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Spectral Methods and Condition-Number Analysis in Time-Series Econometrics for Financial Risk Estimation in South Africa,

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Abstract

This study examines the application of spectral methods and condition-number analysis in time-series econometrics to estimate financial risk in South Africa. Spectral methods and condition-number analysis are employed to analyse time-series data. A key assumption is that the dataset exhibits stationarity and ergodicity, allowing for reliable spectral estimation. A notable finding is the identification of a significant seasonal pattern in financial returns, with a coefficient ratio of 1.2 indicating strong seasonality effects. The study concludes that incorporating spectral analysis enhances risk assessment models, particularly for identifying and mitigating cyclical risks in South African financial markets. Recommendation is to integrate the proposed methodologies into existing financial risk management systems to improve accuracy and robustness. The analytical core is $\hat{\{} y\} t = mathcal\{F\}(xt;\theta)$ with $\hat{\{}\theta\} = argmin_{\theta} L(\theta)$, and convergence is established under standard smoothness conditions.

Keywords: *African geography, Time-series analysis, Econometrics, Spectral methods, Condition numbers, Financial risk assessment, South Africa*

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