



# Revisiting Time-Series Forecasting Models in South African Secondary Schools Systems: A Methodological Evaluation and Replication Study

Lumumba Dlamini<sup>1</sup>, Siyabonga Tshabalala<sup>1,2</sup>, Thembani Mncube<sup>1,3</sup>, Neville Nkosi<sup>4</sup>

<sup>1</sup> Tshwane University of Technology (TUT)

<sup>2</sup> Department of Cybersecurity, Agricultural Research Council (ARC)

<sup>3</sup> Department of Software Engineering, Agricultural Research Council (ARC)

<sup>4</sup> Department of Data Science, Vaal University of Technology (VUT)

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Correspondence: [ldlamini@hotmail.com](mailto:ldlamini@hotmail.com)

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### Author notes

*Lumumba Dlamini is affiliated with Tshwane University of Technology (TUT) and focuses on Computer Science research in Africa.*

*Siyabonga Tshabalala is affiliated with Department of Cybersecurity, Agricultural Research Council (ARC) and focuses on Computer Science research in Africa.*

*Thembani Mncube is affiliated with Department of Software Engineering, Agricultural Research Council (ARC) and focuses on Computer Science research in Africa.*

*Neville Nkosi is affiliated with Department of Data Science, Vaal University of Technology (VUT) and focuses on Computer Science research in Africa.*

### Abstract

This study addresses a current research gap in Computer Science concerning Methodological evaluation of secondary schools systems in South Africa: time-series forecasting model for measuring yield improvement in South Africa. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of secondary schools systems in South Africa: time-series forecasting model for measuring yield improvement, South Africa, Africa, Computer Science, replication study This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. Model estimation used  $\hat{\theta} = \operatorname{argmin} \{ \theta \} \operatorname{sumiell} (y_i, f\theta(\xi)) + \lambda \operatorname{Vert}\theta \operatorname{rVert} 2^2$ , with performance evaluated using out-of-sample error.

**Keywords:** Sub-Saharan, African, Time-Series, Modelling, Econometrics, Longitudinal, Methodology



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