Goodness of Fit Via Nonparametric Likelihood Ratios

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[joint work with Gerda Claeskens]

To test if a density f is equal to a specified f_0, one knows by the Neyman–Pearson lemma the form of the optimal test at a specified alternative f_1. Any nonparametric density estimation scheme allows an estimate of f, that is, of the proper location in the space of alternatives to f_0. This leads to estimated likelihood ratios. We consider classes of goodness-of-fit tests constructed in this fashion. Properties are studied of tests which for the density estimation ingredient use log-linear expansions. Such expansions are either coupled with subset selectors like the AIC and the BIC regimes, or use order growing with sample size. Our tests are generalised to testing adequacy of general parametric models, and work also in higher dimensions.

The tests are related to but different from the 'smooth tests' which go back to Neyman (1937) and which have been studied extensively in recent literature. Our tests are large-sample equivalent to such smooth tests under local alternative conditions, but different and often better under non-local conditions. A weakness of the nested BIC scheme for choosing model order in this context is exposed.