Ubiquitous Gaussian Distribution and Modeling Skewness

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ABSTRACT：Exactly two hundred years ago Karl Friedrich Gauss derived normal distribution as the distribution of errors. Since then this distribution, also known as Gaussian distribution has preeminent place in the statistical and probability literature. Recently skew-normal distributions and elliptically contoured distributions have been developed which have many of the properties of normal distribution thus extending the application of normal theory to non-normal models.

In this talk, first a family of skew-symmetric distributions will be defined. Then the univariate skew-normal distribution and some of its properties, including the result that the square of a skew-normal random variable is chi-squared, will be described. Two applications are given, one in the financial field and the other in epidemiology. Then a skew multivariate normal distribution is defined and its properties are studied in some details. A stochastic representation of the skew multivariate normal random vector is given which is useful for computer simulation. Some applications of this distribution are also given. Finally a generalization to the matrix case is indicated which leads to the Wishart distribution.