

Research
Paper

Bayesian regression analysis using R and S-plus softwares

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ABSTRACT

The analysis of regression models has been discussed and implemented from Bayesian viewpoint. The Bayesian regression analysis gives more robust results as compared to non-Bayesian approach. Bayesian analysis of regression models have been made by generating functions for simple and multiple regression models in R Software which works in S-PLUS as well, and illustrated its application in agriculture. One of the important features of R- software is that it is an Open Source and freely available on website <http://cran-project.org>. Advancement in the computational power of high speed computers has aided the application part. Suitable illustrations have been proposed on real data set generated on potato crop in year 2005-2006 at five different locations with twelve genotypes in SKUAST-(K).

Nazir, Nageena, Mir, A.H. and Maqbool, Showkat (2011). Bayesian regression analysis using R and S-plus software, *Internat. Res. J. agric. Eco. & Stat.*, 2 (2) : 163-166.

Key words : Bayesian analysis, Simple regression analysis, Multiple regression analysis

INTRODUCTION

Bayesian statistics is an approach to statistics, which formally seeks use of prior information and Baye's theorem provides the basis for making use of this information in a formal manner. On a more practical level, Gelman *et al.* (2003) provided a user's guide to Bayesian calculations. Bayesian statistics is an excellent alternative to be more reasonable for moderate and especially for small sample sizes when non Bayesian procedures do not work (Berger, 1985).

In practice, many situations involve heterogeneous populations and it is important to consider the relationship of response variable y on regressor variable x which is explicitly recognized. One way to examine the relationship of the regressor x to response variable y is through a regression model in which $y | x$ has a distribution that depends on the regressor variable. Erickson (1974) used a regression method for estimating population changes of local area.

At present, a number of statistical software's are available for the analysis of statistical data, here we use R and S-PLUS software for the analysis of data. Three fundamental books written by Becker *et al.* (1988), Chambers and Hastie (1992) and Venables and Ripley (2004) are of immense use for understanding these

softwares. Khan and Mir (2005) discussed in detail the application of R- software in agricultural data analyses.

MATERIALS AND METHODS

In this paper, Bayesian Analysis of Regression models has been employed and functions were developed for Bayesian regression analysis in R-software. The functions are run on the real data set generated on agricultural crop tried at several locations.

Simple regression analysis:

A simple regression model is a linear model containing a single regressor variable. Thus, if (y_i, x_i) , $i = 1, \dots, n$ be the pair of observed values of response and regressor variables for i th individual, the relationship between y_i and x_i can be expressed as

$$y_i = \beta_0 + \beta_1 x_i + e_i \quad (2.1)$$

where
 $i = 1, 2, \dots, n$

This model can be extended to a general linear model defined as

$$y = X\beta + e \quad (2.2)$$