

[DOI: 10.20472/IAC.2017.33.075](https://doi.org/10.20472/IAC.2017.33.075)

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FORECASTING MORTALITY: SOME RECENT DEVELOPMENTS

Abstract:

Forecasting mortality has been a vital issue in demography and actuarial science. It also has profound implications for pension plan and long-term economic forecasts of the nation. In the present paper we examine various forecasting methods for mortality in the framework of cointegrated time series analysis.

The Lee-Carter (LC) method has been regarded as the benchmark for forecasting mortality. However, its forecasting accuracy has been known to be particularly poor for short-term forecasts, while it is well for long-term forecasts. Recently, a new methods called the multivariate time series variance component (MTV) method has been proposed which explicitly satisfies cointegration restrictions of the series. It overcomes weak points of the LC method.

In the present paper we propose two new methods. The first one is the modified MTV (mMTV) method which modifies the MTV method in order to get more accurate forecast of the trend component of the method. The second is the all-component Lee-Carter (LCA) method which generalizes the Lee-Carter method, by using all principal components, in order to improve short-term forecasts of the LC method. However, it may be noted that the LCA method does not satisfy cointegration restrictions.

We analytically compare forecasting accuracy of the proposed methods with the Lee-Carter method and the MTV method in the framework of cointegrated time series. We further compare them in a Monte Carlo experiment and in an empirical application of forecasting mortality for Japanese male.

It is shown that the mMTV method is generally the most accurate in the Monte Carlo experiment and in Japanese data. The MTV method works almost as well. However, since the drift estimator is inefficient, it is slightly less accurate than the mMTV method in some occasions. The forecast accuracy of the LCA method is reasonably high and can be equivalent to the mMTV method in some occasions, but is generally inferior to the MTV method and the mMTV method. As expected, the LC method is the worst among methods examined in the present study. The mMTV method is recommended for practical use.

Keywords:

Time Series Models
Forecasting Methods
Cointegrated Process
Mortality.

JEL Classification: C01, C32, C53