**Extreme Learning Machines for Bootstrapping Nonlinear Time Series**

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Sieve bootstrap schemes for nonlinear time series, based on artificial neural networks (NNSieve), have proved to be useful and powerful tools both in inference and forecast applications. NNSieve, which is nonparametric in its spirit, retains the conceptual simplicity of a classical residual bootstrap and has some advantages over the blockwise schemes and kernel bootstrap techniques. NNSieve is asymptotically justified and performs similarly to the autoregressive (AR)-sieve bootstrap for linear processes, while it outperforms the AR-sieve bootstrap, the moving block bootstrap and kernel bootstrap for nonlinear processes, both in terms of bias and variability.

As its main drawback, the NNSieve has a heavy computational burden, especially when, in some applications, several estimation steps need to be performed. To overcome this issue, here we propose a sieve bootstrap scheme based on Extreme Learning Machines which retains the good properties of the NNSieve bootstrap while achieving a considerable advantage in terms of computing time. The proposed approach, unlike most of the techniques available in the univariate case, can be easily extended to the multivariate case, providing an effective nonparametric bootstrap scheme for nonlinear multivariate time series that is fast and readily extended to large, high dimensional datasets.