African Geometry and Topology (Pure Science)

Finite-Element Discretization in Financial Risk Estimation: A Replication Study on Rwanda's Context

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Abstract

This study revisits a previous research on financial risk estimation in Rwanda, focusing on the application of finite-element methods. Finite-element discretization was employed to model financial risks. The method adhered to standard assumptions in functional analysis, including the boundedness of market fluctuations within a specified range and the convergence towards accurate estimates over time. The replication study achieved an error bound reduction by optimising the mesh size for numerical simulations, resulting in more precise risk predictions with less than 5% deviation from the original model's output. The replicated results confirm the reliability of the initial findings and demonstrate the efficiency of finite-element methods in financial risk estimation. Future research should explore broader applications of these models across different regions to validate their generalizability 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: *Rwanda, Functional Analysis, Finite-Element Method, Discretization, Error Bounds, Sobolev Spaces, Variational Inequalities*

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