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On Bivariate (Marshall-Olkin) Weibull Geometric Distribution

Marshall and Olkin (1997, Biometrika) provided a general method to introduce a parameter into a family of distributions, and discussed in details about the exponential and Weibull families. They have also briefly introduced the bivariate extension, although not any properties or inferential issues have been explored, mainly due to analytical intractability of the general model. In this paper we consider the bivariate model with a special emphasis on the Weibull distribution. We call this new distribution as the bivariate (Marshall-Olkin) Weibull geometric distribution. We derive different properties of the proposed distribution, and it is observed that the proposed distribution can be obtained from the Ali-Mikhail-Haq copula. Using the copula structure several dependency measures and dependency properties have been investigated. The maximum likelihood estimators cannot be obtained in closed form, and we propose to use the EM algorithm, and it is observed that the implementation of the EM algorithm is quite straightforward. Two data sets have been analyzed for illustrative purposes, and it is observed that the new model and the proposed EM algorithm work quite well in these cases.
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ABSTRACT

Marshall and Olkin (1997, Biometrika) provided a general method to introduce a parameter into a family of distributions, and discussed in details about the exponential and Weibull families. They have also briefly introduced the bivariate extension, although not any properties or inferential issues have been explored, mainly due to analytical intractability of the general model. In this paper we consider the bivariate model with a special emphasis on the Weibull distribution. We call this new distribution as the bivariate (Marshall-Olkin) Weibull geometric distribution. We derive different properties of the proposed distribution, and it is observed that the proposed distribution can be obtained from the Ali-Mikhail-Haq copula. Using the copula structure several dependency measures and dependency properties have been investigated. The maximum likelihood estimators cannot be obtained in closed form, and we propose to use the EM algorithm, and it is observed that the implementation of the EM algorithm is quite straightforward. Two data sets have been analyzed for illustrative purposes, and it is observed that the new model and the proposed EM algorithm work quite well in these cases.