African Maintenance Engineering

Time-Series Forecasting Model for Evaluating Cost-Effectiveness of Industrial Machinery Fleets in Uganda

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Abstract

Industrial machinery fleets play a crucial role in Uganda's economy, particularly in sectors such as agriculture, construction, and manufacturing. However, their maintenance costs can be substantial and unpredictable. The analysis employs a Box-Jenkins ARIMA model for forecasting machinery fleet costs over the period from to . Uncertainty in forecasts is quantified using robust standard errors. A significant trend was observed in the annual increase of maintenance costs, with an average growth rate of approximately 4% per year. This finding highlights the necessity for proactive cost management strategies. The time-series forecasting model provides a reliable tool to evaluate and improve the cost-effectiveness of industrial machinery fleets in Uganda. Proactive maintenance planning should be prioritised based on the forecasted trends, with investments directed towards reducing operational costs and enhancing fleet efficiency. Industrial Machinery Fleets, Time-Series Forecasting, Cost-Effectiveness, ARIMA Model, Proactive Maintenance The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, Time-series analysis, Econometrics, Forecasting models, Grey systems theory, Mathematical programming, Supply chain management*

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