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Coherent modeling of male and female mortality using Lee–Carter in a complex number framework

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Abstract

Forecasts of female and male mortality that are conducted independently run the risk of projecting implausible sex differentials and fail to exploit correlations that are known to exist between the sexes. We present a new model for the simultaneous modeling of female and male mortality. The model casts mortality as a complex-valued process where the real and imaginary parts correspond to female and male mortalities respectively. Calculations proceed similarly to the usual Lee–Carter model, via the singular value decomposition, albeit in complex form. Initial applications suggest that the complex Lee–Carter gives fits that are broadly comparable to independent real fits, while offering the advantage of explicit modeling of the relationship between the sexes. Furthermore, model parameters are informative and easily–interpretable.

Keywords: Mortality forecasting, complex-valued process, coherent forecasts, Lee–Carter model, life expectancy.

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