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Essays on the Unit Burr XII Distribution: Regression and Time Series Models

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There is an interest in modeling bounded random variables to the standard unit interval in many practical situations, such as rates, proportions, and indexes. We propose two new probability distributions to deal with the uncertainty involved by variables of this type and develop its associated regression models. Both distributions are based on a transformation of the Burr XII random variable. We also introduce a new dynamic model for time series data with support in the interval $(0, 1)$. This study is composed of three main and independent sections. In the first, we define the unit Burr XII (UBXII) distribution and its quantile regression model. Some of its mathematical and statistical properties are investigated. In the second, the reflexive UBXII distribution is obtained, and the regression model is proposed. The maximum likelihood (ML) method is considered for parameter estimation of both regression models. In the third, we propose the dynamic class of models: UBXII autoregressive moving average (UBXII-ARMA) for time series taking values in the unit interval. The conditional ML method is used to estimate and construct asymptotic confidence intervals of the parameters that index the UBXII-ARMA model. Closed-form expressions for the conditional score vector are derived. Furthermore, Monte Carlo simulation studies, diagnostic analysis tools, model selection criteria, and applications to the real data are presented and discussed for the three proposed models.

Palavras-chave: BetaRregression; Quantile Regression; Statistical Learning; Time Series; Unit Probability Distributions.

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