

## On the Simes inequality in elliptical models

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Received: 4 February 2015 / Revised: 28 April 2015 / Published online: 4 September 2015  
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**Abstract** We provide some necessary and some sufficient conditions for the validity of the inequality of Simes in models with elliptical dependencies. Necessary conditions are presented in terms of sufficient conditions for the reverse Simes inequality. One application of our main results concerns the problem of model misspecification, in particular the case that the assumption of Gaussianity of test statistics is violated. Since our sufficient conditions require non-negativity of correlation coefficients between test statistics, we also develop two exact tests for vectors of correlation coefficients and compare their powers in computer simulations.

**Keywords** Covariance matrix · Distributional transform · Multiple testing · Multivariate normal distribution ·  $p$  value · Student's  $t$  · Total positivity

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This research was partly supported by the Deutsche Forschungsgemeinschaft via the Research Unit FOR 1735 “Structural Inference in Statistics: Adaptation and Efficiency”.

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