these changes from being of the same order as those for the probability of death, qxt. If, moreover, we bear in mind that life expectancy offers no information as to whether this improvement is the same for different age groups, it is important and necessary to turn to other mortality indicators whose past and future evolution in Spain we are going to study.

These indicators are applied to Spanish mortality data for the period 1981-2008, for the age range 0 to 99. To study its future evolution, the mortality ratios have to be projected using an adequate methodology, namely the Lee-Carter model (Lee and Carter, 1992; Brouhns et al., 2002; Debon et al., 2008b). With the aim of incorporating the uncertainty measures suggested by Pedroza (2006) into predictions, confidence intervals are obtained for these predictions. These intervals can be calculated using the methodology which Lee and Carter apply in their original article for expected lifetime confidence intervals, but they only take into account the error in the prediction of the mortality index kt obtained from the ARIMA model adjusted to its temporal series, excluding other sources of error such as that introduced by estimations of the other parameters in the model. That is why bootstrap procedures are preferred, as used in Koissi et al. (2006), permitting the combination of all sources of uncertainty.

Keywords: Lee-Carter model, mortality indicators, bootstrap.