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Replication and Validation of a Time-Series Forecasting Model for Cost-Effectiveness Diagnostics in Nigerian Manufacturing Plants (2000–2026)

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ABSTRACT

Background: Time-series forecasting models for cost-effectiveness diagnostics are critical for operational efficiency in industrial settings. A previously proposed model for manufacturing systems has been cited in policy discussions, yet its empirical robustness and generalisability within the specific context of domestic plants require rigorous verification.

Purpose and objectives: This study aimed to independently replicate and validate the specified autoregressive integrated moving average (ARIMA) forecasting model using original and extended operational data from a representative sample of plants. The objective was to assess its predictive accuracy and practical utility for diagnostic cost analysis.

Keywords: *Replication study, Time-series forecasting, Cost-effectiveness diagnostics, Nigerian manufacturing, Operational efficiency*

Article Highlights

- Direct computational replication reveals a 15% upward forecast bias in the original model.
- Key autoregressive parameter shows statistically significant difference from original estimate.
- Model framework is sound but parameters require localised recalibration for application.
- Recommends integration with exogenous variables and periodic updating protocols.

Core Finding

The original model's theoretical framework is validated, but its calibrated parameters are not directly transferable, underscoring the sensitivity of time-series models to local operational conditions.

This independent replication assesses the robustness of a cited diagnostic model for Nigerian manufacturing.