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RESEARCH ARTICLE

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Forecasting mortality rate by multivariate singular spectrum analysis

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In this paper, we investigate the possibility of using multivariate singular spectrum analysis (SSA), a nonparametric technique in the field of time series analysis, for mortality forecasting. We consider a real data application with 9 European countries: Belgium, Denmark, Finland, France, Italy, Netherlands, Norway, Sweden, and Switzerland, over a period 1900 to 2009, and a simulation study based on the data set. The results show the superiority of multivariate SSA in comparison with the univariate SSA, in terms of forecasting accuracy.

KEYWORDS
multivariate singular spectrum analysis, forecasting, mortality

1 | INTRODUCTION

There are many time series models (linear or nonlinear; parametric or nonparametric) that can be used for characterization and forecasting of the human mortality rate dynamics. Most of them have been discussed and compared thoroughly in the literature (eg, previous studies[1-3]). The general methods considered in the field of mortality forecasting belong to 1 of the 2 cases:

- methods based on a predefined statistical model,
- model-free methods.

In the first case, we find, for example, the autoregressive integrated moving average model, the Lee-Charter model and all its variations, and the generalized linear models (eg, other studies[4-7] and references therein).

For the second case, the use of univariate Singular Spectrum Analysis (SSA) was recently proposed in the field of mortality forecasting by Mahmoudvand et al[8] and Mahmoudvand et al[9] and its efficiency was compared with the method from Hyndman and Ullah,[5] which was used as a benchmark. The univariate SSA has proven to have a great potential in mortality forecasting. Overall, SSA has been favored by academics and applied researchers due to following features:

- no model is required to start the analysis,

