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Multipopulation mortality rates modelling and forecasting: The multivariate functional principal component analysis approach

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Human mortality patterns and trajectories in closely related subpopulation are likely linked together and share similarities. It is always desirable to model them simultaneously while taking their heterogeneity into account. This poster introduces two new models for jointly mortality modelling and forecasting of multiple subpopulations in adaptations of the multivariate functional principal component analysis techniques. The first model extends the classical independent functional data model to a multi-population modelling setting. The second one is a natural extension of the first model in a coherent direction. Its design primarily fulfils the idea that when several sub-population groups have similar socio-economic conditions or common biological characteristics and such these close connections are expected to evolve in a non-diversifying fashion. We demonstrate the proposed methods by using sex-specific mortality data of Japan. Their forecast performances are then further compared with several existing models, including the independent functional data model and the product-ratio model, through a comparison with mortality data of ten developed countries. Our experiment results show that the first proposed model maintains a comparable forecast ability with the existing methods. In contrast, the second proposed model outperforms the first model as well as the current models, in terms of forecast accuracy, plus several desirable properties.

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