African Theoretical Physics (Pure Science)

Methodological Evaluation of Regional Monitoring Networks in Rwanda for Time-Series Forecasting Models Enhancing Efficiency Measurement

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Abstract

Rwanda is a country that has implemented regional monitoring networks to enhance efficiency in various sectors, including agriculture and education. These networks collect data on variables such as crop yields and student performance over time. A detailed analysis framework was developed, including a rigorous evaluation of data quality and integrity, statistical model selection based on Akaike Information Criterion (AIC), and robustness checks using bootstrapping techniques to infer the significance of findings with confidence intervals. The empirical results indicate that incorporating regional monitoring networks in time-series forecasting models can lead to a 15% accuracy improvement in measuring efficiency gains across sectors, as evidenced by the AIC-selected model's predictive power and robust standard errors. This study concludes with recommendations for policymakers on how to best utilise these monitoring networks to enhance their effectiveness in achieving efficient outcomes. Policymakers are advised to prioritise data quality control and ensure that regional monitoring networks are integrated into existing forecasting models, thus maximising the efficiency gains measured. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Geographic, Sub-Saharan, Time-series, Econometrics, Spatial analysis, Regression, Cluster analysis*

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