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Industrial Machinery Fleet Time-Series Forecasting Model Evaluation in Senegal: A Methodological Approach

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Abstract

Industrial machinery fleets play a critical role in Senegal's economy, influencing productivity and operational costs. However, their maintenance and performance data are often fragmented and underutilized. The study employs an ARIMA (AutoRegressive Integrated Moving Average) model to forecast maintenance intervals and operational efficiency. Uncertainty is assessed through robust standard errors, ensuring the reliability of predictions. A significant proportion (75%) of machinery fleets experienced predictive maintenance, leading to a reduction in unexpected breakdowns by over 20% compared to historical data. The ARIMA model demonstrated high accuracy and robustness in forecasting industrial machinery fleet performance, offering valuable insights for maintenance planning and cost management. Implementing the proposed time-series forecasting models can enhance overall system reliability and reduce operational costs by preemptively addressing potential issues. ARIMA, Time-Series Forecasting, Industrial Machinery Fleet, Senegal The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, African, Econometrics, SystemsTheory, MaintenanceScience, TrendAnalysis, ForecastingModels*