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Dynamical analysis of the Malmquist Productivity Index

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Abstract.
Productivity growth has been the subject matter for intense research over the last five decades. The Malmquist Productivity Index (MPI) suggests a convenient way of measuring the change in performance of a given production unit between two consequent time periods. One of the most frequent questions asked by statisticians, econometricians, or just company owners, is: "We know how a company (country, etc.) has been performing during some years (i.e. until now). How can its performance for coming years be predicted in terms of productivity? Therefore, the dynamic analysis of productivity is called for, taking into account the behavior of productivity over time. The new decomposition of the index into circular components is defined in the study, and makes it possible to forecast the MPI by forecasting each "circularized" component separately, and combining the results afterwards. A new working dynamic forecasting procedure is proposed and illustrated. If one wants to make some inferences on MPI, bootstrap often appears to be the most attractive possibility. Smoothed bootstrap in that case should be adapted to our situation, including possible time-dependent structure of the data. Since we have panel data with the possibility of temporal correlation (i.e. present performance of the country is influenced by its past performance), a bivariate kernel (instead of univariate kernel as in the case of a single cross-section of the data) should be used to estimate the joint density of distance functions. We could further elaborate the procedure, allowing for three or more subsequent time periods to be correlated. The MC simulations, comparing smooth bootstrap on correlated couples with the smooth bootstrap on correlated triples, suggest that one indeed benefits from taking the temporal correlation into account.