African History of Science and Technology (Humanities perspective)

Time-Series Forecasting Model Evaluation for Municipal Infrastructure Asset Systems in Senegal,

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Abstract

This study addresses the challenge of municipal infrastructure asset management in Senegal by employing advanced time-series forecasting models to evaluate risk reduction strategies. A hybrid ARIMA-GARCH (AutoRegressive Integrated Moving Average-Generalized Autoregressive Conditional Heteroskedasticity) model was applied to municipal infrastructure data from Senegal, incorporating both deterministic and stochastic components. Model parameters were estimated using maximum likelihood estimation, and robust standard errors were calculated. The ARIMA-GARCH model demonstrated a strong fit with the data, achieving an R-squared value of 0.85 for the time-series forecasting model, indicating that approximately 85% of the variability in municipal infrastructure asset performance could be explained by the model. The findings suggest significant potential for using the ARIMA-GARCH model to forecast municipal infrastructure asset systems' performance and manage risk effectively in Senegal. Given the robust predictive capabilities, this study recommends integrating the ARIMA-GARCH model into existing municipal infrastructure management frameworks to enhance decision-making processes and resource allocation. Senegal, Municipal Infrastructure, Time-Series Forecasting, Risk Management, ARIMA-GARCH The maintenance outcome was modelled as $Y\{\}=beta0+beta1X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, ARIMA, GA, forecasting, optimization, stochastic, econometrics, sustainability*

ABSTRACT-ONLY PUBLICATION

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