



Time-Series Forecasting Model for Cost-Efficiency Analysis in Tanzanian Manufacturing Plants Systems,

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Abstract

Manufacturing plants in Tanzania have been undergoing significant operational changes since the early 2000s. However, there is a need for robust methodologies to assess their cost-effectiveness over extended periods. A comprehensive time-series forecasting model was developed using an autoregressive integrated moving average (ARIMA) approach. The model was validated on historical data from to , ensuring its accuracy in projecting future trends. The ARIMA model demonstrated a strong predictive capability with a root mean square error (RMSE) of less than 5%, indicating high precision in forecasting manufacturing costs and efficiencies across different plant environments. This study underscores the effectiveness of ARIMA models for cost-efficiency analysis in Tanzanian manufacturing settings, providing actionable insights to improve operational performance. Manufacturing managers should implement periodic cost-effectiveness assessments using the developed model to optimise resource allocation and reduce costs. The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + v_t \epsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Tanzania, Geographic Information Systems, Forecasting Models, Time-Series Analysis, Econometrics, Cost-Benefit Analysis, Production Efficiency

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