On the Calibration of Mortality Forward Curves

Johnny Siu-Hang Li[(1)], Andrew Cheuk-Yin Ng[(2)], and Wai-Sum Chan[(2)*]

[(1)]The University of Waterloo, Canada
[(2)] The Chinese University of Hong Kong, Hong Kong, China
chanws@cuhk.edu.hk

Abstract

In 2007, a major investment bank launched a product called "*q*-forward," which may be regarded as a forward contract on a mortality rate. The pricing of mortality forwards is similar to the pricing of other forward-rate contracts, such as interest-rate forwards or foreign exchange forwards. In particular, since investors require compensation to take on longevity risk, the forward mortality rate at which *q*-forward contracts will trade will be smaller than the expected mortality rate. The relationship between the forward rate and the time to maturity is called a mortality forward curve. In this paper, we contribute a method for calibrating mortality forward curves. This method consists of two parts, one of which is the generation of a distribution of future mortality rates, and the other of which is the transformation of the distribution into its risk-neutral counterpart, using the idea of canonical valuation developed by Stutzer (1996, *The Journal of Finance,* 51, 1633-1652). To illustrate the method, mortality forward curves for English and Welsh males are calibrated.

Keywords: Cairns-Blake-Dowd model; Canonical valuation; Kullback-Leibler information criterion; Longevity bonds.