**Summary & Findings:**

The credit risk model and loan limit optimization framework developed in this case study address the critical challenges of managing default risk while maximizing profitability for a lending business. The following are the key takeaways:

1. **Credit Risk Model**:
   * The credit risk model predicts the likelihood of default with high precision, enabling the business to identify and mitigate risks effectively.
   * Features such as income, property value, credit score, debt-to-income ratio (DTIR) and other binary categorical variables were instrumental in driving predictive accuracy.
   * The model's performance was evaluated using metrics such as accuracy, roc\_auc curve classification report, ensuring a balanced trade-off between identifying defaulters and minimizing false negatives.
2. **Loan Limit Optimization**:
   * The loan limit optimization process ensures that borrowers receive personalized loan allocations based on their financial profile and predicted risk.
   * Key factors such as income, property value, and credit score were combined to determine borrower-specific loan limits, improving both fairness and profitability.
   * Constraints like total budget, gross defaults threshold, and risk-based prioritization were incorporated to align with the business objectives of minimizing default costs and maximizing margin contributions.
3. **Insights and Actions**:
   * Borrowers opting for lump sum payments (lpsm) exhibited significantly higher default rates, warranting stricter lending criteria or alternative repayment options for this group.
   * The optimization framework effectively allocated loans to around 50 borrowers while maintaining an acceptable default rate and maximizing the profit.
4. **Productionization**:
   * The model and optimization process are designed to handle scalability, leveraging cloud platforms like Databricks and blob storage for large datasets.
   * Deployment in a cloud-based environment with a Flask-based front-end allows end-users to interact seamlessly and receive personalized loan limits in real-time.

**Impact:**

The proposed solution provides a robust, scalable, and data-driven approach to lending decisions, balancing profitability with risk management. It empowers the business to make informed decisions, reduce default rates, and optimize resource allocation, ultimately enhancing both financial performance and customer satisfaction.