

Estimation of extreme conditional quantiles of wind speed: An application using South African data

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Abstract

Amongst several renewable energies, wind energy is known to be a pollution-free, cheap and clean energy resource. Due to its irregular, random and mercurial nature, wind energy offers challenges to system operators and decision-makers in power utilities. It is therefore important to know the highest possible energy which can be generated from wind. This study focuses on the prediction of extremely high conditional quantiles of wind speed, which is known to be the main driver of wind energy. The study applies a variety of methods in modelling and prediction of quantiles on the upper tail of the empirical distribution of wind speed data from Wind Atlas South Africa. The methods used in the study are extremal mixture, additive quantile regression, locally linear quantile regression, generalised additive extreme value and FKML GLD quantile regression models.

Keywords: Additive quantile regression, Extremal mixture models, Generalised Lambda Distributions, Wind energy.