

Longevity/Mortality Risk Modeling and Securities Pricing

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Abstract

Securitization of longevity/mortality risk provides the insurer and pension fund an effective, low-cost approach to transferring the longevity/mortality risk from their balance sheets to capital markets. The modeling and forecasting of the mortality rate is the key point in pricing mortality-linked securities that facilitates the emergence of liquid markets. The catastrophic longevity jump and mortality jump are significant in historical data and have a critical effect on securities pricing. This paper introduces a stochastic diffusion model with a Double Exponential Jump Diffusion (DEJD) process that describes the mortality time-series indicator. The DEJD model captures asymmetric jump features, and has the advantage of easy calibration and mathematical tractability. Compared with previous stochastic models with or without jumps, the DEJD model fits the data better. To apply the model, the implied risk premium is calculated based on the Swiss Re mortality bond price. As an example, we use the DEJD model to price the q-forward, which is the standard product contingent on the LifeMetrics index for hedging longevity or mortality risk.

Keywords: Longevity Risk; Mortality Risk; Securitization; Double Exponential Jump Diffusion Model; Lee-Carter Framework.