Saddlepoint approximations in the frequency domain

Davide La Vecchia¹, Elvezio Ronchetti²

¹ Research Center for Statistics and Geneva School of Economics and Management, University of Geneva, ² Research Center for Statistics and Geneva School of Economics and Management, University of Geneva

Keywords: Edgeworth expansion; Generalized linear model in the frequency domain; p-value; Short and long memory; Testing in the presence of nuisance; Tilting

Saddlepoint techniques provide accurate, higher order, small sample approximations to the distribution of estimators and test statistics. Except for a few simple models, these approximations are not available in the framework of stationary time series. We contribute to fill this gap by developing new saddlepoint approximations for frequency domain statistics. Our method is based on tilting devices of the Edgeworth expansion and it can be applied to frequency domain statistics admitting a valid Edgeworth expansion. Under short or long range serial dependence, for Gaussian and non Gaussian processes, we show how to derive and implement our saddlepoint techniques (density approximation and test in the presence of nuisance) for two relevant classes of statistics: ratio statistics and Whittle’s estimator. A Monte Carlo study for different models illustrates the theory and compares (for Whittle’s estimator) the new approximations with those obtained by first order asymptotic theory and the frequency domain bootstrap. An example based on data about the European Central Bank assets concludes the paper.

References


