

# A restricted variable dispersion beta regression model: frequentist approach

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## Abstract

The variable dispersion beta regression model (VDBRM) is useful when the response is measured continuously in the  $(0, 1)$  interval (if  $y \in (a, b)$ , then  $\frac{y-a}{b-a} \in (0, 1)$ ). In this work, in order to take account of constraints on parameters, a restricted variable dispersion beta regression model is proposed, developed, and applied from a frequentist perspective. i) when there are not restrictions, our model coincides with the *variable dispersion BRM*; ii) if there are not restrictions and the dispersion parameter  $\phi$  is assumed constant across observations, our model is the *simple BRM*. First, a penalized likelihood function is proposed, using Lagrange multipliers for restrictions. Second, the restricted maximum likelihood estimators are obtained. Third, the respective inferential analysis is done: hypothesis tests for restrictions and goodness of fit for models. Good results were obtained for simulated and real data. Comparisons with normal and transformed model are done. Also, some Bayesian explorations are presented from an integrated Bayesian/likelihood framework, using flat prior distributions.

**Keywords and Phrases:** Restricted beta regression model; Bayesian beta regression model; variable dispersion beta regression model; credibility intervals; factorial experiments; transformations.