# Stochastic Mortality Modeling with Lévy processes

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Abstract

The main purpose of this paper is to construct a stochastic mortality model which incorporates the Lévy processes with the classical Lee-Carter (LC) model. Using the Human Mortality database (HMD), we find that the mortality index $k_t$ of the LC model is mean-reverting process with jumps. As a result, we adopt the Lévy processes – Variance Gamma Process (VG) – to model the mortality index. Based on criterions of log likelihood function (LLF), Akaike Information Criterion (AIC) and Bayes Information Criterion (BIC), the numerical results demonstrate that the Lee-Carter (LC) model with mortality index following VG process provides a better goodness-of-fit results of mortality rate than those of the original Lee-Cater model when we consider a longer time period including the World War I and World War II. In addition, based on the criterion of mean absolute percentage error, the LC model with the VG process also provides a better mortality projection.

Keywords: Mortality model; Lévy process; Variance Gamma Process; Lee-Carter model

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