Lending Club Loan Data Analysis

Springboard Capstone Project

J Slaga

Peer-to-peer lending sites such as Lending Club match lenders and borrowers through their online platforms. These businesses operate with a much lower overhead compared to traditional banks. Thus borrowers are able to get unsecured loans at lower interest rates and lenders are able to earn higher returns. The interest rates for the loans are determined by risk - borrowers deemed more risky will have a higher interest rate and those with less risk will have a lower interest rate.

Loans with higher interest rates (but more risk) provide a higher return on investment so tend to be more appealing to investors, however their risk of default is higher than the lower interest rate loans (with a lower return of investment).

Creating a machine learning model to predict which of the loans are more likely to default enables investors to gage which of the high interest loans are more likely to be returned, and identification of defaulters will allow investors to better decide which loans to invest in or grant. The model will aid in finding the balance between risk and return on investment.

Client

Lending Club is the world's largest peer-to-peer lending (crowdlending) company, headquartered in San Francisco, California. It provides a link between investors who provide funds and borrowers seeking unsecured personal loans between $1000 and $40,000 at interest rates ranging from 5.6%-35.8%, depending on the loan term and borrower rating.The standard loan period is three years. The default rates vary from about 1.5% to 10%.

Investors can search and browse the loan listings on Lending Club platform and choose the loans that they want to invest in based on the borrower's information such as the amount of loan, annual income, number of open credit accounts, and loan purpose, and the Lending Club assigned loan grade. Investors make money from interest - higher interest (but higher risk of default) will have higher returns. Lending Club makes money by charging borrowers an origination fee and investors a service fee.

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Data

Data was obtained from https://www.kaggle.com/wendykan/lending-club-loan-data. It contains a data dictionary for all the feature columns and complete loan data for all loans issued through the 2007-2015. Current loan status (Current, Late, Fully Paid) in addition to features such as loan amount, amount funded, credit scores, number of finance inquiries, address including zip code and state, and collections are provided. In all, there are 60 numerical features and 18 categorical features used to assess default risk.

Feature Information

The feature information can be broken down into the following categories:

- Profile variables: These features describe the borrower's basic information such as address, marital status, and employment title and duration.
- Financial history variables: These features describe the borrower's credit history and include annual income, number of open credit accounts, total current balances, and number of bankruptcies.
- Loan variables: These features describe the loan including the loan amount, term, interest rate, and the Lending Club loan grade.

Data was imported and the dictionary file was used to name and determine which features to keep. Features with less that 65% available data were then dropped. This brought the number of columns down from 145 to 63 columns for the 2,260,668 entries. Features containing a single unique value were also dropped.

For our model we're predicting default rate so we need only examine completed loans - those with the loan status of 'charged off' or 'fully paid'. Loans that were current, late, or in grace periods were eliminated. Remaining loans were consolidated into either 'charged off' or 'fully paid' accordingly. The working data set was 1,306,356 entries and 61 features. Approximately 80% of the loans were fully paid and the remaining 20% charged off. The dataset was then split into train and test sets.

Data was separated into numerical and categorical parts to be further wrangled. Missing numerical data was filled with the feature's median values. Outliers were removed and data was scaled. I encoded categorical features using one-hot encoding and using a 'Rare' category for group frequencies of less than 1% in category. This brought the number of columns up to 109.

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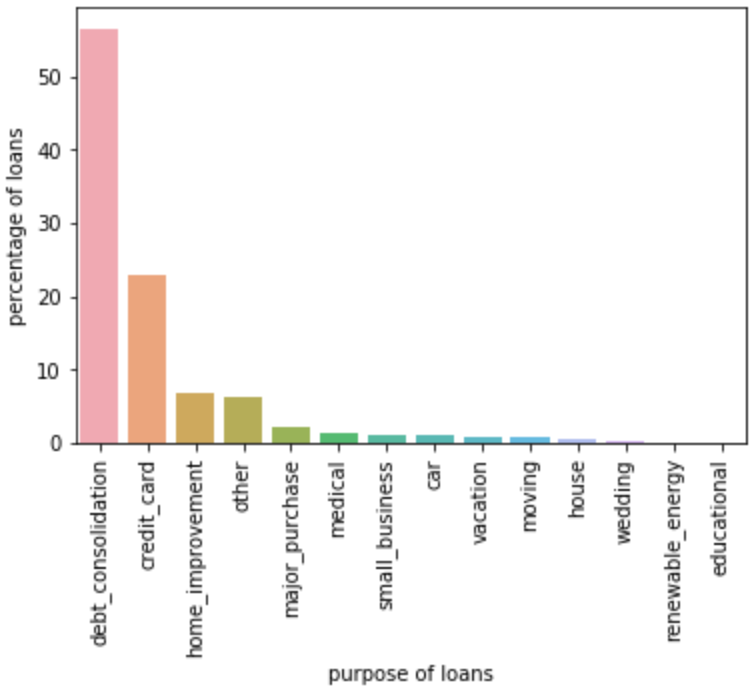
Exploratory Analysis:

Lending club tracks what borrowers will use their loans for and debt consolidation (~60%) and paying off higher interest credit cards (~25%) were overwhelmingly the top reasons cited. Home improvement was the next most cited reason but by less than 10% of the borrowers.



Next, I examined the amounts for the funded loans. These range from $1,000 to $40,000 skewing to the left with most loans being between $8,000 and $20,000. The median loan amount was $15,041.66. The distribution of interests rates has a similar shape skewing to the left with a range of 5.6%-35.8%. Most loans have an interest rate between 9.49% and 15.99% with a median of 13.09%.

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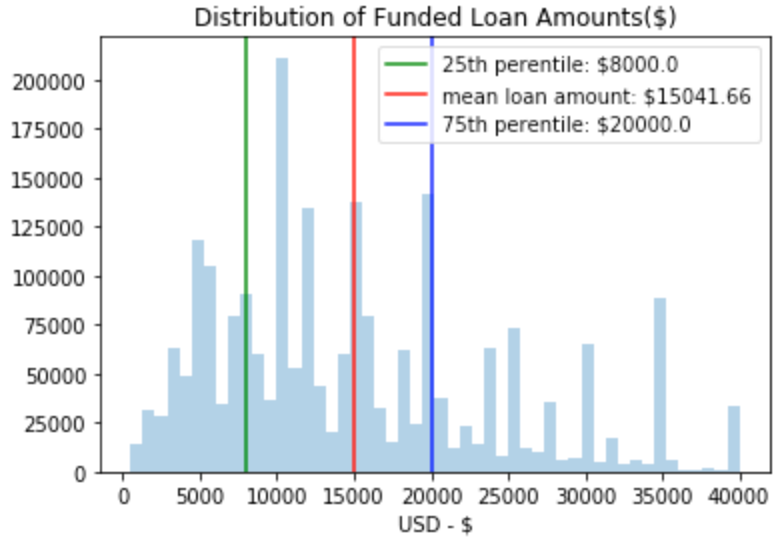

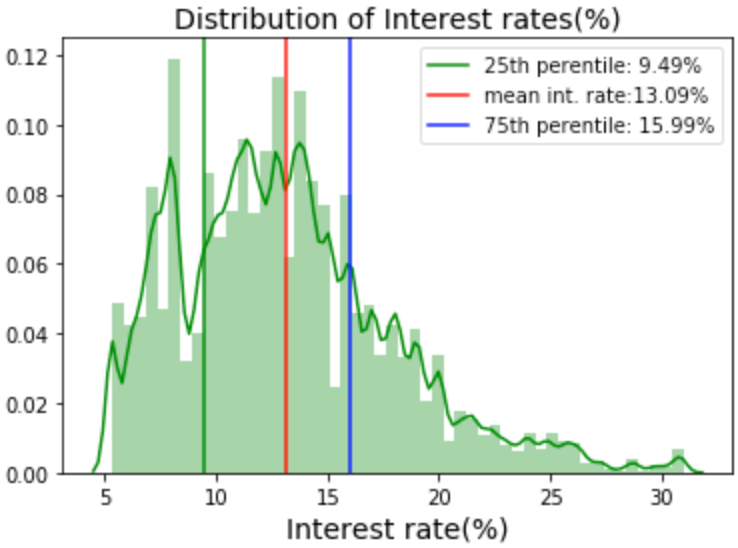

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After assessing each loan, Lending Club assigns it a grade (A-G) to each loan according to its perceived credit risk. For example, if the borrower has a weaker credit profile they would get a lower grade, and if the borrower has a stronger credit history, they'd get a higher grade. As one would expect, the interest rates of the loan directly correspond to the Lending Club loan grade.