

# Testing equality between several populations covariance operators

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**Abstract** In many situations, when dealing with several populations, equality of the covariance operators is assumed. An important issue is to study whether this assumption holds before making other inferences. In this paper, we develop a test for comparing covariance operators of several functional data samples. The proposed test is based on the Hilbert–Schmidt norm of the difference between estimated covariance operators. In particular, when dealing with two populations, the test statistic is just the squared norm of the difference between the two covariance operators estimators. The asymptotic behaviour of the test statistic under both the null hypothesis and local alternatives is obtained. The computation of the quantiles of the null asymptotic distribution is not feasible in practice. To overcome this problem, a bootstrap procedure is considered. The performance of the test statistic for small sample sizes is illustrated through a Monte Carlo study and on a real data set.

**Keywords** Asymptotic distribution · Bootstrap calibration · Covariance operators · Functional data analysis · Local alternatives

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