A new approach to probabilistic population forecasting with an application to Estonia

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Abstract.

This paper shows how measures of uncertainty can be applied to existing population forecasts using Estonia as a case study. The measures of forecast uncertainty are relatively easy to calculate and meet several important criteria used by demographers who routinely generate population forecasts. This paper applies the uncertainty measures to a population forecast based on the Cohort-Component Method, which links the probabilistic world forecast uncertainty to demographic theory, an important consideration in developing accurate forecasts. We applied this approach to world population projections and compared the results to the Bayesian-based probabilistic world forecast produced by the United Nations, which we found to be similar but with more uncertainty than found in the latter. We did a similar comparison in regard to sub-national proabilistic forecasts and found our results to be similar with Bayesian-based uncertainty measures. These results suggest that the probability forecasts produced using our approach for Estonia are consistent with knowledge about forecast uncertainty. We conclude that this new method appears to be well-suited for developing probabilistic world, national, and sub-national population forecasts.

Keywords: ARIMA, Bayes, Cohort Component Method, Espenshade-Tayman Method, Forecast Uncertainty, Fundamental Population Equation, Superpopulation

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