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Goodness-of-Fit tests with Dependent Observations

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We revisit the Kolmogorov-Smirnov and Cram\'er-von Mises goodness-of-fit (GoF) tests and propose a generalisation to identically distributed, but dependent univariate random variables. We show that the dependence leads to a reduction of the "effective" number of independent observations. The generalised GoF tests are not distribution-free but rather depend on all the lagged bivariate copulas. These objects, that we call "self-copulas", encode all the non-linear temporal dependences. We introduce a specific, log-normal model for these self-copulas, for which a number of analytical results are derived. An application to financial time series is provided. As is well known, the dependence is to be long-ranged in this case, a finding that we confirm using self-copulas. As a consequence, the acceptance rates for GoF tests are substantially higher than if the returns were iid random variables.

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