



# Asymptotic Analysis and Identifiability Checks in Time-Series Econometrics for Traffic Flow Optimization in Nigeria

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### Abstract

This study focuses on optimising traffic flow in Nigeria by applying time-series econometrics methods. A novel approach combining vector autoregression (VAR) models with Kalman filters was employed. The methodology includes specifying a VAR model based on empirical data from Nigeria’s major urban areas, incorporating exogenous variables such as weather conditions and public holidays, and using the Kalman filter for state estimation. The asymptotic analysis revealed that the estimated parameters of the VAR models converge to their true values over time under certain conditions. The identifiability checks indicated that the model is identifiable given the data structure constraints. The proposed methodology provides a robust framework for forecasting traffic flow and optimising transportation systems in Nigeria. Future research should explore the application of these methods across different geographical scales and incorporate more sophisticated econometric techniques to enhance predictive accuracy. Traffic Flow, Time-Series Econometrics, Asymptotic Analysis, Identifiability Checks Model selection is formalised as  $\hat{\theta} = \underset{\theta \in \Theta}{\operatorname{argmin}} \{ L(\theta) + \lambda \omega(\theta) \}$  with consistency under mild identifiability assumptions.

**Keywords:** *Sub-Saharan, Vector Autoregression (VAR), Kalman Filters, Identifiability, Asymptotic Properties, Time-Varying Parameters, Econometric Models*

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