LendSmart Credit Risk Analysis: Executive Summary

Sophia Gabriela Martínez Albarrán, Sibyla Vera Avila, Regina Pérez Vázquez

Instituto de Estudios Superiores Tecnológico de Monterrey CCM

November 3, 2025

1 Business Context

LendSmart, a mid-sized consumer lending company, faces a significant challenge in managing loan defaults, which currently stand near **28%**. High default rates directly reduce profitability and weaken investor confidence, while also limiting LendSmart's ability to offer competitive credit to reliable applicants.

Project Objective: The goal of this project was to develop a predictive model capable of identifying high-risk applicants before loan approval. By integrating the model into the company's decision-making pipeline, LendSmart aims to reduce default losses and strengthen its credit evaluation system.

Index Terms: Credit Risk Analysis, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Predictive Modeling, Financial Risk Management

2 Key Findings and Insights

The analysis used standardized borrower data encompassing both financial and behavioral metrics such as payment history, employment stability, credit utilization, and debt-to-income ratio. Two statistical models Linear Discriminant Analysis (LDA) and Quadratic Discriminant Analysis (QDA) were applied to identify the best predictors of credit default.

Main Insights:

- **Payment history** emerged as the single strongest predictor of default. Borrowers with irregular or delayed payments showed significantly higher risk.
- **Employment stability** and **credit utilization** also played crucial roles — unstable job history and high utilization ratios strongly correlated with default.
- Additional indicators such as **high debt-to-income** and **low savings ratios** further characterized high-risk borrowers.

Profile of a High-Risk Borrower: Typically, these applicants exhibit late payments, high revolving credit balances, limited savings, and inconsistent employment records. Low-risk borrowers, conversely, maintain steady income, disciplined credit use, and consistent repayment behavior.

3 Model Performance and Selection

Two discriminant models were evaluated:

- **Linear Discriminant Analysis (LDA)** — assumes equal variance across groups and creates linear decision boundaries.
- **Quadratic Discriminant Analysis (QDA)** — allows distinct covariance matrices, generating more flexible, nonlinear boundaries.

Both models achieved **perfect classification accuracy (AUC = 1.000)**, successfully separating defaulters from non-defaulters. Even though performance was identical, QDA offers a more general and flexible framework, making it the **preferred model for deployment**.

Business Interpretation of Results:

- Both models achieved **100% recall** and **100% precision**, ensuring all high-risk applicants are correctly identified.
- The strong performance confirms that borrower behavior and financial variables provide clear separation between default and non-default groups.
- QDA's ability to handle different covariance structures ensures robustness as borrower profiles evolve over time.

4 Final Recommendation

Recommendation: Go (Deploy QDA Model) While LDA and QDA performed identically on current data, QDA is recommended for production deployment due to its theoretical robustness and flexibility. By not assuming equal covariance matrices, QDA remains valid even if the data distribution changes in the future.

Business Trade-off: QDA introduces slightly higher computational complexity but delivers stronger adaptability to borrower heterogeneity, ensuring consistent predictive accuracy as market conditions and applicant profiles shift.

Next Steps:

- Integrate the QDA model into the credit evaluation system for automated applicant screening.
- Monitor covariance structures quarterly to confirm ongoing model validity.
- Retrain periodically with new borrower data to sustain predictive precision.
- Use variable importance insights (e.g., payment history, job stability) to inform borrower education and risk management strategies.

Conclusion: The QDA model its adaptability to unequal covariance structures ensures long-term reliability as borrower behaviors evolve. By deploying QDA, LendSmart can enhance portfolio quality, reduce default rates, and strengthen its financial decision-making framework.