ISSN: 2320-5407

International Journal of Advanced Research

Publisher's Name: Jana Publication and Research LLP

www.journalijar.com

REVIEWER'S REPORT

Manuscript No.: IJAR-52122 Date: June 6, 2025

Title: Applying Bayesian Weighted Linear Discriminant Analysis for the Classification of Commercial and Personal Loans in the Liberia Banking Sector

Recommendation:
Accept after minor revision

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality		√		
Clarity		√		
Significance	√			

Reviewer Name: Dr Tegegne Getachew **Date:** June 6, 2025

Reviewer's Comment for Publication.

(*To be published with the manuscript in the journal*)

The reviewer is requested to provide a brief comment (3-4 lines) highlighting the significance, strengths, or key insights of the manuscript. This comment will be Displayed in the journal publication alongside with the reviewers name.

The manuscript effectively demonstrates the superiority of the BwLDA model in credit risk classification within the Liberian banking sector. Its ability to integrate prior information and account for uncertainty makes it a robust tool for risk management and regulatory decision-making, especially in data-limited environments. The findings advocate for its adoption to enhance financial stability in the region.

Detailed Reviewer's Report

This manuscript, "Applying Bayesian Weighted Linear Discriminant Analysis for the Classification of Commercial and Personal Loans in the Liberia Banking Sector," presents a compelling case for adopting the **Bayesian weighted linear discriminant analysis (BwLDA)** model. The authors effectively highlight the limitations of traditional LDA and even weighted LDA (wLDA) in handling real-world banking data, especially in emerging economies like Liberia, where data scarcity, class imbalance, and volatile markets are prevalent.
Here's a detailed review of the report:

1. Strengths

The manuscript clearly articulates the challenge of credit risk classification in emerging economies and the shortcomings of existing models. The introduction of BwLDA as an extension of wLDA by incorporating Bayesian principles is a significant contribution, addressing the crucial aspects of

ISSN: 2320-5407

International Journal of Advanced Research

Publisher's Name: Jana Publication and Research LLP

www.journalijar.com

REVIEWER'S REPORT

incorporating prior knowledge and quantifying uncertainty. The theoretical framework is well-defined, detailing the formulation of wLDA and its extension into the Bayesian framework. Integrating the Merton model via "distance-to-default (DD)" is a strong point, bringing a forward-looking, market-based indicator into the analysis. Careful selection of variables for commercial and personal loans, based on theoretical and practical relevance and consistent with international guidelines (BASEL II), strengthens the model's applicability. An application of the BwLDA model to real-world data from five Liberian banking institutions is highly valuable, providing concrete evidence of its performance. The results are presented systematically, with separate analyses for commercial and personal loans and detailed discussions of estimated parameters and classification counts. The comparison of the BwLDA model with and without the "distance-to-default" feature provides valuable insights into the impact of this crucial variable, highlighting its context-dependent effectiveness. The manuscript concludes with actionable recommendations for Liberian banking institutions and the Central Bank of Liberia, promoting the adoption of advanced credit risk assessment frameworks. The manuscript is logically organized, making it easy to follow the progression from problem definition to methodology, results, and conclusions.

2. Areas for Minor Improvements

I. **Clarity on "Actual Bank Records":** While the paper mentions "actual bank records" for comparison, it could benefit from a more explicit explanation of how these records are derived or defined by the banks. Are these based on internal default definitions, write-offs, or a combination of factors? This would help in better interpreting the discrepancies observed between BwLDA predictions and bank records.

II. **Quantifying "Slight Discrepancy":** In the results section, terms like "slight discrepancy" (line 203) and "slight overestimation" (line 240) are used. While the tables provide numbers, a more quantitative measure of this discrepancy (e.g., percentage difference, mean absolute error) could further strengthen the analysis.

III. **Addressing Over and/ or Under Estimation:** For cases where BwLDA shows over or underestimation compared to bank records (e.g., ABLL commercial and personal loans), a deeper dive into potential reasons for these discrepancies beyond "different thresholds, internal scoring systems, or expert-driven adjustments" would be beneficial. Are there specific characteristics of these banks or their loan portfolios that lead to this?

IV. **Convergence Diagnostics for MCMC:** The paper acknowledges the challenges of MCMC convergence diagnostics (lines 95-97). While PyMC3 or Stan are mentioned as implementation frameworks, providing some detail on how convergence was assessed (e.g., trace plots, Gelman-Rubin statistic, effective sample size) would enhance the credibility of the Bayesian estimates.

V. **Homogeneity of Data across Banks:** The study uses data from five different banks. While the BwLDA model adapts flexibly, it would be useful to discuss any efforts made to standardize or harmonize the data across these diverse institutions, especially regarding how loan default is defined or reported, to ensure comparability.

VI. **Generalizability beyond Liberia:** While the focus is on Liberia, a brief discussion on the potential generalizability of BwLDA to other emerging economies facing similar challenges would broaden the impact of the research.

VII. **Referencing in Section 2 (Lines 55-108):** While the theoretical framework is sound, incorporating specific references within this section for the equations and concepts (e.g., where the logistic assumption for likelihood comes from, or the justification for the chosen classification threshold) would further solidify the academic rigor.

VIII. Use of abbreviation at the abstract section is not recommended.

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

In general, the manuscript presents a significant and timely contribution to the field of credit risk modeling, particularly for emerging economies. The development and application of the BwLDA model are well-justified and empirically supported. Addressing the minor improvements suggested above would further strengthen the manuscript's clarity, rigor, and impact.

Thus, I recommend it to be published in International Journal of Advanced Research (IJAR) with the above minor revisions.