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## Skew Elliptical Distributions: The State of the Art

Chair: Christian Genest (McGill University)  
Organizer: C. J. Adcock (Sheffield University)

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**C. J. ADCOCK**, Sheffield University

*The Multivariate Extended Normal-Gamma Distribution*

This paper describes an extended version of the multivariate normal-gamma distribution and its properties. The distribution is closed under conditioning and exhibits the general property that it is possible for standardised values of skewness and kurtosis to become arbitrarily large. These properties imply that the model has potential for applications in financial economics, particularly for asset classes whose returns are severely asymmetric. All moments of the distribution exist; a property which is important for general portfolio selection. The multivariate extended skew-normal distribution arises as a special case.

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**ADELCHI AZZALINI**, Università di Padova

*Perturbation of Symmetry in Non-Standard Settings*

In the last 12-15 years, a great deal of work has been dedicated to the study of so-called 'skew-symmetric distributions'. These are obtained starting from a symmetric 'base' density via a simple mechanism of perturbation which conceptually involves another continuous distribution. The talk describes briefly various extensions of the common setting of this construction. Firstly the support does not need to be the  $d$ -dimensional Euclidean space. A more radical extension replaces the requirement of symmetry by a suitable form of generalized symmetry. Moreover, under certain conditions, the constructive mechanism can also be applied to discrete distributions.

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**MARC G. GENTON**, King Abdullah University of Science and Technology

*Semiparametric Efficient and Robust Estimation of the Center of an Unknown Symmetric Population under Arbitrary Sample Selection Bias*

We propose semiparametric estimation methods of the center of a symmetric population when a representative sample of the population is unavailable due to an arbitrary selection bias. We do not impose any parametric form on the population distribution. Under this general framework, we construct a family of consistent estimators that is robust to population model misspecification, and we identify the efficient member that reaches the minimum possible estimation variance. The asymptotic properties and finite sample performance of the estimation and inference procedures are illustrated through theoretical analysis and simulations. A data example illustrates the usefulness of the methods in practice.