Modeling the Dynamics of Mortality Rates as Transformations

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ABSTRACT

Modeling and forecasting mortality rates are crucial to life insurers, social benefits programs, and the society as a whole. The vast literature developed four methods to model and/or forecast mortality rates. We propose a new way in this paper by modeling the dynamics of mortality rates as the transformation from one mortality curve to another. Such a proposal is reasonable since mortality rates changed gradually due to biological reasons and the rigidity of the social system.

We use empirical data to test the relative performance of this new modeling to the renowned Lee-Carter model. The tests cover both in-sample fitting and out-of-sample forecasting on the US and UK mortality rates from 1951-2007. We find that the linear hazard transform dominates the Lee-Carter model. The new model further provides better ways in generating immunization strategies than Wang et al. (2010) did. Our model is more general and can produce explicit formulas for mortality durations. The potential of this new thought is thus confirmed and deserve further pursuit.

Keywords: mortality rates, transform, fitting, forecasting, hedging, duration