Mortality Trend Risk

Gary G. Venter
Columbia University

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Abstract

Mortality trend risk affects pension plans, life insurers, annuity writers and insurers of workers' compensation, where the tail claims are mostly annuities. As with many risk sources, mortality risk can be broken down into process risk, parameter risk and model risk. To have concrete examples, models are fit to U.S. male and female mortality data. The Lee-Carter model with and without cohort effects is fit, with several distributions of residuals. Heavier-tailed distributions than Poisson turn out to be needed. The information matrix of the parameters is used to estimate parameter standard deviations and correlations.

U.S. population mortality is higher than for typical annuity recipients, who are usually select in some way. Nonetheless, trends in population mortality may be relevant for select populations as well. Moreover, mortality in the United States for permanently injured workers after medical stabilization is similar to that for the population as a whole, perhaps because their better access to medical care offsets the impact of their injuries, so population mortality data may be directly applicable in that case.

The Lee-Carter model plus cohorts is found to fit the data quite well, but there are nonetheless a number of questions about the appropriateness of this model. Selection of the data to be fit can overcome some of the problems, but for female data high correlation across the parameter types was found that makes the parameter estimates unstable and not readily interpretable.

Process risk, parameter risk and model risk are discussed using the fitted models.

Keywords: Mortality Risk; Lee-Carter Model; Cohort Effects; Parameter Risk; Model Risk.