

The Locally-Linear Cairns-Blake-Dowd Model: A Note on Delta-Nuga Hedging of Longevity Risk

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Abstract

The success of a longevity hedge depends on the robustness of the assumed stochastic mortality model, from which the hedging strategy is derived. However, the bivariate random walk with drift encompassed in the original Cairns-Blake-Dowd (CBD) model lacks robustness, as the drift terms are highly sensitive to the most recent data point. In this paper, we address this problem by introducing the locally-linear CBD model, in which the drift terms are assumed to be random. It is found that the locally-linear version is substantially more robust with respect to changes in the data sample period. The treatment of the drift terms as random variables naturally calls for nuga-hedging, a technique proposed by Cairns (2013) to hedge the risk associated with changes in drifts. To improve existing delta- and nuga-hedging techniques, we propose a new method under which hedging strategies are based on transformed stochastic factors rather than the original ones. The proposed method allows hedgers to extract more hedge effectiveness out of a hedging instrument, and is therefore useful when there are only a few traded longevity securities in the market.

Keywords: Delta-hedging; Nuga-hedging; Robustness; State-space models; The CBD model

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