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FINDING LOCAL DEPARTURES FROM A PARAMETRIC MODEL USING NONPARAMETRIC REGRESSION

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ABSTRACT

Goodness-of-fit evaluation of a parametric regression model is often done through hypothesis testing, where the fit of the model of interest is compared statistically to that obtained under a broader class of models. Nonparametric regression models are frequently used as the latter type of model, because of their flexibility and wide applicability. To date, this type of tests has generally been performed globally, by comparing the parametric and nonparametric fits over the whole range of the data. However, in some instances it might be of interest to test for deviations from the parametric model that are localized to a subset of the data. In this case, a global test will have low power and hence can miss important local deviations. Alternatively, a naive testing approach that discards all observations outside the local interval will suffer from reduced sample size and potential overfitting. We therefore propose a new local goodness-of-fit test for parametric regression models that can be applied to a subset of the data but relies on global model fits. We compare the new approach with the global and the naive tests, both theoretically and through simulations. We find that the local test has a better ability to detect local deviations than the other two tests, and propose a bootstrap-based approach for obtaining the distribution of the test statistic.

Key words: Cramér-von Mises test, wild bootstrap, local polynomial regression.