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Bayesian Hierarchical Model for Risk Reduction in Ghanaian Industrial Machinery Fleets Systems

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Abstract

Industrial machinery fleets in Ghana are subject to frequent breakdowns and accidents, posing significant safety risks and economic burdens. A Bayesian hierarchical model was developed and applied to data from industrial machinery fleets. The model accounts for variability across different machines, operators, and maintenance practices. The model revealed that incorporating predictive maintenance reduced the likelihood of equipment failure by approximately 30%. The Bayesian hierarchical model provided a robust framework for identifying key risk factors and optimising maintenance schedules in industrial machinery fleets. Industrial operators should consider implementing the recommended maintenance strategies to enhance fleet reliability and safety. Bayesian Hierarchical Model, Predictive Maintenance, Industrial Machinery, Ghanaian Fleets The maintenance outcome was modelled as $Y\{\}=beta0+beta1X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, Ghana, Hierarchical modelling, Industrial safety, Risk assessment, Predictive maintenance, Econometrics*

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