African Nanochemistry (Environmental/Earth Science focus)

Time-Series Forecasting Model for Cost-Effectiveness Analysis of Secondary Schools Systems in Rwanda: An Evaluation Framework

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Abstract

This study aims to evaluate the cost-effectiveness of secondary schools systems in Rwanda by forecasting future trends. A hybrid ARIMA-GARCH (AutoRegressive Integrated Moving Average - Generalized Autoregressive Conditional Heteroskedasticity) model was employed to forecast secondary school system expenditures and student outcomes over a decade. Robust uncertainty intervals were calculated to account for forecasting errors. The analysis revealed that annual enrollment growth has significantly influenced expenditure patterns, with increases in costs accounting for approximately 20% of the variability observed. The time-series model provides valuable insights into cost-effectiveness trends and can inform future policy decisions aimed at optimising resource allocation within the Rwandan secondary school system. Policy-makers should consider implementing targeted interventions to mitigate high-cost growth areas, ensuring sustainable financial planning for educational investments in Rwanda. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Rwanda, Geographic Information Systems, Time-series Analysis, Econometrics, Monte Carlo Simulation, Hierarchical Modelling, Adaptive Neuro-Fuzzy Inference System*

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