Bayesian Hierarchical Model for Risk Reduction in Senegalese Manufacturing Plants Systems, 2009

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Abstract

This study examines the application of a Bayesian hierarchical model to assess risk reduction in manufacturing plants within Senegalese industries. A Bayesian hierarchical model was developed to analyse data from multiple manufacturing plants across different sectors of the Senegalese economy. This approach allows for the integration of plant-specific characteristics with aggregated national-level data, providing a more nuanced understanding of risk reduction mechanisms. The analysis revealed that implementing robust safety protocols and regular maintenance significantly reduced operational risks by approximately 40% in manufacturing plants compared to baseline conditions. The Bayesian hierarchical model demonstrated the effectiveness of targeted interventions in enhancing plant safety and productivity, offering a valuable tool for risk management in Senegalese industries. Manufacturing companies should prioritise the adoption of comprehensive safety programmes and regular maintenance schedules based on this study's findings. Additionally, regulatory bodies should encourage compliance with these standards to ensure consistent improvement across all plants. The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, Bayesian statistics, Hierarchical modelling, Risk assessment, Manufacturing systems, Methodological evaluation, Quantitative analysis*

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