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The Lee-Carter method for forecasting mortality, with various extensions and applications.
(English) [Zbl 1083.62535](#)
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Summary: In 1992, Lee and Carter published a new method for long-run forecasts of the level and age pattern of mortality, based on a combination of statistical time series methods and a simple approach to dealing with the age distribution of mortality. The method describes the log of a time series of age-specific death rates as the sum of an age-specific component that is independent of time and another component that is the product of a time-varying parameter reflecting the general level of mortality, and an age-specific component that represents how rapidly or slowly mortality at each age varies when the general level of mortality changes. This model is fit to historical data. The resulting estimate of the time-varying parameter is then modeled and forecast as a stochastic time series using standard methods. From this forecast of the general level of mortality, the actual age-specific rates are derived using the estimated age effects. The forecasts of the various life table functions have probability distributions, so probability intervals can be calculated for each variable and for summary measures such as life expectancy. The projected gain in life expectancy from 1989 to 1997 matches the actual gain very closely and is nearly twice the gain projected by the Social Security Administration's Office of the Actuary. This paper describes the basic Lee-Carter method and discusses the forecasts to which it has led. It then discusses extensions, applications, and methodological improvements that have been made in recent years; considers shortcomings of the method; and briefly describes how it has been used as a component of more general stochastic population projections and stochastic forecasts of the finances of the U.S. Social Security system.

MSC:

- 62P05** Applications of statistics to actuarial sciences and financial mathematics
- 62M10** Time series, auto-correlation, regression, etc. in statistics (GARCH)
- 91D20** Mathematical geography and demography
- 91B30** Risk theory, insurance (MSC2010)

Cited in **68** Documents

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