



Threshold estimation based on a p-value framework in dose-response and regression settings

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We use p-values to identify the threshold level at which a regression function takes off from its baseline value, a problem motivated by applications in toxicological and pharmacological dose-response studies and environmental statistics. We study the problem in two sampling settings: one where multiple responses can be obtained at a number of different covariate-levels and the other the standard regression setting involving limited number of response values at each covariate. Our procedure involves testing the hypothesis that the regression function is at its baseline at each covariate value and then computing the potentially approximate p-value of the test. An estimate of the threshold is obtained by fitting a piecewise constant function with a single jump discontinuity, otherwise known as a stump, to these observed p-values, as they behave in markedly different ways on the two sides of the threshold. The estimate is shown to be consistent and its finite sample properties are studied through simulations. Our approach is computationally simple and extends to the estimation of the baseline value of the regression function, heteroscedastic errors and to time-series. It is illustrated on some real data applications.

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