African Civil Law Studies

Bayesian Hierarchical Model for Assessing Risk Reduction in Manufacturing Systems Across Ethiopia

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Abstract

Bayesian hierarchical models are increasingly used in assessing risk reduction across various sectors, including manufacturing systems in Ethiopia. A Bayesian hierarchical model was developed, incorporating data from multiple sources including government records, industry reports, and expert assessments. This approach allows for the estimation of risk across different plants while accounting for variability within and between them. The analysis revealed a significant reduction in operational risks by 30% when effective preventive maintenance strategies were implemented across all assessed manufacturing systems. The Bayesian hierarchical model proved to be an effective tool for quantifying risk reduction measures, particularly in the context of Ethiopian manufacturing environments. The results underscore the importance of systematic preventive maintenance programmes. Based on these findings, it is recommended that Ethiopian manufacturing entities implement comprehensive preventive maintenance protocols and utilise the developed Bayesian hierarchical model framework for continuous monitoring and improvement. The maintenance outcome was modelled as $Y\{\}=beta0+beta1X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Hierarchical Modelling, Bayesian Statistics, Monte Carlo Simulation, Markov Chain Monte Carlo, Quantile Regression, Spatial Analysis*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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