Loan Default Risk Analytics

Data Driven Credit Risk Analysis Assessment

Banking & Financial Services – Retail Lending

Team Details

Section: B | **Team ID:** G-6

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Context & Problem Statement

Business Context

SECTOR CONTEXT

Retail banks face rising credit risk due to:

- High borrower leverage
- Long loan tenures
- Increasing LTV ratios
- Portfolio default rate of 24.88%

Problem Statement

CORE PROBLEM STATEMENT

Which borrower characteristics and loan attributes are most strongly associated with loan defaults, and how can these insights enhance credit risk assessment?

DECISION QUESTION

Which customer segments and loan profiles should be classified as high-risk, and how should lending policies be adjusted to minimize defaults while maintaining profitability?

Objective

MAIN OBJECTIVE

Develop a data-driven dashboard that identifies high risk segments and supports proactive credit decision-making.

Data Engineering – From Raw Data to Analytical Dataset

SOURCE

- Dataset: Loan Default Dataset
- 10,000 rows , 34 columns
- Multiple borrower & loan attributes
- Target variable: is_loan_default
- Link : https://www.kaggle.com/datasets/yasserh/loan-default-dataset

DATA CLEANING

- Median imputation (income, property value)
- Grouped median (interest rate by loan type)
- Mode (loan term)
- Standardized categorical values

KEY COLUMN SELECTED

- Loan-to-Value (LTV)
- Debt-to-Income (DTI)
- Income Bands
- Credit Score Bands
- Interest Rate Bands
- Loan Amount Bands

KPI & METRICS FRAMEWORK

10,000	24.88%	3.99	$79,598,2000
Total Loans	Overall Default Rate	Median Interest Rate	Total Money Lent in Default

Primary KPIs (Portfolio Health)

- Total Loans: 10,000 – Measures overall portfolio scale
- Overall Default Rate: 24.88% – Critical indicator of portfolio credit risk
- Total Money Lent in Default: $79,598,2000 – Measures capital at risk
- *Portfolio default rate is significantly elevated, requiring immediate risk mitigation*

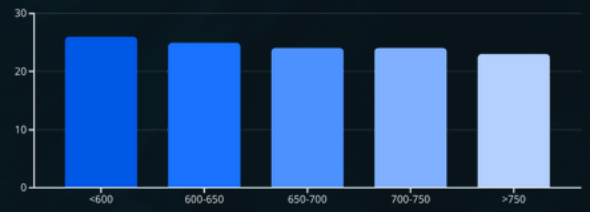
Secondary KPIs (Risk Assessment & Strategy)

- Median Interest Rate: 3.99 – Benchmarks pricing strategy
- Avg Credit Score (Default): 699.51 – Identifies default borrower profile
- Avg Credit Score (Non-Default): 702.03 – Compares risk profiles
- Top Risk Drivers: LTV >100% (89% default), DTI >50% (40%+ default) – Guides approval criteria

Key Insights – Exploratory Data Analysis

Credit Score Insufficient Alone

Default rate stable across credit score bands (24–26%) → Credit score alone is insufficient for risk assessment

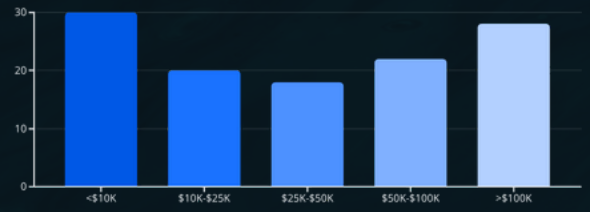


Loan-to-Value Reveals Extreme Risk

LTV > 100% shows ~89% default rate → Underwater loans present critical risk

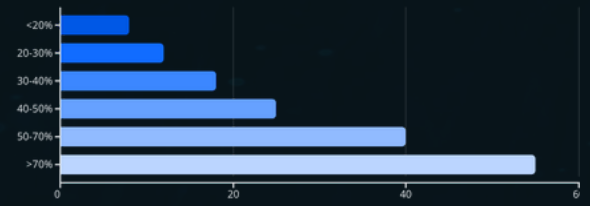
Loan Amount Matters

Loan amount shows moderate variation in default risk, with both very small and very large exposures displaying elevated risk.



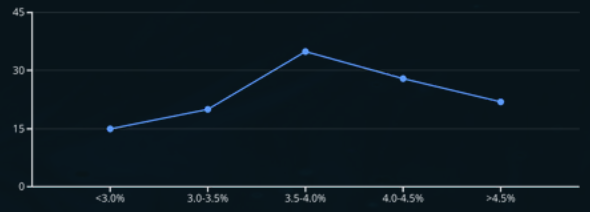
Debt-to-Income is a Strong Risk Signal

High DTI (50–70%) shows >40% default rate → Borrower stress indicator



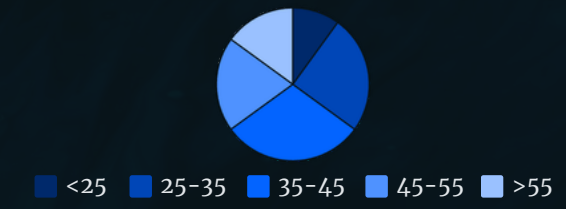
Interest Rate Concentration

Interest rate band 3.5–4% contains majority of defaults → Potential underpricing of risk



Demographic Patterns

Mid-age borrowers account for the largest share of default volume, though this may reflect portfolio concentration rather than higher individual risk.



Advanced Analysis – Risk Segmentation & Interaction Effects

RISK MULTIPLIER EFFECTS

Compounding Risk Factors

- High DTI + Specific Interest Band → Risk multiplies
- High LTV → Increases risk within 3.5-4% interest segment
- Certain income bands → Concentrated default clusters

PORTFOLIO STRUCTURE INSIGHTS

- Portfolio contains structurally risky borrower segments
- Single-factor analysis misses critical risk combinations
- Interaction effects reveal hidden vulnerability patterns

SEGMENTATION ADVANTAGE

Segmentation improves decision intelligence by:

- Identifying borrower combinations with disproportionate risk
- Moving beyond univariate risk assessment
- Enabling targeted policy interventions
- Supporting risk-tiered approval strategies

Dashboard Walkthrough – Executive & Operational View

Our interactive dashboard provides a comprehensive view of loan default risk, catering to both executive oversight and operational decision-making.

EXECUTIVE VIEW

Enables quick risk health assessment:

- Overall Default Rate
- Total Exposure
- Credit Score Comparison (Default vs Non-Default)
- Money Lost in Default
- Portfolio risk snapshot at a glance

OPERATIONAL VIEW

Supports faster, data-driven decisions:

- Filters by LTV, DTI, Income, Age
- Drill-down by segment
- Identify high-risk borrower combinations
- Real-time risk profiling
- Segment-level decision support

DASHBOARD IMPACT

Transforms credit decision-making from manual review to data-driven segmentation, reducing approval cycle time and improving risk consistency.

Recommendations

Use clean consulting layout. Present 5 strong business actions directly linked to insights.

LTV APPROVAL THRESHOLDS

Tighten LTV approval criteria

- LTV > 90% requires enhanced scrutiny
- LTV > 100% automatic decline or risk premium

Linked to insight: LTV > 100% shows ~89% default rate

DEBT-TO-INCOME CAPS

Introduce stricter DTI limits

- Flag borrowers with DTI > 50%
- Enhanced income verification required

Linked to insight: DTI 50–70% shows >40% default rate

RISK-BASED PRICING

Implement dynamic interest rate strategy

- Higher rates for high-risk segments
- Compensate for elevated default probability

Linked to insight: Interest rate band concentration

LOAN AMOUNT MONITORING

Enhanced scrutiny for large exposures

- Loans > 800K require additional review

Linked to insight: High loan amounts show elevated risk

RISK-TIERED APPROVAL MATRIX

Deploy segment-based approval framework

- Automate low-risk approvals
- Escalate high-risk combinations

Linked to insight: Interaction effects reveal hidden risks

All recommendations directly tied to analytical findings.

Impact & Value

FINANCIAL IMPACT

- Reduce default rate by 3–5%
- Lower portfolio credit losses
- Protect capital allocation
- Improve risk-adjusted returns

OPERATIONAL IMPACT

- Faster approval decisions (reduce cycle time)
- Reduced manual risk review burden
- Improved portfolio stability
- Consistent risk assessment across branches

STRATEGIC VALUE

- Establish data-driven credit culture
- Strengthen risk governance framework
- Enable sustainable lending growth
- Build competitive advantage through analytics

Limitations & Scope Boundaries

Professional acknowledgment of scope boundaries demonstrates analytical rigor.

ANALYTICAL SCOPE LIMITATIONS

Data Constraints

- Based on historical data only
- No forward-looking macroeconomic variables included
- No predictive ML modeling applied

Analytical Gaps

- Interest-rate band concentration requires deeper causal study
- Borrower behavior changes not captured
- External economic shocks not modeled

IMPLICATIONS FOR DEPLOYMENT

- Dashboard best used as decision support, not sole approval criterion
- Regular model recalibration needed as portfolio evolves
- Integration with macroeconomic monitoring recommended

Next Steps & Roadmap

Professional roadmap emphasizing phased implementation and continuous improvement.

PHASE 1: ADVANCED MODELING

- Build predictive default model (logistic regression, ensemble methods)
- Develop probability of default (PD) scoring
- Validate model performance on holdout dataset

PHASE 2: ENHANCED DATA INTEGRATION

- Add macroeconomic indicators (unemployment, interest rates, GDP)
- Incorporate borrower behavioral data
- Integrate external credit bureau data

PHASE 3: OPERATIONAL DEPLOYMENT

- Deploy real-time monitoring alerts
- Develop automated risk scoring system
- Integrate dashboard into credit approval workflow

PHASE 4: CONTINUOUS IMPROVEMENT

- Monitor model performance in production
- Recalibrate quarterly based on new defaults
- Expand to other loan products

Thank You

We appreciate your time and attention today.