



Convex Optimization Techniques for Financial Risk Estimation in Ghana: Stability Analysis and Convergence Proofs

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Abstract

Financial risk estimation in Ghana is crucial for regulatory compliance and investment decision-making. Convex optimization techniques offer a robust framework to model financial risks effectively. A novel convex optimization problem formulation is introduced to estimate financial risks in Ghana. Theoretical stability and convergence proofs are derived under specific assumptions regarding market dynamics and investor behaviour. The convex optimization model demonstrates robust performance across various scenarios, showing a stable estimation with high predictive accuracy for financial risk levels in Ghana. This study provides theoretical foundations for using convex optimization in financial risk assessment, offering a reliable methodological framework for practitioners in Ghana. Future research should validate these models on real-world data and explore their applicability to other African economies with varying market conditions. Convex Optimization, Financial Risk Estimation, Stability Analysis, Convergence Proofs, Ghana 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: *Ghana, Convex Optimization, Financial Risk, Stability Analysis, Convergence Proofs, Quadratic Programming, Non-Convex Problems*

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