

# **An invariance property of quadratic forms in random vectors with a selection distribution, with application to sample variogram and covariogram estimators**

**Reinaldo B. Arellano-Valle · Marc G. Genton**

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**Abstract** We study conditions under which an invariance property holds for the class of selection distributions. First, we consider selection distributions arising from two uncorrelated random vectors. In that setting, the invariance holds for the so-called  $\mathcal{C}$ -class and for elliptical distributions. Second, we describe the invariance property for selection distributions arising from two correlated random vectors. The particular case of the distribution of quadratic forms and its invariance, under various selection distributions, is investigated in more details. We describe the application of our invariance results to sample variogram and covariogram estimators used in spatial statistics and provide a small simulation study for illustration. We end with a discussion about other applications, for example such as linear models and indices of temporal/spatial dependence.

**Keywords** Kurtosis · Multivariate · Non-normal · Selection mechanism · Skewness · Spatial statistics · Time series