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On UMPS hypothesis testing

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Abstract
For two-sided hypothesis testing in location families, the classical optimality criterion is the one leading to *uniformly most powerful unbiased (UMPU)* tests. Such optimal tests, however, are constructed in exponential models only. We argue that if the base distribution is symmetric, then it is natural to consider *uniformly most powerful symmetric (UMPS)* tests, that is, tests that are uniformly most powerful in the class of level-α tests whose power function is symmetric. For single-observation models, we provide a condition ensuring existence of UMPS tests and give their explicit form. When this condition is not met, UMPS tests may fail to exist and we provide a weaker condition under which there exist UMP tests in the class of level-α tests whose power function is symmetric and U-shaped. In the multi-observation case, we obtain results in exponential models that also allow for non-location families.

Keywords Exponential families · Hypothesis testing · Statistical principle · UMP tests · UMPU tests

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