The CBD Mortality Indexes: Modeling and Applications

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Abstract

Most extrapolative stochastic mortality models are constructed in a similar manner. Specifically, when they are fitted to historical data, one or more series of time-varying parameters are identified. By extrapolating these parameters to the future, we can obtain a forecast of death probabilities and,consequently cash flows arising from life contingent liabilities. In this paper, we first argue that, among various time-varying model parameters, those encompassed in the Cairns-Blake-Dowd (CBD) model (also known as Model M5) are most suitably used as indexes to indicate levels of longevity risk at different time points. We then investigate how these indexes can be jointly modeled with a more general class of multivariate time-series models, instead of a simple random walk that takes no account of cross-correlations. Finally, we study the joint prediction region for the mortality indexes. Such a region, as we demonstrate, can serve as a graphical longevity risk metric, allowing practitioners to compare the longevity risk exposures of different portfolios readily.

Keywords: Cairns-Blake-Dowd model; VARIMA models; Prediction regions.