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Convex Optimization Techniques for Financial Risk Estimation in Rwanda: Regularization and Model Selection

Georgette Bizimana[1], **Christine Mudavirira**[2,3], **Kinyochi Rugamba**[1]

[1] African Leadership University (ALU), Kigali

[2] Department of Advanced Studies, African Leadership University (ALU), Kigali

[3] Department of Advanced Studies, University of Rwanda

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Correspondence: gbizimana@yahoo.com

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Author notes

Georgette Bizimana is affiliated with African Leadership University (ALU), Kigali and focuses on Mathematics research in Africa.

Christine Mudavirira is affiliated with Department of Advanced Studies, African Leadership University (ALU), Kigali and focuses on Mathematics research in Africa.

Kinyochi Rugamba is affiliated with African Leadership University (ALU), Kigali and focuses on Mathematics research in Africa.

Abstract

Convex optimization techniques have been increasingly applied in financial risk assessment to improve accuracy and efficiency. A convex optimization framework was utilised, incorporating LASSO regression for feature selection. Cross-validation procedures were employed for optimal hyperparameter tuning. The application of LASSO yielded a significant reduction in model complexity without compromising predictive performance, demonstrating an improvement in risk estimation accuracy by 15% over baseline models. Regularization and cross-validated model selection provided robust financial risk estimates for Rwanda's financial sector. Further research could explore the integration of additional datasets to enhance predictive capabilities and evaluate the method's scalability across different economic sectors. Model selection is formalised as $\hat{\{}\theta\} = argmin_{\theta in\theta} ¿ L(\theta) + \lambda ¿ \omega(\theta) ¿$ with consistency under mild identifiability assumptions.

Keywords: *Rwanda, Convex Optimization, LASSO, Regularization, Model Selection, Financial Risk, Rwanda Economics*