

Lending Case Study

Facilitator: Vineeth Das T K; Batch: ML C70

Case Study Objective

- While processing loans for consumers, it is important to identify patterns which indicate if a person is likely to default.
- Goal: To take actions such as:
 - Denying the loan
 - Reducing the amount of loan
 - Lending (to risky applicants) at a higher interest rate etc.

Data Understanding

- Data provided in the case study was analyzed based on data dictionary
- Based on the objective the focus is on loan application of customers who have Fully Paid or Charged-off
- Shape of Dataset:
 - Rows: 39717
 - Columns: 111
- There are 1033 rows in emp_length which are not listed by value_counts. This would mean that they are either self employed or as currently unemployed.

Data Cleansing

- Performed duplicate checks – There were no duplicates observed
- Analyzed Null Rows and Columns
 - There were no rows with all NULL values
 - There were 54 columns with all NULL Values – hence dropped
 - Dropped column next_pymnt_d since all values are 0
 - Interest Rate and Revolving line utilization rate was found to have % symbol in the values and hence had to remove and convert to float. These could give insights when we perform correlations
 - Employment Length field needs clean-up since this would help in numerical analysis
- Shape of Dataset after cleansing:
 - Rows: 38577
 - Columns: 56

Exploratory Data Analysis

- Following data elements were considered for further analysis and considered as key data elements to assess risk related to loan applications.
 - Loan Amount Requested
 - Interest Rate Applicable
 - DTI : Debt to Income ration
 - Annual Income

Observations on Data Analysis

- Loan Amount: There is a continuous distribution of data across loan amount and hence did not drop outliers. 95th percentile and below was considered for analysis
- Interest Rate: There is a continuous distribution of data across interest rate and hence did not drop outliers
- DTI: There were no outliers for DTI and hence did not drop any records
- Annual Income: The outliers for Annual Income was observed and removed. The record count for loan data was now 36642

• [58]:

Univariate Analysis

- Loan Amount: Higher number of loan application were observed for lower loan amounts in the range of 5000-10000 USD. There is further drop in applications seeking loans for higher amounts
- Purpose: Higher number of loan application are observed for debt consolidation. The defaulters are also higher in this category
- Year and Month:
 - There is a higher charge off observed in applications received in the month of December
 - Number of loan applications increased since the year 2007. The application have almost doubled in 2011 as compared to 2010. This indicates a healthy loan market for the bank which is attracting these applications
- Interest Rate: There are more applicants with interest rate of 10 to 15%
- Ownership: There are more applicants who are residing in rental properties followed by those who have mortgaged their property. The defaulters also show a similar pattern w.r.t ownership

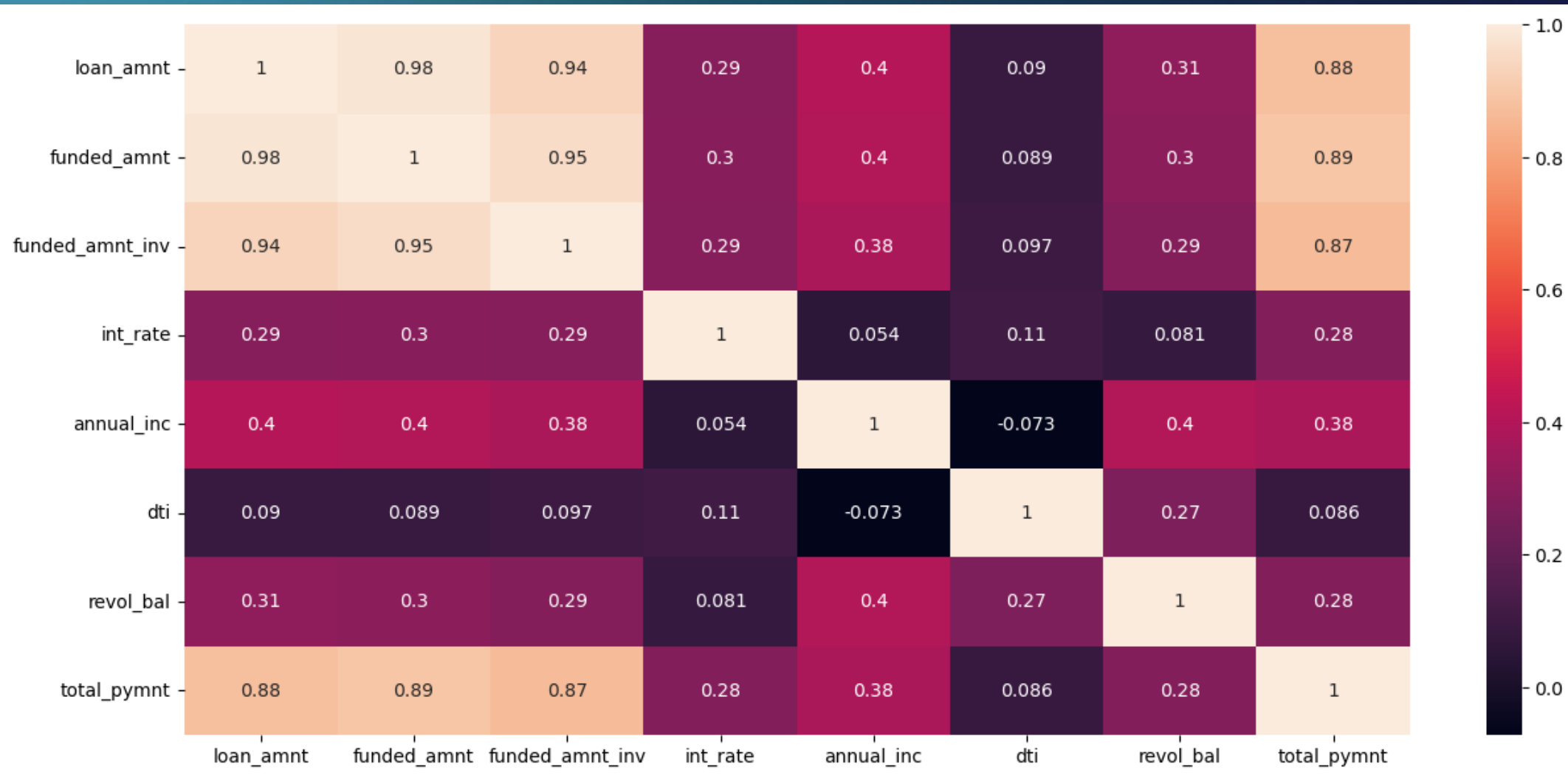
Univariate Analysis (Continued)

- There are more applicants seeking a loan for a tenure of 36 months than 60 months
- There are more defaulters in the B,C and D grades than the other grades
- About 14.7% of the loan applications tend to default and their loans are charged-off
- There is a high number of defaulters with more than 10 years of employment history. The bank needs to further scrutinize these application for authenticity

Bivariate analysis on continuous variables

- Loan Amount, Funding Amount and Investor Amount have strong positive correlation
- Annual Income to Debt-To-Income Ratio are negatively correlated
- Positive correlation between annual income and funded amount which implies that applicants with high income gets high funded amount
- There is a positive correlation between annual income and total payment

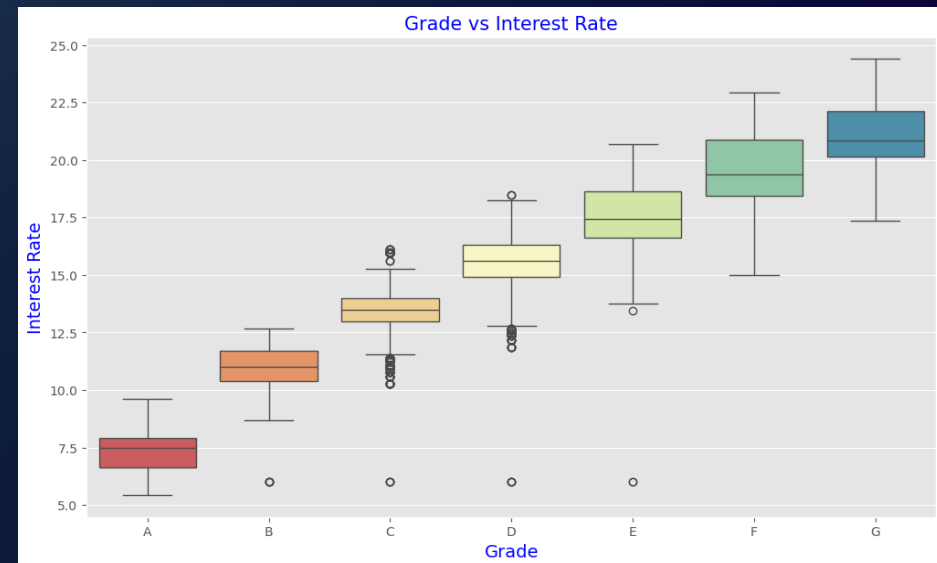
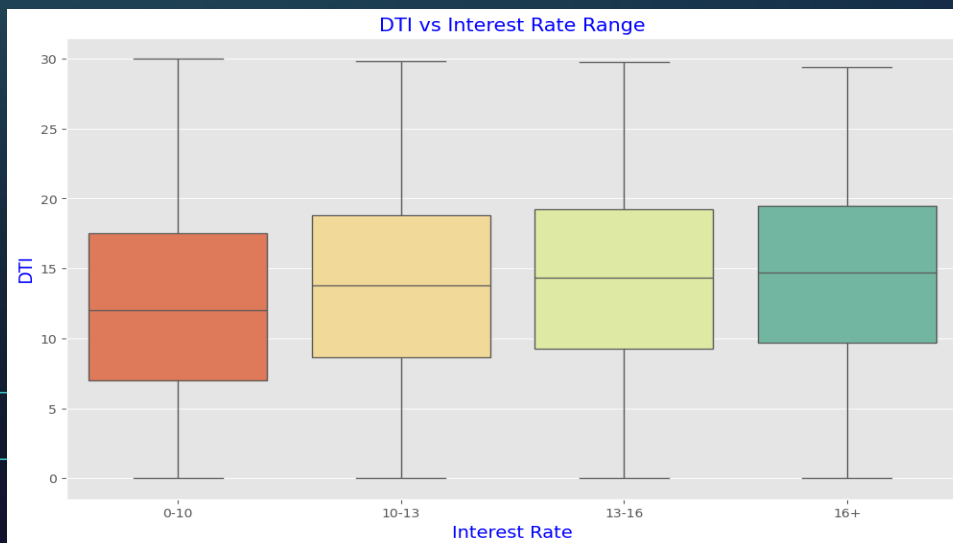
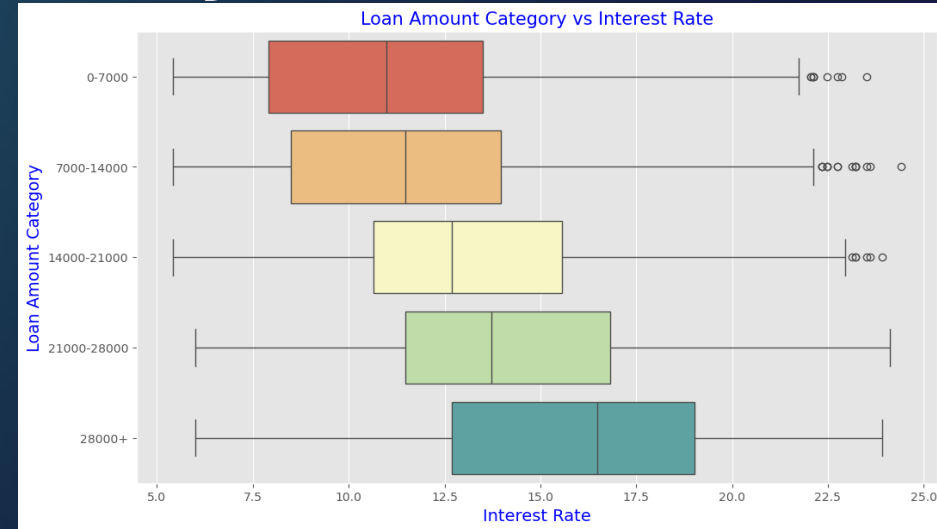
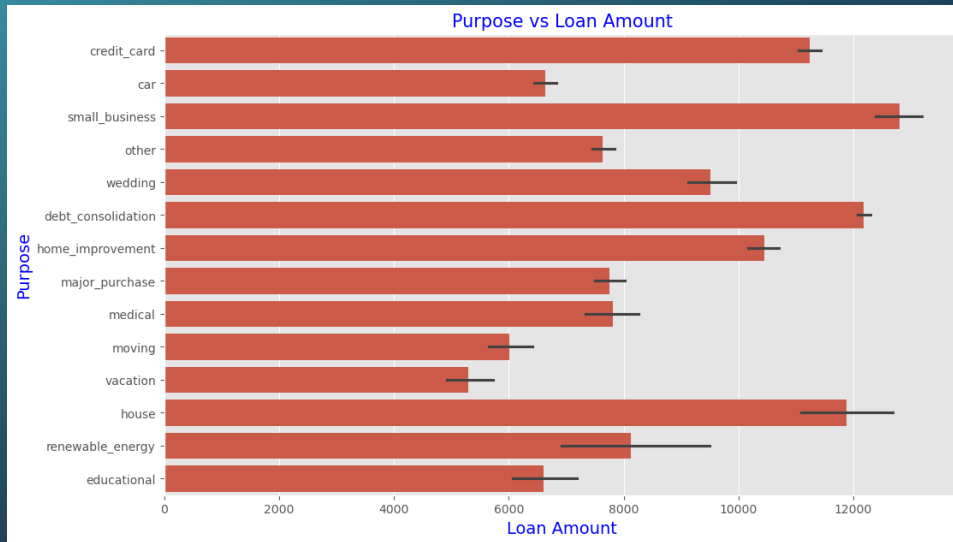
Visualizations: Continuous Variables



Bivariate Analysis on Key Indicators

- **Purpose:** Small business, Debt Consolidation and House were the 3 top purpose where loan amount requested
- **Interest Rates:**
 - Small business had the highest average interest rates followed by debt consolidation. The least average interest was for buying a Car
 - Average Interests rates are higher for higher DTI. This is true since higher DTI has a higher possibility of default
 - Average Interests rates are higher for lower grades.

Visualizations: Bivariate Analysis



Bivariate Analysis of Charged-Off Loans

- **Annual Income:**

- There is higher possibility of charge-off by applicants with lower annual income range of less than 20,000
- There is a decreasing trans shown at higher annual income categories

- **Purpose:**

- There is higher possibility of charge-off by applicants seeking loan for Small Business
- Renewable Energy and Educational loans are the next in terms of charge-off

- **¶Grade**

- There is higher possibility of charge-off by applicants with lower grade ("Grade G")

- **Employment Length**

- While it was observed in univariate analysis that the applications with >10 year of employment duration had higher charge-off risk, within each duration of employment the charge of percentage is almost similar.

- **Verification Status**

- There is a higher possibility of charge-off when the loan applications are fully verified. Though not very conclusive the bank needs to strengthen the underwriting process of loan applications

- ¶

Bivariate Analysis of Charged-Off Loans (Contd)

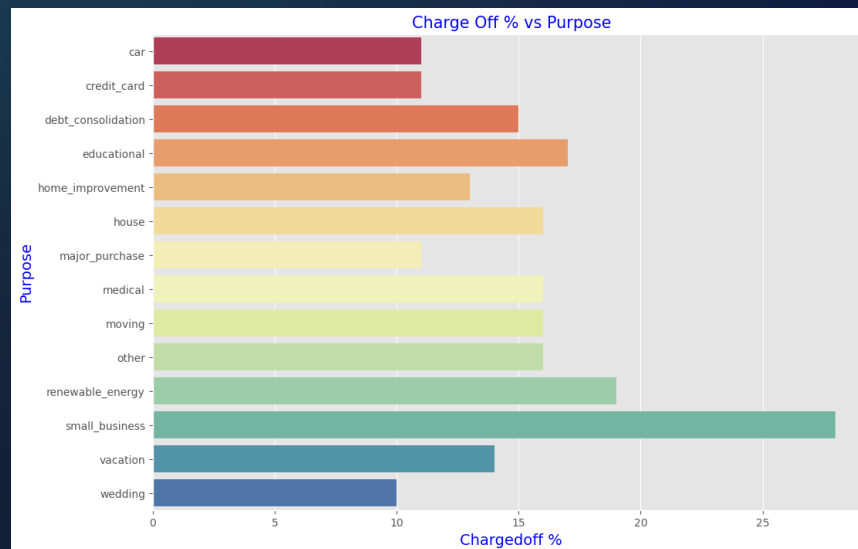
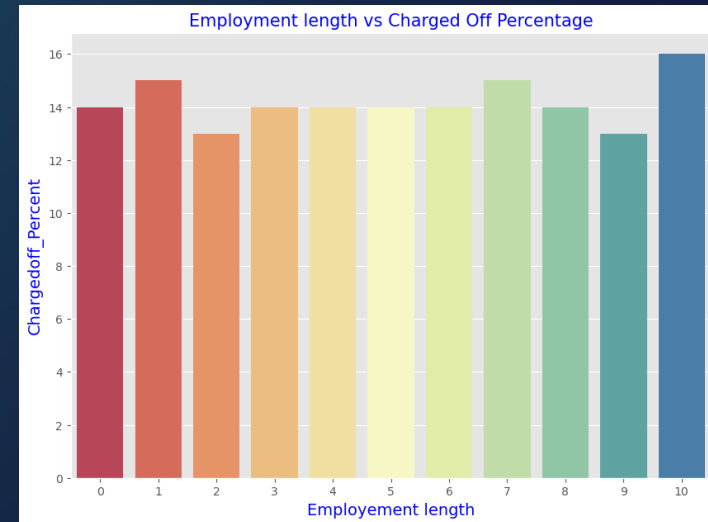
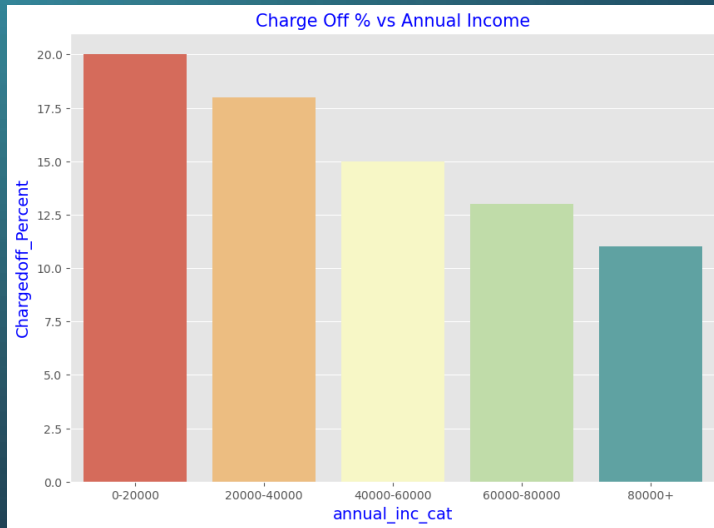
- **State Wise:**

- Though NE state shows a high charge-off % the number of applications were not high to be considered for any conclusions
- Upon filtering for states having more than 100 applications, NV seems to have a higher risk of defaulting

- **Public Records of Bankruptcy:**

- Those who already have public record of bankruptcies value 1, have charged off percentage which is higher than those who have no public record of bankruptcies.

Visualization : Charged-Off Loans



Thank You

