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Empirical comparison of vector bootstrap methods for multivariate scenario generation

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ABSTRACT

Stochastic simulation models require input scenarios, which may be generated from observed data using bootstrap methods. If a model's input variables are auto- and/or cross-correlated, these dependencies must be preserved in the generated scenarios. Three bootstrap methods were tested empirically: (1) the vector moving block bootstrap method, with a block length of one timeframe, (2) the vector moving block bootstrap method, with an optimized block length, and (3) the vector nearest neighbour bootstrap method. They were applied to data observed from processes at a petro-chemical plant: 28 numerical, multivariate, stationary time series, with a variety of auto- and cross-correlations. The quality of the generated scenarios was measured using a Turing test procedure, which balances fidelity to the observed data and natural variety. Method (2) performed best, followed by method (3), and then method (1). The number of input variables bootstrapped simultaneously did not significantly affect the performance of the bootstrap methods.