BAYESIAN analysis of the factors affecting form iv mathematics performance in Tanzania

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This dissertation concerns the Bayesian analysis of the factors affecting form IV mathematics performance in Tanzania. We used Bayesian approach such as Markov chain Monte Carlo (MCMC) technique for numerical simulations. This has achieved by using prior information obtained after a study done by Kisakali and Kuznetsov (2015) in Arusha and Kilimanjaro regions of Tanzania. The multiple linear regression model by Kisakali and Kuznetsov (2015) was developed based on five factors affecting learning and performance of students in mathematics. Furthermore, the model used few factors to address the influence of mathematics learning and performance of students in Tanzania. Nonetheless, they lacked strong mathematical analysis that used an advanced method such as MCMC technique. Hence, we used MCMC techniques to solve this problem by generating samples of chains that showed good convergence. The Kisakali and Kuznetsov (2015) model was estimated by nonlinear LSQ and MCMC techniques. The idea of LSQ technique is to estimate the parameters by minimizing the squared discrepancies between observed data and theirs expected values. The results showed that at beginning the estimated data deviate from the true values but later on, the two data value fit each other. We analysed the MCMC samples by studying the MCMC convergence. Sample of model parameters were generated by using MCMC to demonstrate how combination of the simulated data and MCMC methods has used to study estimation of parameter in developed model. The accuracy and convergence of MCMC samples were done in different ways such as graphically, the trace, scatter, autocorrelation function, and marginal distribution of sample parameters. The mixing of parameters was relatively good, which means that the convergence of parameters is good. The modified model added more factors such as students' disciplines, quality of examination, qualities of books and student gender. However, we presented theoretical analysis of the model due to absence of data related to additional factors.