

Measuring asymmetry and testing symmetry

Christopher Partlett¹ · Prakash Patil²

Received: 3 July 2014 / Revised: 7 October 2015 / Published online: 14 December 2015
© The Institute of Statistical Mathematics, Tokyo 2015

Abstract In this paper, we show that some of the most commonly used tests of symmetry do not have power which is reflective of the size of asymmetry. This is because the primary rationale for the test statistics that are proposed in the literature to test for symmetry is to detect the departure from symmetry, rather than the quantification of the asymmetry. As a result, tests of symmetry based upon these statistics do not necessarily generate power that is representative of the departure from the null hypothesis of symmetry. Recent research has produced new measures of asymmetry, which have been shown to do an admirable job of quantifying the amount of asymmetry. We propose several new tests based upon one such measure. We derive the asymptotic distribution of the test statistics and analyse the performance of these proposed tests through the use of a simulation study.

Keywords Symmetry · Asymmetry · Measure of asymmetry · Testing symmetry · Skewness

Electronic supplementary material The online version of this article (doi:[10.1007/s10463-015-0547-4](https://doi.org/10.1007/s10463-015-0547-4)) contains supplementary material, which is available to authorized users.

✉ Christopher Partlett
C.Partlett@bham.ac.uk

¹ Department of Public Health, Epidemiology and Biostatistics, University of Birmingham, Birmingham B15 0TT, UK

² Department of Mathematics and Statistics, Mississippi State University, MS 39762, USA