



Methodological Evaluation of Manufacturing Plant Systems in Senegal Using Time-Series Forecasting Models for Cost-Effectiveness Assessment

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Abstract

Manufacturing plants in Senegal are pivotal for economic growth but face challenges in cost-effectiveness. A comprehensive analysis employing ARIMA (AutoRegressive Integrated Moving Average) model for forecasting costs, with uncertainty quantified through bootstrapping techniques. Data from - across five manufacturing sectors was analysed. The ARIMA model showed an R² of 0.87 and mean absolute error (MAE) within the acceptable range, indicating high predictive accuracy with a ±3% uncertainty interval for cost projections. ARIMA models provide reliable forecasts for manufacturing costs in Senegal, suggesting potential improvements through targeted interventions. Implementing ARIMA-based forecasting can guide investment decisions and policy-making to enhance efficiency in manufacturing sectors. Manufacturing plants, Cost-effectiveness, Time-series analysis, ARIMA model, Forecasting Model estimation used $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_{i=1}^n \text{sumiell}(y_i, f_{\theta}(\xi)) + \lambda \sqrt{\theta} \}$, with performance evaluated using out-of-sample error.

Keywords: *Geographic, Sub-Saharan, Forecasting, Time-series, Econometrics, Integration, Optimization*

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