

Bootstrap methods for estimating spatial synchrony of fluctuating populations: an addendum

Magnar Lillegård and Steinar Engen, Dept of Mathematical Sciences, Norwegian Univ. of Science and Technology, NO-7491 Trondheim, Norway (magnarl@math.ntnu.no). – Bernt-Erik Sæther, Dept of Biology, Norwegian Univ. of Science and Technology, NO-7491 Trondheim, Norway.

In Lillegård et al. (2005) we described and examined bootstrap methods for estimating spatial correlations used in population ecology. Stochastic simulations were used to examine how seven different ways of resampling performed when the goal was to find nominal 95% confidence intervals for how the spatial correlation in population growth rates was related to the distance between locations. We showed that resampling of locations performed badly, with true coverage level as low as 30–40% (method II), especially for small correlations at long distances. In contrast, our analyses showed that resampling of timepoints was a much better method, with coverage varying from 80 to 90%, depending on the strength of density regulation and whether the spatial correlation was estimated for the response variable or for the error terms in the model. Assuming the underlying model to be known, the best results were obtained for parametric bootstrapping.

We now realize that our interpretation of method I, a method used by Bjørnstad and Falck (2001), was incorrect. They draw n locations with replacement from $1, 2, \dots, n$, calculate all points of distance and correlation based on the locations in this resample and discard the calculations giving distance zero due to sampling of one location more than once. But this has also the consequence that some location pairs will be duplicated, and that fact is not taken into account in the article. In our example with five locations $1, 2, \dots, 5$ and a resample $2, 5, 3, 1$ and 1 , we then have to double the pairs $(1, 2)$, $(1, 3)$ and $(1, 5)$, hence we get a total of nine location pairs instead of six.

We have now repeated the simulation study using the correct procedure. The minimum estimated coverage of nominal 95% confidence intervals for the spatial correlation improved from 59% to 70% (Fig. 1). However, this coverage is still poorer than the coverage found by using methods III–VII in Lillegård et al. (2005). Thus, these new results do not affect the major conclusions of our work.

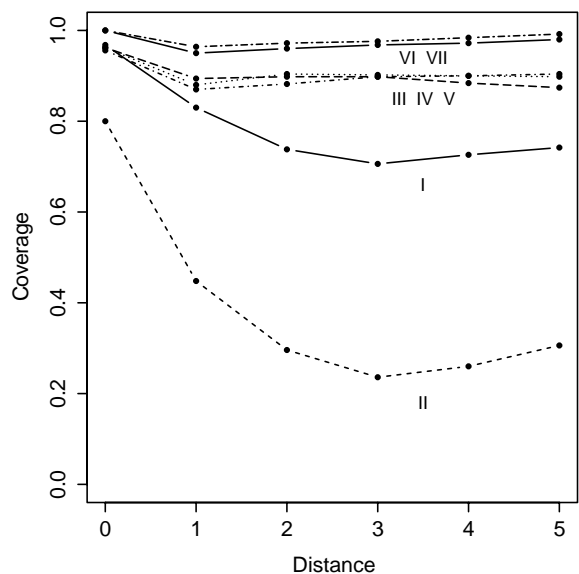


Fig. 1. Coverage, defined as the relative frequency of confidence intervals that cover the spatial correlation $\rho(z)$, under weak density regulation in relation to distance z for different bootstrap methods I–VII.

Acknowledgements – We want to thank Ottar N. Bjørnstad for useful comments on our article.

References

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