

Machine learning-based functional time series forecasting: Application to age-specific mortality rates

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Abstract

We propose a functional time series method to obtain accurate multi-step-ahead forecasts for age-specific mortality rates. The dynamic functional principal component analysis method is used to decompose the mortality curves into dynamic functional principal components and their associated principal component scores. Machine learning-based multi-step-ahead forecasting strategies, which automatically learn the underlying structure of the data, are used to obtain the future realization of the principal component scores. The forecasted mortality curves are obtained by combining the dynamic functional principal components and forecasted principal component scores. The point and interval forecast accuracy of the proposed method is evaluated using six age-specific mortality datasets and compared favorably with four existing functional time series methods.

Keywords

Direct prediction strategy, Dynamic functional principal component analysis, Long-run covariance, Machine learning, Recursive prediction strategy.

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