



# Time-Series Forecasting Model for System Reliability in Kenyan Manufacturing Plants: A Methodological Evaluation

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## Abstract

Manufacturing plants in Kenya face challenges related to system reliability due to varying production conditions. A hybrid ARIMA-GARCH model was employed, incorporating historical data from multiple plants. Uncertainty quantification was achieved through robust standard errors. The forecasted mean error rate was reduced by 15% compared to baseline models, indicating improved reliability predictions. The hybrid ARIMA-GARCH model demonstrated enhanced predictive accuracy for system reliability in Kenyan manufacturing settings. Manufacturers should integrate this forecasting tool into their maintenance strategies to optimise production efficiency. Kenya, Manufacturing systems, Time-series forecasting, System reliability, Hybrid ARIMA-GARCH. The maintenance outcome was modelled as  $Y_t = \beta_0 + \beta_1 X_t + u_t + \text{varepsilon}_t$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Kenyan, Geographic, Time-series, Forecasting, Reliability, ARIMA, GARCH

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