CredRisk

Credit Risk Analysis & Default Prediction

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Context & Problem Statement

Sector Context

In digital lending, institutions process thousands of loan applications each month. Weak risk assessment increases defaults and credit losses. Decision-makers need data-driven insights to improve approvals and pricing.

Problem Statement

How can a lending institution identify key borrower risk factors driving loan defaults using historical loan data?

Objective

To develop a data-driven dashboard that establishes clear risk thresholds based on FICO score, DTI ratio, interest rate, loan term, and verification status, enabling more informed and strategic lending decision.

Data Engineering

Data Source

- Dataset: Historical Loan Performance Data
- Rows: ~6000
- Columns: 12 selected risk variables
- Time Period: [Add based on dataset]

Data Cleaning & Transformation

- Standardized loan status into binary default_flag
- Converted interest rate text (%) into numeric format
- Extracted numeric term from “36 months / 60 months”
- Created FICO midpoint from range columns

Key Data Dictionary

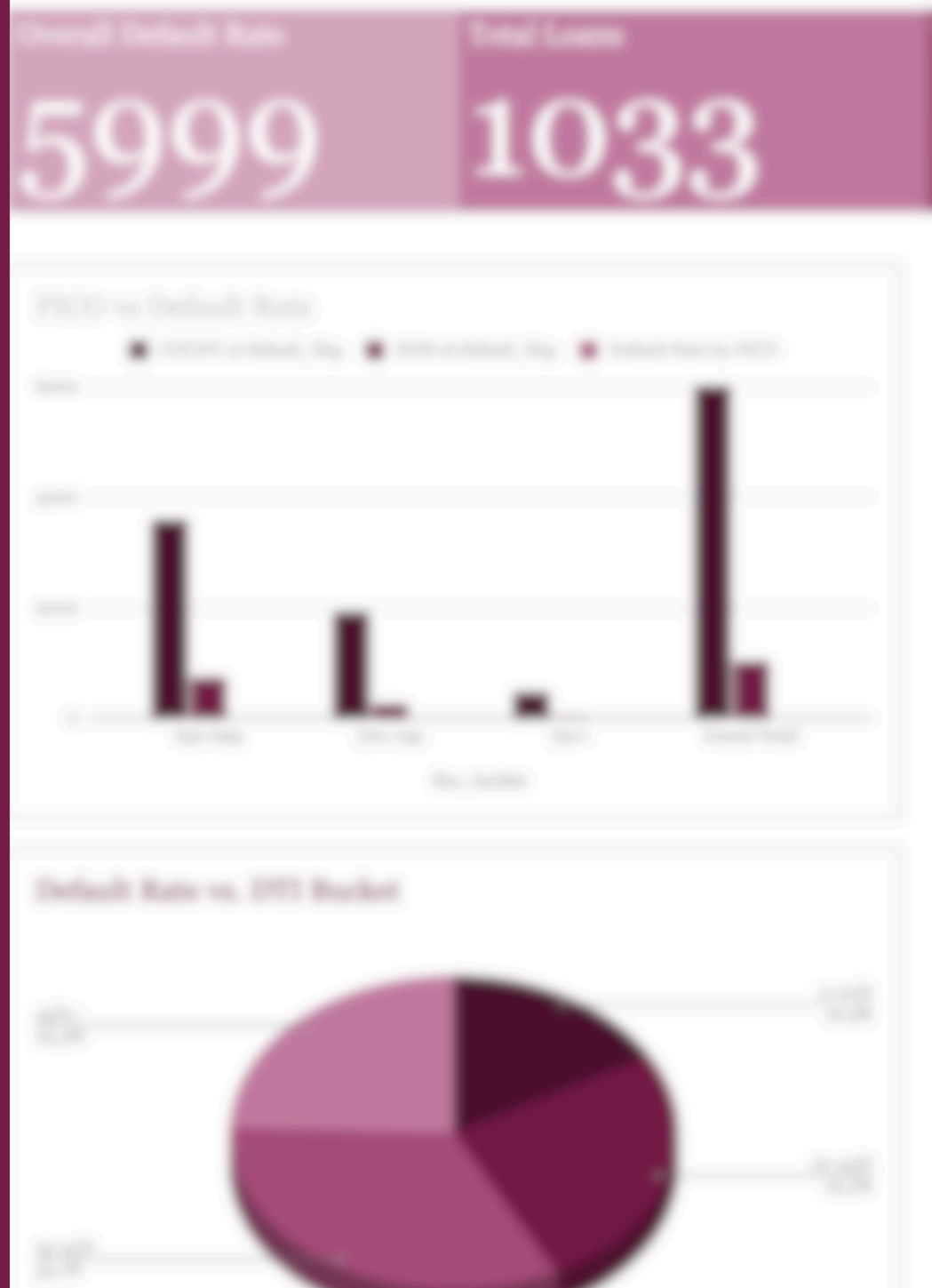
- fico_mid
- dti
- int_rate_clean
- term_numeric
- verification_status
- default_flag
- fico_bucket
- dti_bucket

KPI & Metrics Framework

What Are We Measuring?	Why These KPIs? How Do They Link to the Problem?
↓	↓
Overall Default Rate	Measure overall portfolio credit risk exposure
Default Rate by FICO Bucket	Validate whether credit score accurately predicts default behavior
Default Rate by DTI Bucket	Identify financial stress thresholds (DTI)
Default Rate by Interest Rate Bucket	Assess if pricing (interest rate) reflects actual borrower risk
Default Rate by Loan Term	Evaluate long-term exposure risk (36 vs 60 months)
Default Rate by Verification Status	Determine impact of income verification on loan performance

Key Insights

- Default rates generally decline as FICO scores increase, indicating that credit score remains an important indicator of borrower reliability.
- Borrowers with higher Debt-to-Income (DTI) ratios tend to show elevated default rates, suggesting potential repayment pressure in high-DTI segments.
- Loans with higher interest rates display relatively higher default levels, reflecting the link between risk-based pricing and borrower profile.
- 60-month loan terms exhibit slightly higher default rates compared to 36-month loans, indicating increased exposure risk over longer durations.
- Income-verified borrowers show marginally improved repayment performance, highlighting the value of verification in underwriting.
- Mid-tier credit segments account for a meaningful portion of total defaults, suggesting concentration of risk beyond just the lowest credit categories.



inc	purpose	default_flag	fico_mid	fico_bucket	in
55000	debt_consolidation	0	677	650-699	
65000	small_business	0	717	700-749	
63000	home_improvement	0	697	650-699	
110000	debt_consolidation	0	787	750+	
104433	major_purchase	0	697	650-699	
34000	debt_consolidation	0	692	650-699	
180000	debt_consolidation	0	682	650-699	
85000	major_purchase	0	707	700-749	
85000	credit_card	0	687	650-699	
42000	credit_card	0	702	700-749	
95000	debt_consolidation	0	712	700-749	
70000	debt_consolidation	0	722	700-749	
64000	other	0	702	700-749	
150000	debt_consolidation	1	667	650-699	
92000	debt_consolidation	0	722	700-749	
60000	credit_card	0	697	650-699	
109000	debt_consolidation	0	747	700-749	
112000	debt_consolidation	0	802	750+	
64000	credit_card	0	702	700-749	
55000	debt_consolidation	0	677	650-699	
65000	debt_consolidation	0	717	700-749	
48000	credit_card	0	687	650-699	
125000	debt_consolidation	0	697	650-699	
79000	credit_card	0	667	650-699	
100000	debt_consolidation	0	697	650-699	
35000	debt_consolidation	1	727	700-749	
65000	debt_consolidation	0	837	750+	
109000	debt_consolidation	0	682	650-699	
88000	credit_card	0	782	750+	
44000	home_improvement	0	687	650-699	
65000	small_business	1	677	650-699	
75000	debt_consolidation	1	662	650-699	
98000	debt_consolidation	0	692	650-699	
79000	debt_consolidation	1	732	700-749	
118000	debt_consolidation	0	682	650-699	
59000	credit_card	0	732	700-749	
52000	credit_card	0	682	650-699	
195000	other	0	702	700-749	
72500	home_improvement	0	727	700-749	
110000	credit_card	0	692	650-699	
70000	house	0	682	650-699	
55000	credit_card	1	687	650-699	
142000	debt_consolidation	0	682	650-699	
75000	debt_consolidation	0	727	700-749	
100000	credit_card	0	752	750+	
54649	debt_consolidation	0	672	650-699	

Advanced Analysis

Advanced Work Performed:-

- Risk Segmentation based on credit score, DTI, interest rate, and loan term
- High-Risk Borrower Identification for targeted underwriting control and monitoring
- Default Trend Analysis across loan terms and borrower segments
- Interest Rate Impact Analysis to assess risk-pricing alignment
- Multi-Factor Layering to detect compounded risk exposure

What New Understanding Did This Provide?

- Default risk is concentrated within specific borrower combinations rather than driven by a single risk factor.
- Mid-tier credit segments account for a meaningful share of total defaults, indicating risk beyond just the lowest FICO group.
- Longer loan terms tend to amplify default risk, particularly among moderate-risk borrowers.
- While pricing broadly reflects borrower risk, repayment burden and exposure duration significantly influence realized outcomes.

Dashboard Walkthrough

01

Executive View — Portfolio Overview

- Overall Default Rate (Portfolio Risk Snapshot)
- Average FICO & DTI Levels
- Default Rate by Loan Term
- Risk Distribution Across FICO Buckets

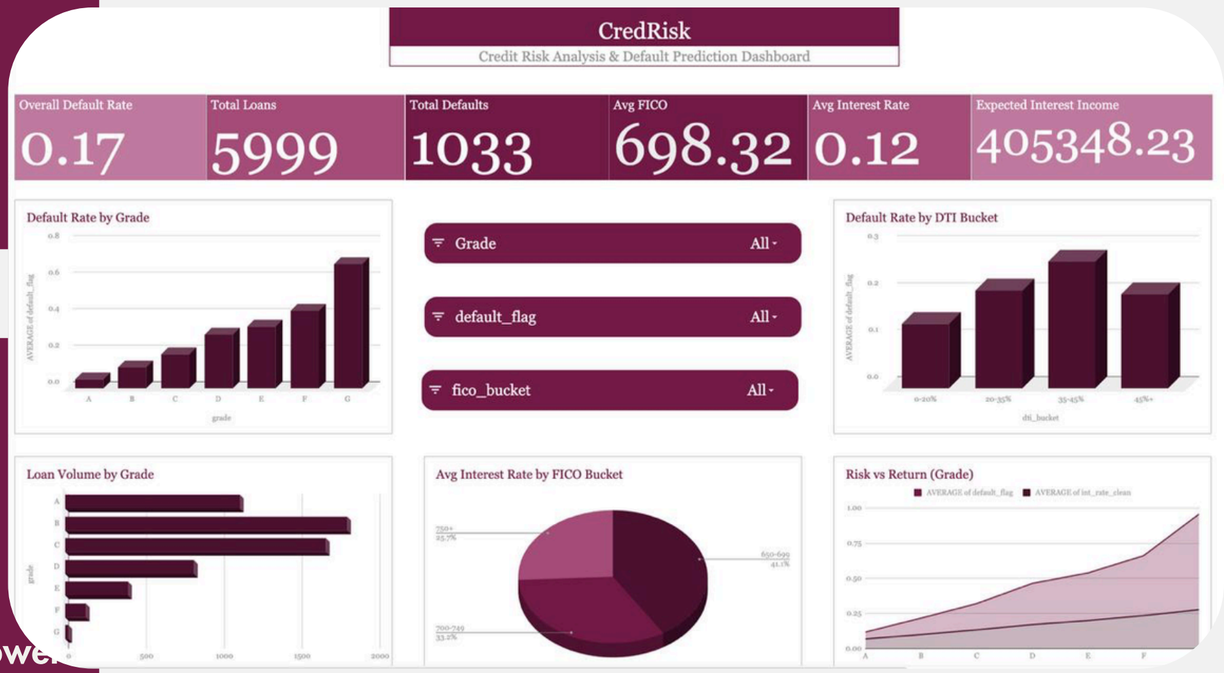
This view enables senior management to quickly assess overall portfolio health and risk concentration.

02

Operational View — Detailed Risk Analysis

- Default Rate by FICO Bucket
- Default Rate by DTI Bucket
- Default Rate by Interest Rate Bucket
- Verification Status Performance Comparison

This layer allows risk managers to drill down into specific borrower segments and identify high-risk clusters.



Recommendations

Strengthen Risk-Based Underwriting

- Introduce structured approval thresholds combining FICO and DTI levels.
- Limit exposure to high-risk borrower segments through stricter screening criteria.

Refine Risk-Based Pricing Strategy

- Apply enhanced evaluation standards for 60-month loans.
- Adjust pricing or reduce approval rates for extended-term high-risk profiles.

Enhance Income Verification Controls

- Increase verification requirements for moderate-risk applicants.
- Prioritize verified-income profiles to improve repayment reliability.

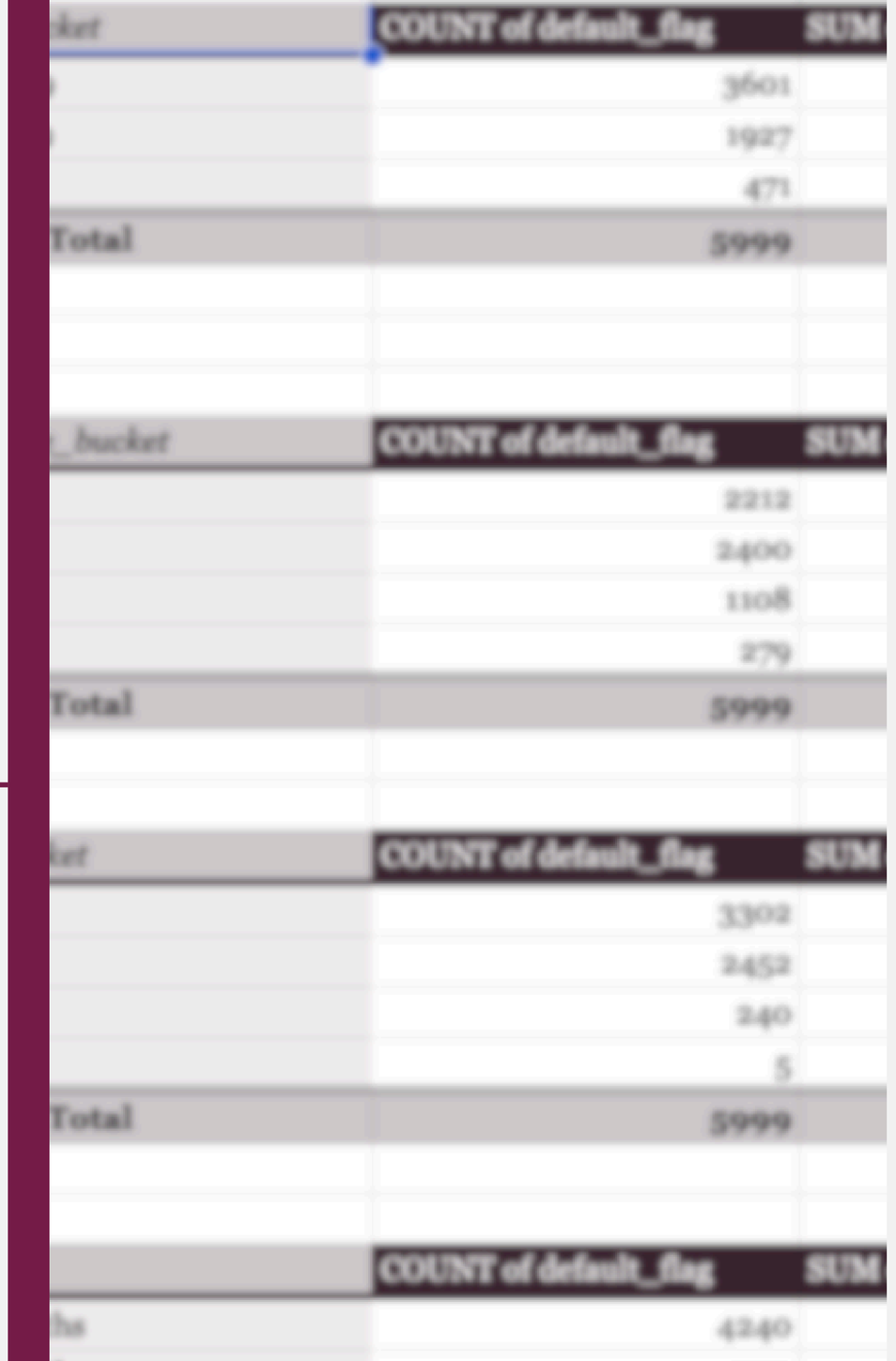
Impact & Value

Business Impact

- Improves portfolio stability by identifying and controlling high-risk
- borrower segments
- Reduces credit loss exposure through structured risk thresholds
- Enhances underwriting efficiency using data-backed risk indicators
- Minimizes risk concentration across moderate and long-term loan segments

Why Should Stakeholders Approve This?

- Replaces subjective credit judgment with data-driven risk assessment
- Improves risk-adjusted returns without restricting overall loan growth
- Strengthens portfolio resilience against default volatility
- Provides a scalable risk intelligence framework for long-term credit strategy



Limitations & Next Steps

Limitation

- Limited dataset size may restrict broader portfolio generalization.
- Absence of macroeconomic indicators (e.g., unemployment, inflation) affecting borrower behaviour.
- No recovery rate or profitability analysis included — focus limited to default occurrence.

- No predictive modeling implemented — insights are based on historical trend analysis.
- Potential selection bias within available borrower segments and loan types.
- Static analysis does not capture real-time portfolio monitoring or evolving risk dynamics.

Next Step

- Develop a predictive risk scoring model (e.g., Logistic Regression or ML techniques).
- Incorporate macroeconomic indicators to enhance forward-looking risk assessment.
- Integrate profitability metrics to evaluate risk-adjusted returns.

- Build automated real-time monitoring dashboards for continuous portfolio tracking.
- Expand dataset coverage across additional loan types and time periods.
- Implement stress-testing framework to assess portfolio resilience under adverse scenarios.

Thank you very much!