Bartlett correction of frequency domain empirical likelihood for time series with unknown innovation variance

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Abstract

The Bartlett correction is a desirable feature of the likelihood inference, which yields the confidence region for parameters with improved coverage probability. This study examines the Bartlett correction for the frequency domain empirical likelihood (FDEL), based on the Whittle likelihood of linear time series models. Nordman and Lahiri (Ann Stat 34:3019–3050, 2006) showed that the FDEL does not have an ordinary Chi-squared limit when the innovation is non-Gaussian with unknown variance, which restricts the use of the FDEL inference in time series. We show that, by profiling the innovation variance out of the Whittle likelihood function, the FDEL is Chi-squared-distributed and Bartlett correctable. In particular, the order of the coverage error of the confidence region can be reduced from $O(n^{-1})$ to $O(n^{-2})$.

Keywords Coverage error · Edgeworth expansion · Periodogram · Whittle likelihood

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