SURVIVAL RATE ANALYSIS - UNSECURED PERSONAL LOAN PORTFOLIO

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SURVIVAL RATE MODELING

Analysis of Unsecured Personal Loan Portfolio Segemented by Credit Score, Rate and Original Loan Amount

This notebook demonstrates advanced survival analysis techniques using Kaplan-Meier and Cox regression models applied to unsecuredpersonal loan portfolio data. We progress from exploratory data analysis through univariate survival modeling to risk-adjusted survival estimates and competing risk analysis. Lastly, we'll compile findings for credit risk management and portfolio optimization applications. Key Analyses:

1) Portfolio EDA and survival model readiness assessment
2) Kaplan-Meier survival estimation with censoring adjustments for young loans
3) Credit risk management applications (PD modeling, portfolio segmentation, loss forecasting)

1.0 Loan Portfolio Sumamry and Exploratory Data Analysis

1.1 Generate Simulated Loan Portfolio

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Loan data generated successfully.


Total Loans: 5,000
Date Range: 2019-01-04 to 2025-06-20
Years Covered: 7
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Overview

This analysis utilizes a simulated personal loan portfolio designed to replicate realistic market conditions and lending patterns for survival analysis modeling. The dataset provides a robust foundation for examining loan performance, default behavior, and portfolio risk dynamics.

Loan Volume & Timing

- Total Loans Generated: 5,000
- Origination Period: January 1, 2019 – June 30, 2025
- Volume Distribution: Strategically weighted to reflect market conditions
- Higher origination volumes during low-rate environment (2019-2022)
- Reduced origination volumes post-rate increases (2022-2025)

Loan Terms & Structure

- Principal Amount Range: $1,000 – $50,000
- Maturity Terms: 3 to 8 years (variable by loan)
- Product Type: Unsecured personal loans with fixed rates and terms
- Amortization: Standard fixed-payment structure

Credit Risk Profile

- Credit Scores: Randomly distributed across realistic range (350-850)
- 6-Month Refresh Scores: Secondary credit score data point for risk monitoring
- Risk Segmentation: Natural distribution across credit quality spectrum

Rate Environment Stratification

The interest rate structure was strategically designed to mirror actual market conditions.

Pre-Rate Increase Period (2019 – April 2022):

- Lower base interest rates reflecting historical market conditions
- Higher loan origination volumes
- Inverse correlation maintained between credit scores and rates

Rate Increase Period (April 2022 – 2025):

- Progressive rate increases of 5-6 percentage points
- Gradual implementation over 18-24 months
- Corresponding reduction in loan origination volumes
- Maintained credit-risk pricing differentials

1.2 Portfolio Summary and Review

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Portfolio summary statistics results are the following:
  Total Number of Loans: 5,000
  Average Portfolio Rate: 11.71%
  Average Original Amount: $17,866
  Average Credit Score: 718
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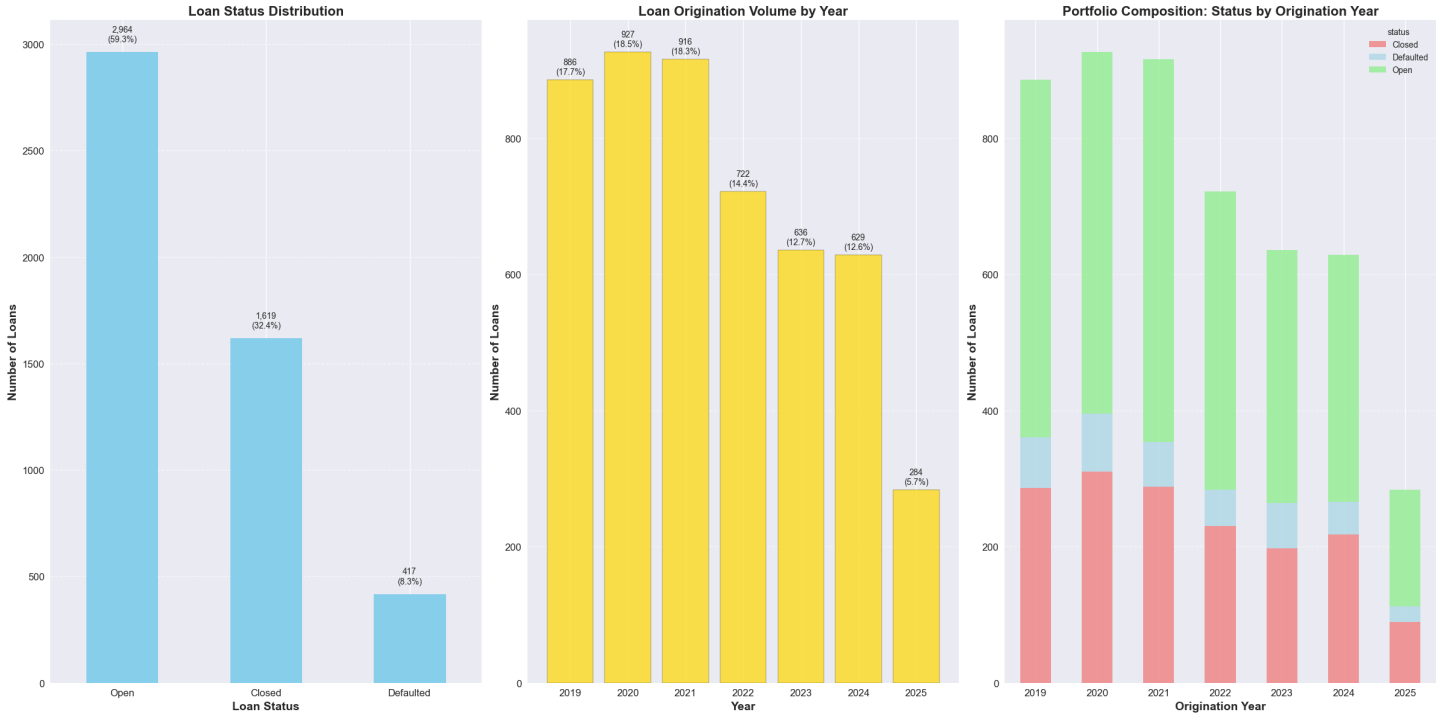

1.3 Key Metrics Summary by Credit Score, Rate, and Opening Amount

1.4 Vintage Analysis of Opening Dates and Maturity Dates

1.5 Additional Concentration and Distribution Analysis