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Lending Club Case Study

Objective

The Objective of this case study is to implement EDA technique on a real world problem and understand the insights and present in a business first manner via presentation.

Benefits of the case study:

- Gives a idea about how EDA is used in real life business problems.
- It also develops a basic understanding of risk analytics in banking and financial services.
- How the data is used to minimize loss of money while lending it to clients.
- It improves our understating of visualization and what charts to use for real life data.

Business Understanding

The business objective is to take a decision whenever they receive a loan application whether to reject or approve based on certain variables.

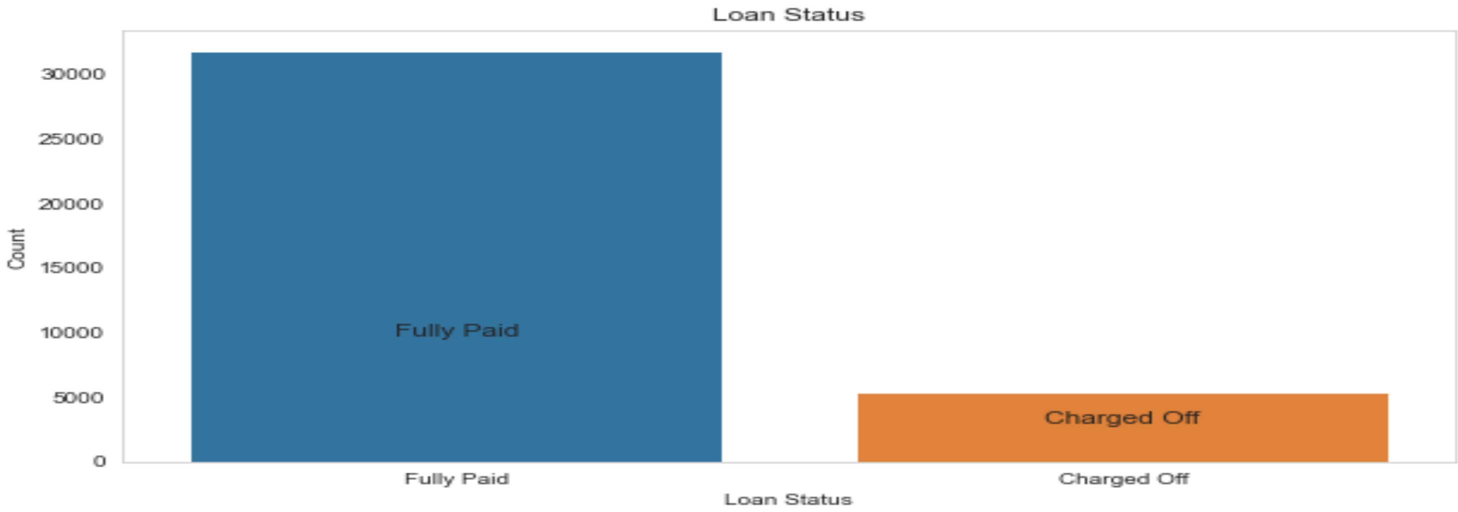
Dataset Details:

The data given below contains information about past loan applicants and whether they 'defaulted' or not. Data has details regarding approved loan not the rejected ones. It has 3 status of loan which is Fully Paid, Current and Charged-Off.

Data Clean-up and preparation process:

1. Drop columns with all null values
2. Drop columns where null value percentage is > 60
3. Drop columns with all 0 values
4. Convert term into int
5. Remove % from columns int_rate and revol_util
6. Removing duplicate rows from the dataframe
7. Correcting Data Types and Deriving New Columns
8. Removing the outliers
9. Consider only rows where loan_status != Current as ongoing loans can't be used to determine credit worthiness

Loan Status and Amount



- **Loan Status:** The number of charged off loan is much smaller(14.5%) compared to total count.

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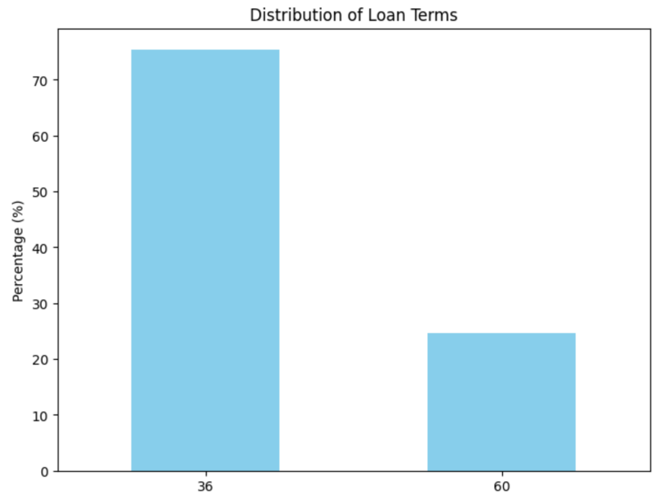
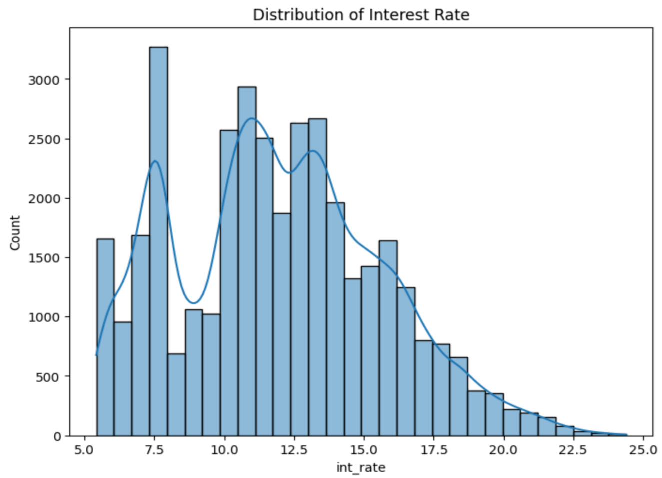
Term and Interest Rate

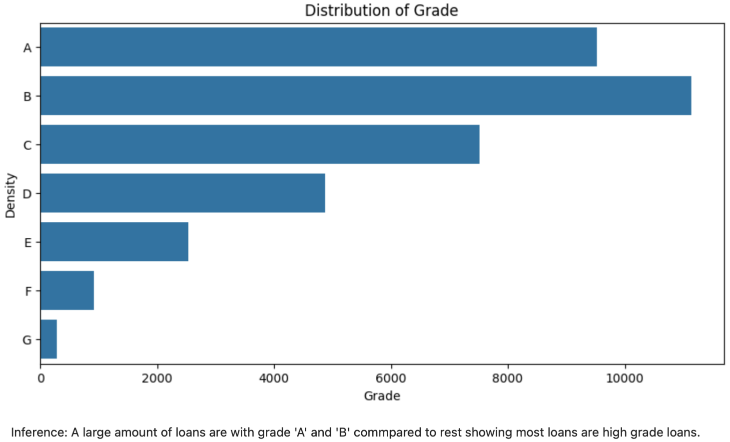


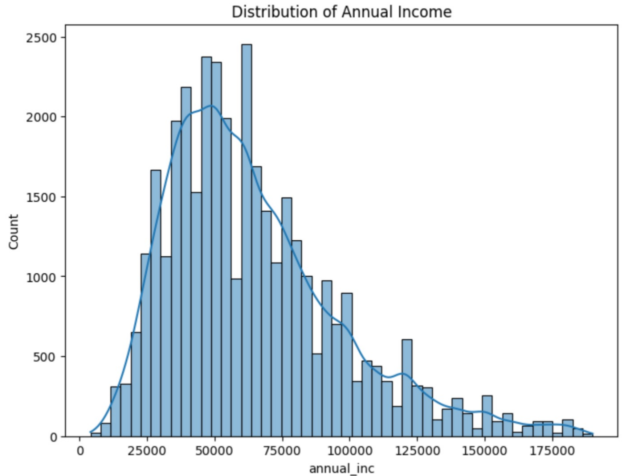


Inference: The interest rate is more crowded around 5-10 and 10-15 with a drop near 10.

- **Loan Term:** The Loans taken for 36 month term are much more than 60 months and have lower chance of defaulting.
- **Interest Rate:** The count of loan taken varies with interest rate showing peak around in 10 and 10 to 15 bracket and decreasing slowly where as the chance of defaulting increases with interest rate.

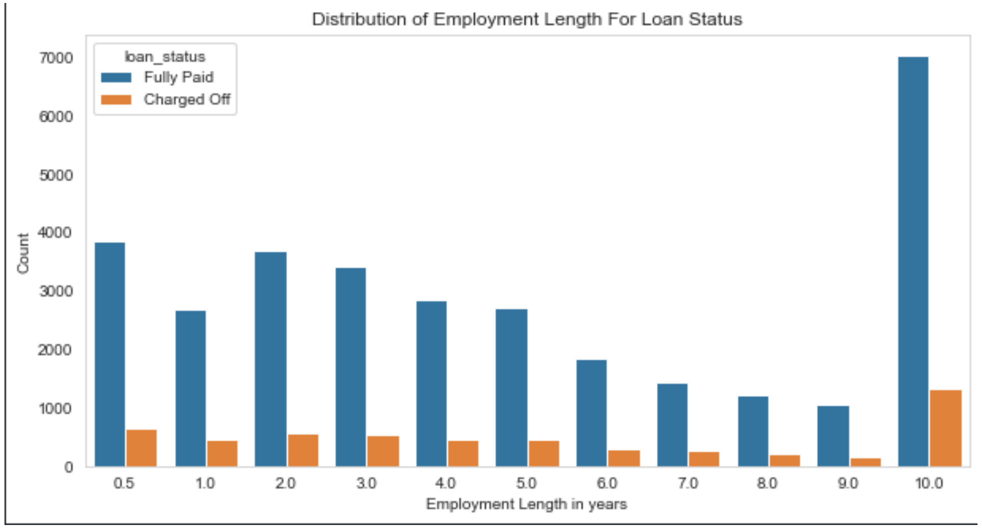
Grade and Annual Income

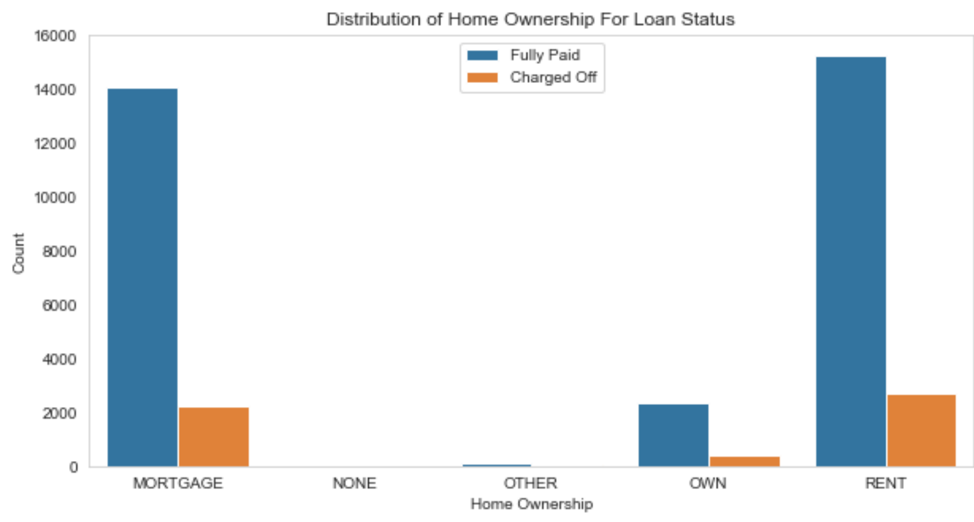




- **Grade:** The loan approved are majorly of higher grade as they are of low risk thus low chance of defaulting. 60 month term loans have larger number of lower grade loans with high risk.
- **Annual Income:** Most of the people have annual income in range of 25K to 100K.

Employment Length & Homeownership

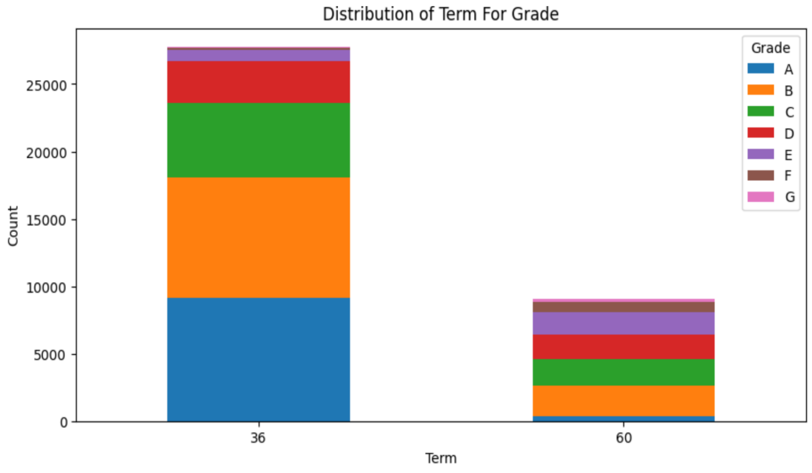


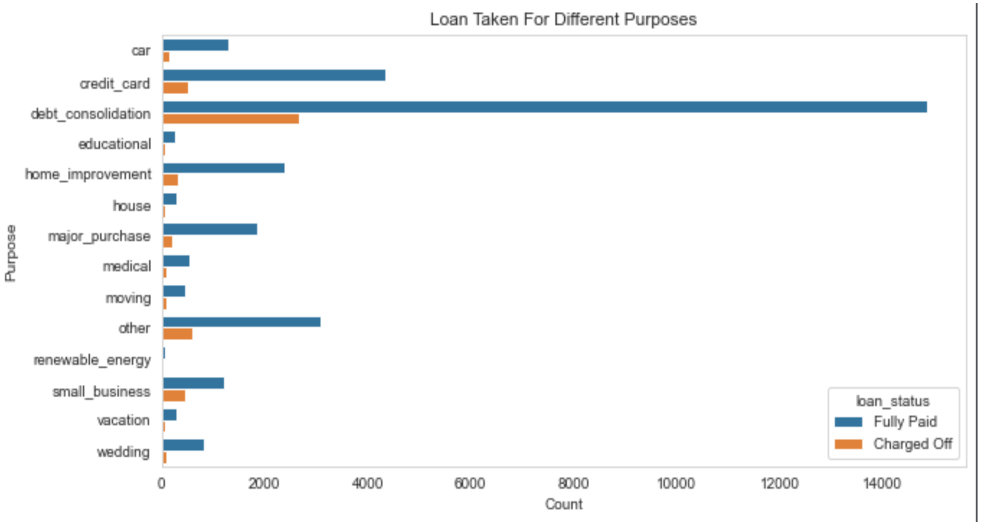


- **Employment Length:** Majority of clients have 10+ years of experience and has highest number of defaulted loan.

- **Home Ownership:** Majority of clients are lacking ownership of any property and are on rent or mortgage and have a higher chance of defaulting.

Grade distribution& Purpose



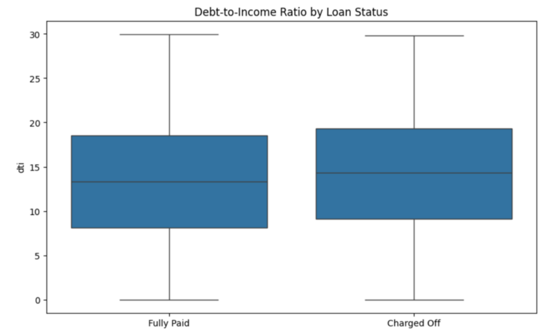


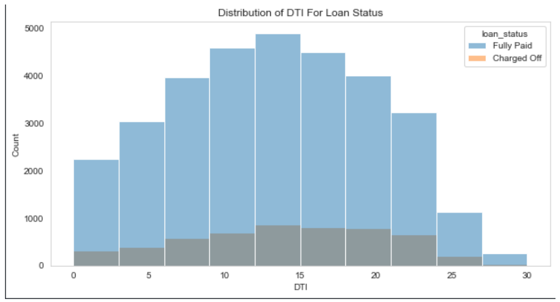
- The loans in 36 month term majorily consist of grade A and B loans whereas the loans in 60 month term mostly consist of grade B, C and D loans..

- **Purpose:** Loans are taken mostly for debt consolidation followed by credit card payment. Whereas the debt consolidation has highest fully paid loan but also has highest defaulted loans as well.

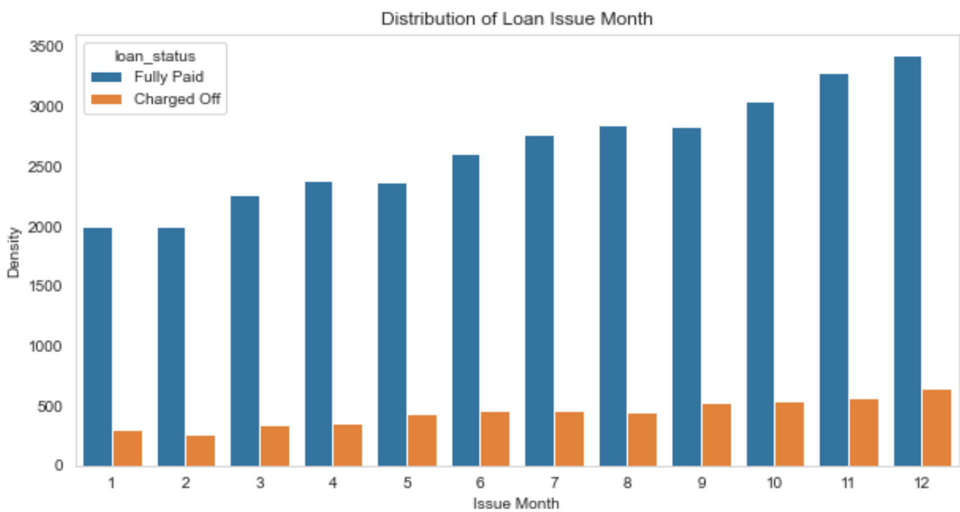
DTI ratio Distribution

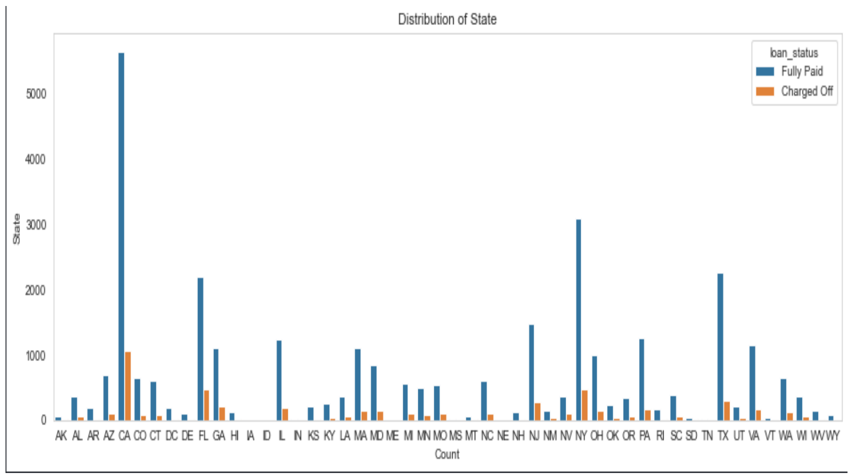
- **DTI:** The large percentage of Clients have a large Debt to Income ratio which shows that lending to such clients can be very risky.





Loan Trend over years



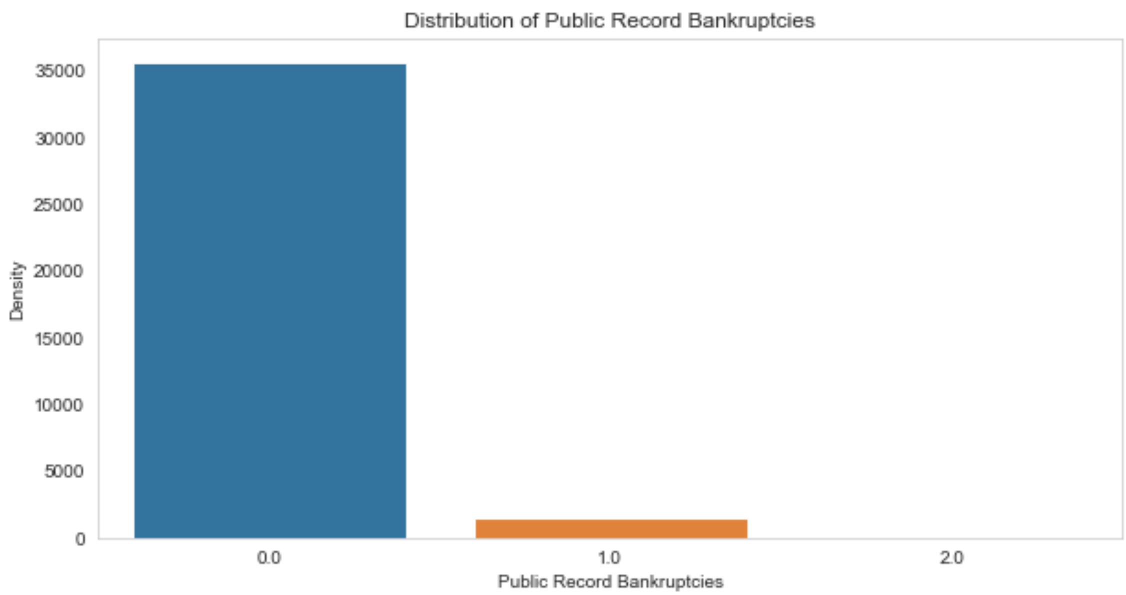


We see a gradual increase in loan taken through the year, with lesser defaulting rate in April ,August, December quarter wise and better more late in year.

For large metropolitan cities we see large number of loans, with higher number of defaulted loans like California, New York, Texas, Florida but have a lower chance of defaulting.

Public Recorded Bankruptcy

Public Recorded Bankruptcy: Majority of clients have no record of declaring bankruptcy.



Recommendations

Recommendations

Major Driving factor which can be used to predict the chance of defaulting and avoiding Credit Loss:

1. DTI
2. Grades
3. Verification Status
4. Annual income
5. Pub_rec_bankruptcies

Other considerations for 'defaults' :

1. Burrowers not from large urban cities like California, new york, texas, florida etc.
2. Burrowers having annual income in the range 50000-100000.
3. Burrowers having Public Recorded Bankruptcy.
4. Burrowers with least grades like E,F,G which indicates high risk.
5. Burrowers with very high Debt to Income value.
6. Burrowers with working experience 10+ years.

Incorporate Findings

To incorporate the findings into decision-making using specific numbers or ranges, you can set thresholds and ranges based on the statistical analysis we've conducted. Here's how you can proceed:

1. Income-Based Loan Approval Criteria

Income Segment Thresholds

- Low Income Segment: Borrowers with annual income below approximately $40,404 (25th percentile, from the earlier annual_inc.describe() output) fall into the Low income segment.
- Decision Criteria:
- Loan Amount: Limit the loan amount for borrowers in the Low income segment to a maximum of $10,000. This cap reduces exposure to risk.
- Interest Rate: Apply a higher interest rate, e.g., 2% above the average rate, for borrowers in this segment to compensate for the higher risk.
- Loan Term: Offer only 36-month terms to borrowers in this segment. Discourage or disallow 60-month terms due to their higher default rates.
- Very High Income Segment: Borrowers with annual income above approximately $82,300 (75th percentile) fall into the Very High income segment.
- Decision Criteria:
- Loan Amount: Allow higher loan amounts, up to the maximum loan amount available ($35,000).
- Interest Rate: Offer a lower interest rate, e.g., 1% below the average rate, to encourage borrowing from lower-risk borrowers.
- Loan Term: Allow flexibility in choosing between 36 and 60 months, with possibly better terms (e.g., lower fees or rates) for 36-month loans.

2. Loan Term Criteria

Term-Based Adjustments

- 60-Month Term:
- Income Requirement: Require a minimum annual income of $60,000 for approval of a 60-month loan term. This threshold is set above the median income to ensure that longer-term loans are extended only to more financially stable borrowers.
- Interest Rate Adjustment: For 60-month loans, add an additional 0.5% to 1% on the interest rate compared to 36-month loans to account for the higher risk of default.
- 36-Month Term:
- Income Flexibility: Offer loans to borrowers with incomes as low as $40,000 but apply stricter limits on the loan amount and interest rate if the income is below $50,000.
- Interest Rate: Offer standard interest rates or potentially lower rates to encourage shorter-term borrowing.

High-Risk Loan Purposes

- Small Business Loans:
- Default Rate: With a default rate of approximately 25.9%, impose stringent requirements:
- Minimum Income: Require a minimum income of $75,000.
- Collateral: Demand collateral or a co-signer to mitigate risk.
- Loan Amount: Cap the loan amount at $15,000 for small business purposes.
- Other High-Risk Purposes (e.g., Educational, Medical):
- Minimum Income: Set a minimum income threshold of $50,000.
- Interest Rate: Apply a risk premium of 1.5% to 2% above the standard rate.
- Loan Term: Limit the term to 36 months unless the borrower has an income exceeding $80,000, in which case a 60-month term might be considered.

Low-Risk Loan Purposes

- Credit Card Consolidation:
- Default Rate: With a lower default rate (~10.6%), offer favorable terms:
- Interest Rate: Provide competitive rates, potentially below the average, to encourage consolidation.
- Loan Amount: Allow up to $35,000, especially if the borrower's income is above $60,000.
- Major Purchases/Weddings:
- Terms: Offer standard or slightly favorable terms, with interest rates 0.5% below average for those in the High or Very High income segments.

4. Revolving Credit Utilization

Utilization-Based Risk Adjustment

- High Utilization (Above 50%):
- Interest Rate: Increase the interest rate by 1% for borrowers with credit utilization above 50%.
- Loan Amount: Reduce the maximum loan amount available by 20% to 30% for high utilization borrowers.
- Credit Monitoring: Implement more frequent monitoring of borrowers' credit utilization if they are approved for a loan.
- Low Utilization (Below 30%):
- Incentives: Offer better terms, such as reduced interest rates (0.5% to 1% below average) or higher loan amounts (up to $35,000), for borrowers with lower utilization rates.

5. Implementation and Monitoring