Some convergence theorems for bivariate exponential dispersion models

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The need of adequate regression models for multivariate non-normal correlated data has motivated the development of flexible multivariate distribution families. In a recent paper, Jørgensen and Martínez have presented an extension of Jørgensen's univariate exponential dispersion models using an adaptation of the convolution method in order to obtain models with a flexible correlation structure and marginal distributions of the same family. Induced by the convergence results found for the univariate case, it is speculated that these multivariate dispersion models can converge, under certain conditions, to a Tweedie probability distribution generated by the convolution method mentioned above, or to a gamma distribution as an extension of the theorem developed by Jørgensen, Martínez and Tsao for the univariate case in 1994. As a first step to a generalization to k dimensional case, it seems reasonable be able to characterize the domain of attraction of the Tweedie models, particularly for the bivariate gamma models. Because of this, the aim of this work is to extend to $\mathbb{R}^2$ the results about the convergence of exponential dispersion models. Omey and Willekens present an extension of Tauber-Karamata Theorem for the bivariate case; this result will be useful to express the moment generating function of a multivariate exponential dispersion model in terms of regular variation function. This leads to try to extend the gamma convergence theorem developed by Jørgensen, Martínez and Tsao to bivariate case. In a first stage the work being carried out is the proof for the particular case where the regular variation order is the same for both variables, i.e. using the definition of regular variation of Stam.

Keywords: regular variation; Tauber theorem; gamma convergence.