African Coastal Engineering

Time-Series Forecasting Model for Efficiency Gains in Ghanaian Industrial Machinery Fleetsystems

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Abstract

Industrial machinery fleets in Ghana are critical for economic growth but often suffer from inefficiencies. A hybrid ARIMA-GARCH model was employed to forecast fleet performance, incorporating historical data on usage patterns and maintenance records. The model predicted an average annual reduction of 15% in operational costs with a confidence interval of ±3 percentage points. The time-series forecasting approach successfully identified trends for optimising machinery utilization and reducing downtime. Implementing preventive maintenance strategies based on the forecasted data could lead to significant efficiency improvements. ARIMA, GARCH, industrial machinery, fleet optimization, Ghana The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, ARIMA, GARCH, econometric, forecasting, efficiency, time-series*

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