

A Time-Series Forecasting Model for the Cost-Effectiveness of Power-Distribution Equipment in Tanzania

A Methodological Evaluation (2000–2026)

Juma Kisimba^{1,2}|Neema Mwambene¹

Grace Mushi³

¹ University of Dar es Salaam

² Tanzania Commission for Science and Technology (COSTECH)

³ Department of Civil Engineering, Mkwawa University College of Education

Correspondence: jkisimba@gmail.com

Received: 11 July 2000 | Accepted: 12 August 2000 | Published: 24 September 2000 | DOI:

[10.5281/zenodo.18968700](https://doi.org/10.5281/zenodo.18968700)

ABSTRACT

Background: The economic sustainability of power-distribution networks in sub-Saharan Africa is constrained by high capital costs and operational inefficiencies. Existing models for evaluating equipment cost-effectiveness often lack a robust, forward-looking component, limiting long-term infrastructure planning.

Purpose and objectives: This paper presents a methodological evaluation of a novel time-series forecasting model designed to measure the cost-effectiveness of power-distribution equipment. The objective is to assess the model's predictive accuracy and utility for long-term capital planning.

Keywords: *Power-distribution networks, Cost-effectiveness analysis, Time-series forecasting, Sub-Saharan Africa, Engineering economics*

Article Highlights

- ARIMAX model achieves 8.7% MAPE in forecasting cost-effectiveness ratios.
- Forecast uncertainty widens significantly beyond a five-year planning horizon.
- Model provides a dynamic improvement over static historical analysis for asset management.
- Framework is technically sound and operationally relevant for utility planning.

Methodological Note

The ARIMAX model incorporates exogenous variables to forecast the cost-effectiveness ratio (Δy_t), with parameters estimated via maximum likelihood and robust standard errors.

This evaluation offers a forward-looking tool for strategic asset management in power-distribution networks.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

REQUEST FULL PAPER

 **Email:** info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We
welcome your submissions!**

Join our community of African scholars and share
your groundbreaking work.

 **Submit at:** app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global
Knowledge