

Peer Review

Review of: "Compositional Data Analysis for Modelling and Forecasting Mortality with the α -Transformation"

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The paper presents two methods for estimating the parameters of the Lee-Carter model: estimation based on the CLR method versus the α -Transformation, and compares their performance in forecasting future mortality trends using two metrics: RMSE and MAE.

Both methods are essentially numerical estimation approaches. Their advantage lies in the absence of constraints on the estimated parameters (similar to the estimation method proposed by Lee and Carter). Additionally, they handle missing values or zeros in age-year combinations.

The dataset used spans the years 1983–2018 across 28 European countries. The period from 1983 to 2010 (training set) served as the basis for model estimation, while the period from 2011 to 2018 (test set) was used to assess model fit and predictive performance based on the two metrics.

Comments:

1. General comment: The estimation method, data reorganization, and transformation process, which is primarily mathematical, are non-trivial, and the calculations are complex.

2. Table 3 shows that there is almost no difference between the CLR method and the α -Transformation method in terms of performance, both in estimation and forecasting, based on the two evaluation metrics.

3. Table 4 shows that although the error using CLR is higher than that of the α -Transformation during the forecasting period (test set), in most countries, the α -Transformation does not provide a clear advantage over CLR during the estimation period (training set). Regarding the forecasting period (test set), what is the degree of improvement (in percentage terms), and is the improvement (or lack thereof) statistically significant between the two estimation methods?
4. Figure 1: During the forecasting period starting in 2011, both estimation methods deviate from the actual mortality rate, particularly in mortality patterns at ages 40 and 60, and even more significantly at ages above 100.

In my opinion, the paper attempts to introduce another numerical method for improving the accuracy of mortality pattern forecasting, with adjustments for missing values or the presence of zeros (which often occur due to inaccurate mortality table calculations or missing values). The key question is the extent to which this improvement is meaningful, or at the very least, whether it is "timely" based on scientific tools (such as the use of parametric or non-parametric statistical tests- like the Chi-squared test). I would appreciate a discussion on this aspect. Additionally, I would expect the authors to review the following paper:

Awad, Y., Bar-Lev K.S., & Makov, U. (2022). A new class of counting distributions embedded in the Lee-Carter model for mortality projections: A Bayesian approach. *Risks*, 10(6), 1-17.

This paper provides at least a partial but promising response to mortality at older ages (and longevity).

Declarations

Potential competing interests: No potential competing interests to declare.