The Lee-Carter Model for Forecasting Mortality Revisited

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Abstract

Interrupting phenomena are commonly encountered in time-series data analysis with the study of mortality trends being no exception. Nevertheless, previous demographic forecasts have paid little attention to the existence of such phenomena. In this study we use mortality data from the United States and Canada to perform time-series outlier analysis on the key component of the Lee-Carter model: the mortality index. We begin by employing a systematic outlier detection process to ascertain the timing, magnitude, and persistence of any outliers present in historical trends of the mortality index. We then try to match the identified outliers with important events that could possibly justify the vacillations in human mortality levels. At the same time, we adjust the effect of the outliers for model reestimation. The empirical results indicate that the outlier-adjusted model could achieve better fits and more efficient forecasts of variables such as the central rates of death and the life expectancies at birth. Finally, we conclude our study with possible extensions on the valuations of life annuities and the probabilistic distribution of the highest attainable age, incorporating the effect of mortality improvement portrayed by the revised model.

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