FITTING AND USING STOCHASTIC MODELS FOR RAINFALL DATA

by

P.N.P. Fernando

Department of Statistics and Computer Science

University of Colombo

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Abstract

Fitting and using stochastic models for daily rainfall data are considered in this study, data from Sri Lanka being used in the analysis. Stochastic models have been proposed by many people to analyse daily rainfall data, but there is less evidence that these models have been widely used by others. One reason could be that there has been no streamlined process to fit and use these models. One aim of the study is to produce such a streamlined process and hence to make the methodology accessible to a wide range of potential users. This aim means that the thesis is written in such a style as to make it accessible to non-mathematicians. The process of fitting and using these models provides a straightforward and flexible analysis for rainfall data.

The thesis consists of two parts, namely I. the fitting and using of stochastic models for rainfall data, and II. streamlining the process of fitting and using these models.

In part I rainfall data available in Sri Lanka, a review of the previous work done using these data and preparation of data for fitting the models are described. When modelling rainfall occurrence, emphasis is placed on the Markov chain models (e.g. Stern and Coe 1984). An extended range of models is studied. In particular, higher order Markov chains for the chance of rain are shown to fit Sri Lankan data better than the second order chains. The consistency of the parameter estimates for the higher order models across many sites in Sri Lanka is also studied. The gamma distribution has been widely used to model rainfall amounts and its use is illustrated. Numerical

methods and simulation are used to derive from these models results that are important in agricultural planning. A spreadsheet package is also used to derive results from the models.

The second part of the thesis is a study of the way in which the system developed in part I is streamlined for use by other people. The processes used to fit the models and to derive the results are also improved and extended. This makes use of the CLICOM system in order to make it accessible to a wide range of users. CLICOM (CLImatic COMputing) is a project of the World Meteorological Organisation (WMO) to supply computing facilities for the entry, management and analysis of climatic data to meteorological organisations worldwide. A streamlined process is set up using the CLICOM system which is available in more than 100 countries including Sri Lanka.