ESTIMATION OF PARAMETERS FROM GAUSIAN-BETA HIERARCHICAL MODEL

A PROJECT REPORT PRESENTED BY

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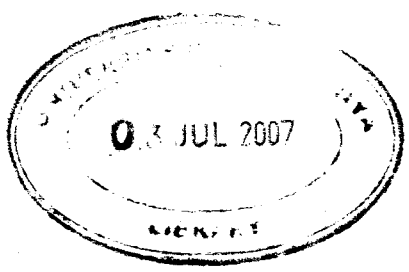
to the Board of Study in Statistics & Computer Science of the
POSTGRADUATE INSTITUTE OF SCIENCE

in partial fulfillment of the requirement
for the award of the degree of

MASTER OF SCIENCE IN APPLIED STATISTICS

of the



UNIVERSITY OF PERADENIYA
SRI LANKA
2005

Abstract

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The maximum likelihood (ML) method was proposed for estimating the parameters of the Gausian-Beta hierarchical model when the variance of the Gausian distribution is a constant. The likelihood function of the Gausian-Beta hierarchical model contains more complicated integral part that can not be solved numerically. The Newton-Raphson algorithm with Monte-Carlo methods were used to compute the ML estimates of the parameters of the Beta distribution. The program for the algorithm to estimate parameters was written in S-language. The constant variance of the Gausian distribution was estimated by using the method of pooled sample variance. The initial values of the estimated parameters of the Beta distribution were obtained by using method of moments and the Fubini's theorem. Also, the best suitable model was selected by comparisons between Monte-Carlo methods for the given situation. The infant mortality data by district from 1989 to 2001 were fitted to the Gausian-Beta hierarchical model. The data was obtained from the statistical Abstract 2003, Department of Census and Statistics, Sri Lanka. The parameters of the Beta distribution were computed by using the developed methodology and the validity of the Gausian-Beta model was tested by using the method of log cumulative distribution function. The data was well fitted to the Gausian-Beta hierarchical model. The infant mortality per 1000 live births of Sri Lanka for the year 2002 was also estimated by using the method of moments and the estimated parameters of the Beta distribution.

The Gausian-Beta model was predicted year 2002 infant mortality rate with 80% accuracy. The infant mortality rate for year 2001 was predicted with 91.8% accuracy by using the infant mortality rate from 1989 to 2000. Also, the infant mortality rate for year 2000 was predicted with 96.2% accuracy by using the infant mortality rate from 1989 to 1999.