Ann Inst Stat Math (2009) 61:789–810
DOI 10.1007/s10463-007-0167-8

Uniformly robust tests in errors-in-variables models

Longcheen Huwang · Y. H. Steve Huang · Yi-Hua Tina Wang

Received: 23 January 2006 / Revised: 7 September 2007 / Published online: 31 January 2008

Abstract Consider an ordinary errors-in-variables model. The true level $\alpha_n(\boldsymbol{\theta}^*)$ of a test at nominal level α and sample size n is said to be pointwise robust if $\alpha_n(\boldsymbol{\theta}^*) \to \alpha$ as $n \to \infty$ for each parameter $\boldsymbol{\theta}^*$. Let Ω^* be a set of values of $\boldsymbol{\theta}^*$. Define $\alpha_n = \sup_{\boldsymbol{\theta}^* \in \Omega^*} \alpha_n(\boldsymbol{\theta}^*)$. The test is said to be uniformly robust over Ω^* if $\alpha_n \to \alpha$ as $n \to \infty$. Corresponding definitions apply to the coverage probabilities of confidence sets. It is known that all existing large-sample tests for the parameters of the errors-in-variables model are pointwise robust. However, they might not be uniformly robust over certain null parameter spaces. In this paper, we construct uniformly robust tests for testing the vector coefficient parameter and vector slope parameter in the functional errors-in-variables model. These tests are established through constructing the confidence sets for the same parameters in the model with similar desirable property. Power comparisons based on simulation studies between the proposed tests and some existing tests in finite samples are also presented.

Keywords Errors-in-variables · Pointwise robust · Uniformly robust · Confidence coefficient · Projected test