Lending Club Case Study

Team:

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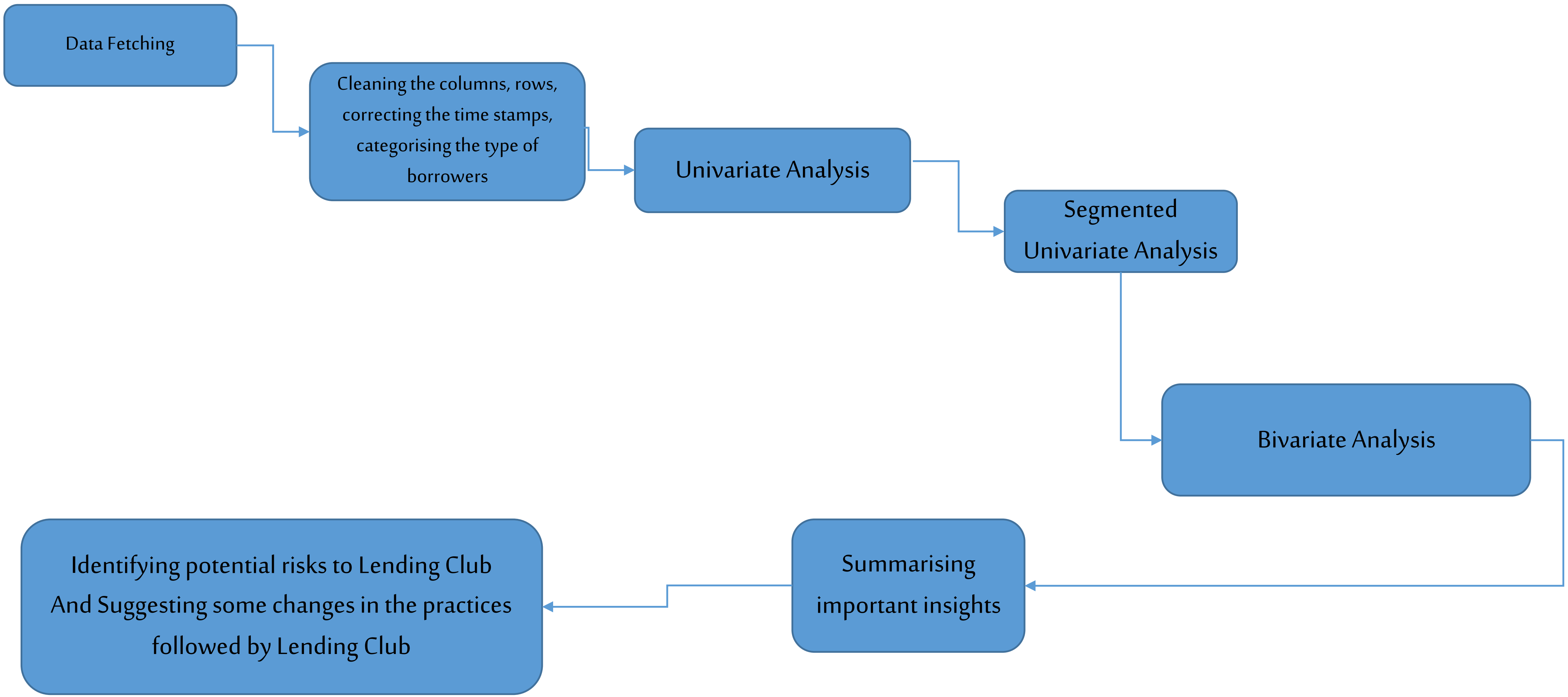
Problem Statement

Lending Club is a consumer finance company which specializes in lending various types of loans to urban customers. Upon receiving a loan application, the company needs to make a decision for loan approval based on the profile of the applicant.

The aim is to identify patterns which indicate if a person is likely to default, which may be used for taking actions such as denying the loan, reducing the amount of loan, lending (to risky applicants) at a higher interest rate, etc.

Analysis Approach



Univariate Analysis

Assumption: If the percentage of Charged Off records exceed 16%, we consider it as a business risk.

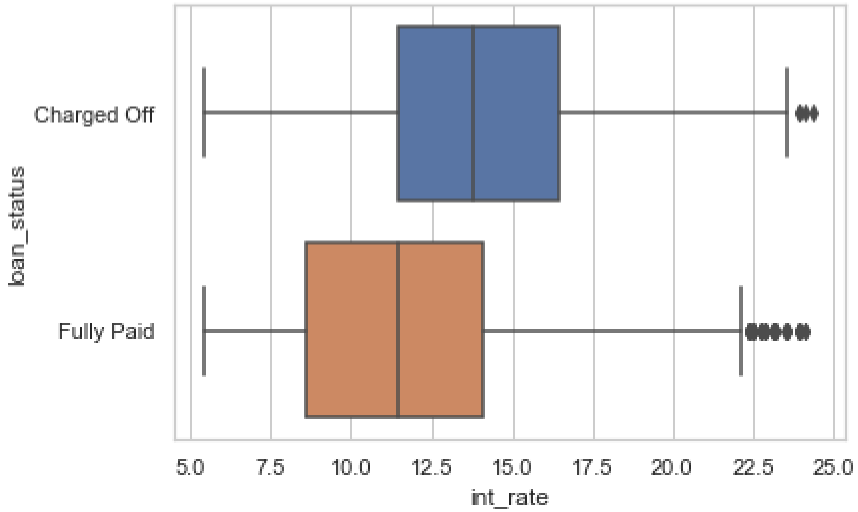
We are not doing any outlier treatment since ~ 35000USD is an acceptable loan amount. Mean for both charged off and Fully paid is greater than it's median which indicates rightward skew. Most loans are in the range of 15000 which is 75th percentile.

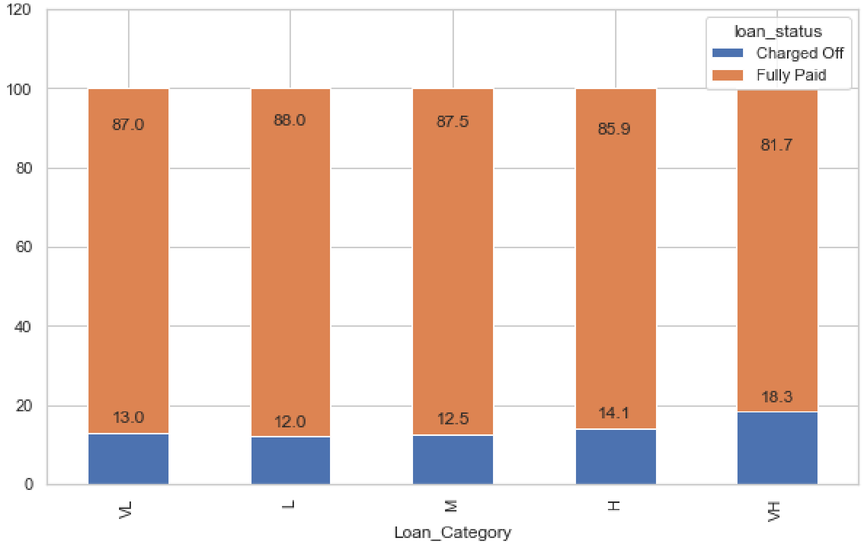
- Density of loans is more when loan is a multiple of 5000. Rate of loan approval is low as amount increases.
- Overall, the interest rate varies from 5.42% to 24.4% with average interest rate of 11.8%. The interest rate for Charged Off loans appear to be higher than for Fully paid. This is naturally expected. As, the risk increases the rate of interest imposed on the loan also increases.
- Percentage of charged off statistically increases with each loan category which means loans with very high amount are mostly charged off and hence should be careful while approving loans with higher amounts.
- Max loans are taken by Rented/ Mortgage category employees
- 75% of the loans belong to 36 month tenure period. About 55% of charged off loans belong to 36 month tenure and 45% percent belong to 60 month tenure. For 36 month tenure loans, only 10.3% loans belong to Charged Off category. For 60 month tenure, almost 25% of loans are charged off which is 1/4th .
- Debt consolidation is by far the largest 'purpose' for seeking a loan. About 50% of charged off loans belong to debt consolidation category. Highest charge off rate is topped by Small Business, Renewable Energy, Education loans.
- Very few loans are extended to people with prior record of bankruptcy. About 40% and 20% of loans are Charged off with employees having 2 and 1 recorded bankruptcies.

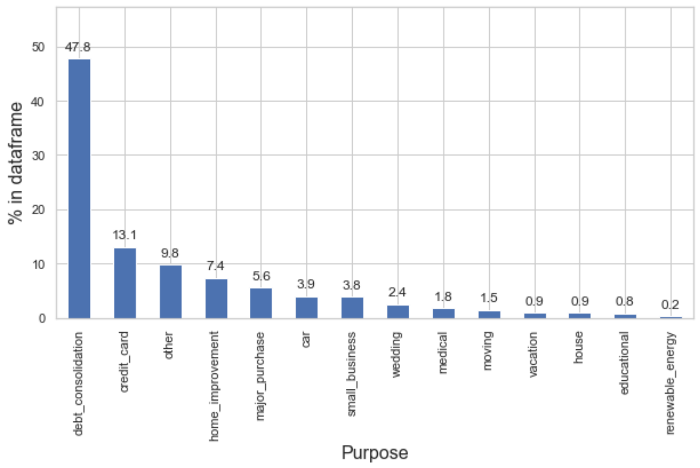
Univariate Analysis

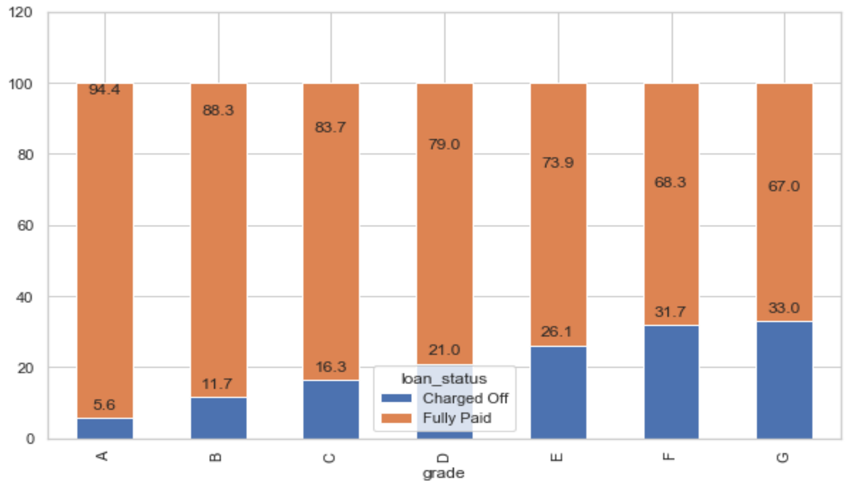
- Installment amount varies largely between 170.08 to 420 with median of 280. Loans Charged Off have high installment on average
- The rate of approval is seen to be statistically decreasing from A to G (B, A, C, D, E, F, G). The rate of Charged Off loans increases statistically from A to G (A being the safest and G being the riskiest). Here we see that Lending Club is, correctly, charging higher installments for lower grade loans.
- Almost 22% of records belong to people with 10+ years experience. The percentage of charged off seems to be the highest for 10+ years employees with 15.4% followed by 7 year experienced employees
- Most of the loans are coming under Not Verified status. Surprisingly, the Charged Off percent is highest for Verified Category.
- Mortgage and Own seem to be the safest category with 13.8% charged off percent followed by Rent and Other with 14.8% and whopping 19.1% respectively.
- Charged Off percent keeps statistically decreasing as income is increasing.
- Number of loans are exponentially increasing year by year which is a good thing as LC is getting more number of customers. The charged off rate is comparatively higher in 2011 compared to rest with an increase of 3% from previous years.
- Charged off rate highest in 5th, 9th, 12th month of every year. It's always highest in the month of December.
- Charged Off rate is too high for some states like AK, NV, TN. Assumption: LC should consider anything >=20% as a risk.
- Higher the DTI, higher the charged off percent.
- Charged off percent is increasing with value of delinq_2yrs
- Charged off rate is increasing with number of inquiries. 48% didn't inquire at all.
- Borrowers with even 1 derogatory record can significantly increase the charged off percentage.
- Last average charged off payment is quite less than last average Fully Paid payment.
- Ratio increases, the charged off ratio also increases.

Visualizations for Univariate Analysis









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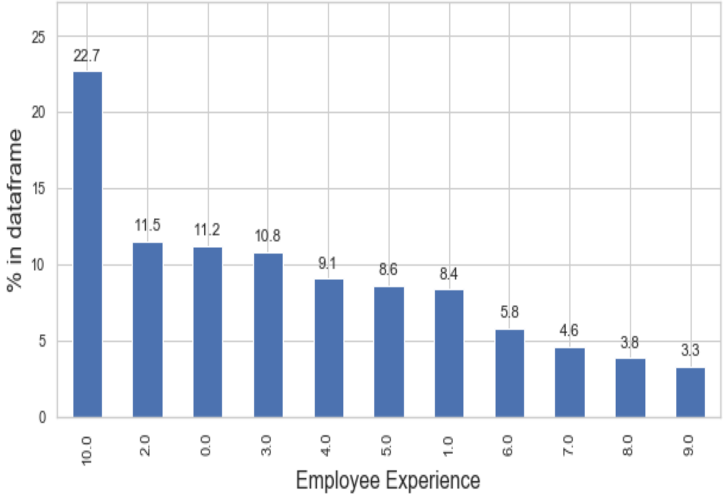
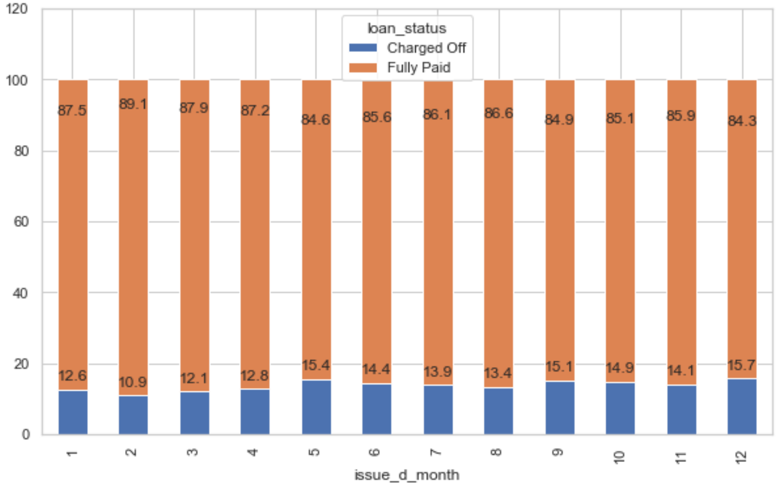
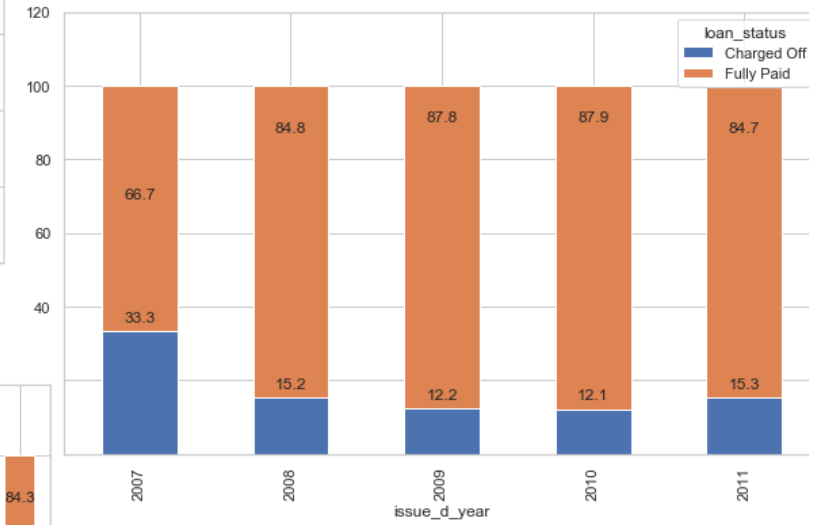
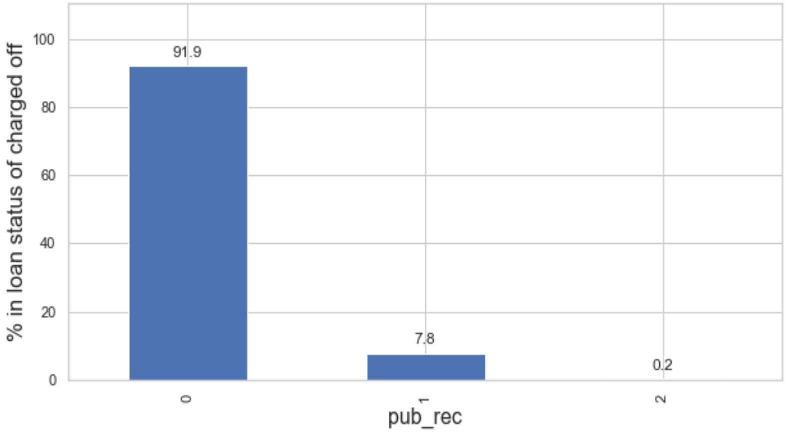
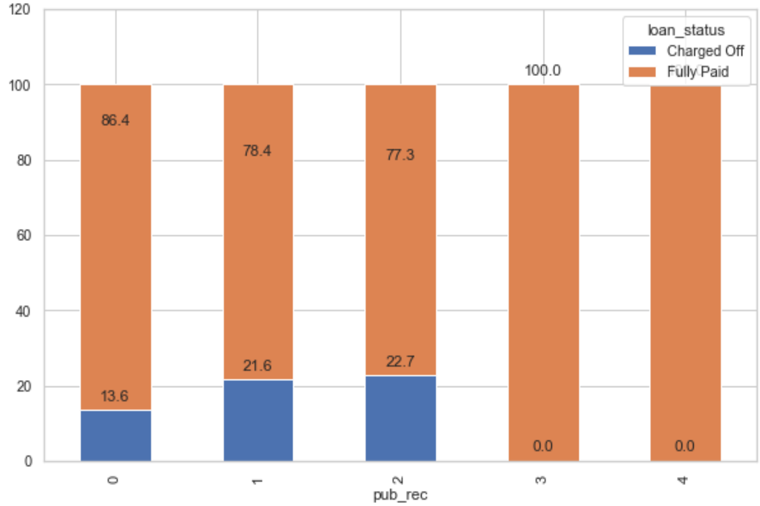






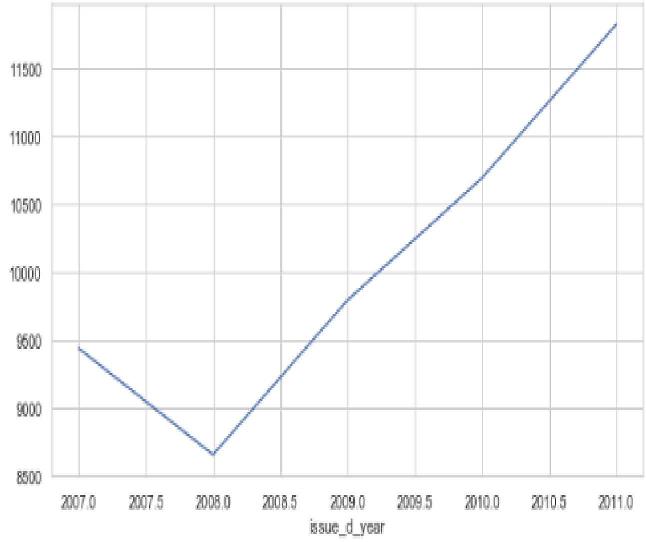


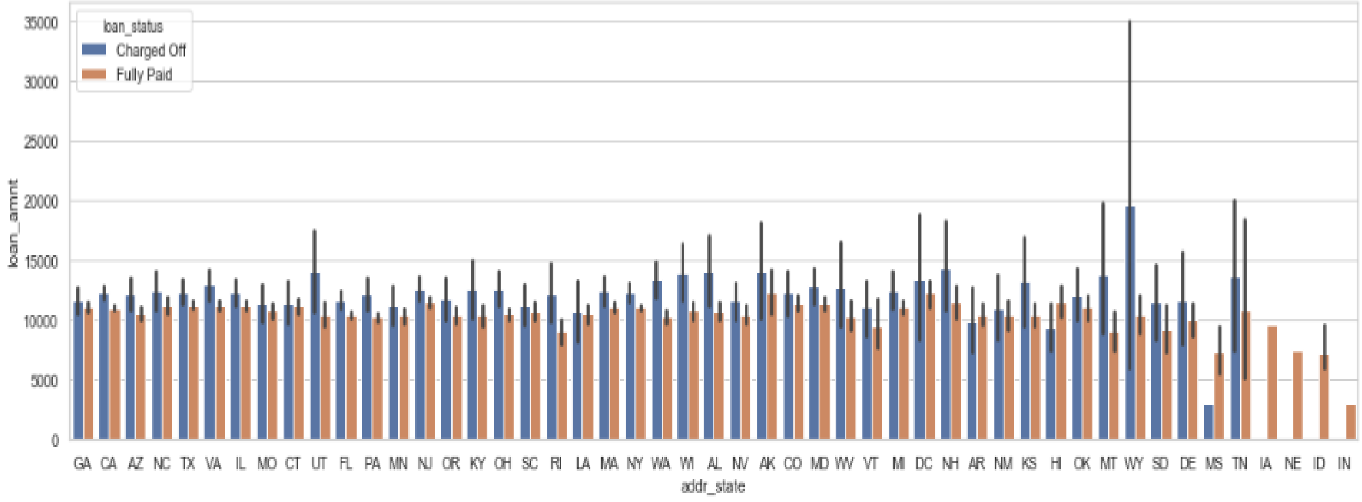


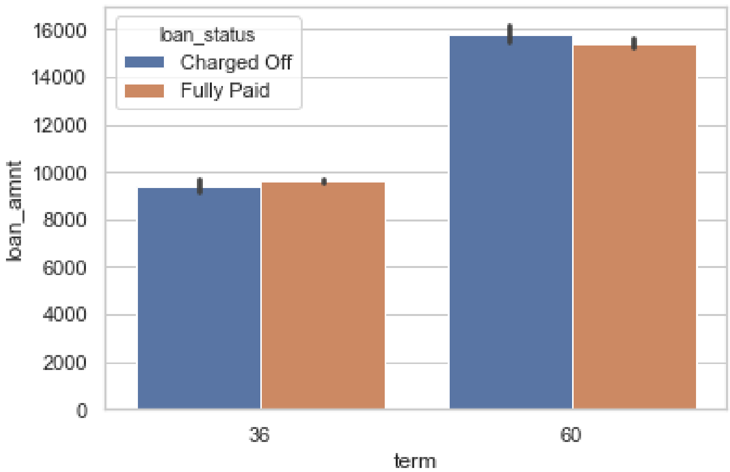
Bivariate Analysis

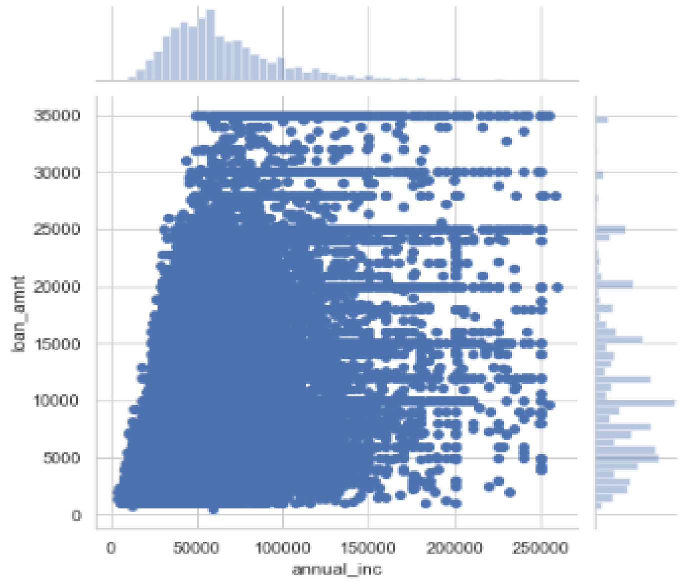
- *There is a sudden dip in the year 2008 for issued loan amount. LC might have faced some economic issues in year 2008. The approved amount increases with each year with a positive slope. Annual income of borrowers is also increasing exponentially every year.
- *There is a high density where borrowers with annual income of ~50000 are approved a loan of more than ~25000. These are risky loans which LC should take care.
- Higher the loan amount, higher is the grade. Annual income doesn't seem to have any observable effect on Grade
- Higher loans are often verified. Loans with higher amounts seem to be risky.
- Charged Off rate is higher for borrowers with higher interest rates in both the terms.
- Interest rate increases with increase in grade. Also, interest rate is almost same for fully paid and charged off for the same grade.
- *The loan amount is significantly higher for 5 year term with increasing in higher grades.
- With increasing grade and interest rate, Revolving line utilization rate is increasing.
- For the borrowers having greater then 2 delinquencies, approved loan amount is decreasing. Delinquencies is directly corelated to interest rate.
- *WY state is having the highest charged loan amount which is clearly outlier from this graph. LC needs to investigate on this

Visualizations for Bivariate Analysis



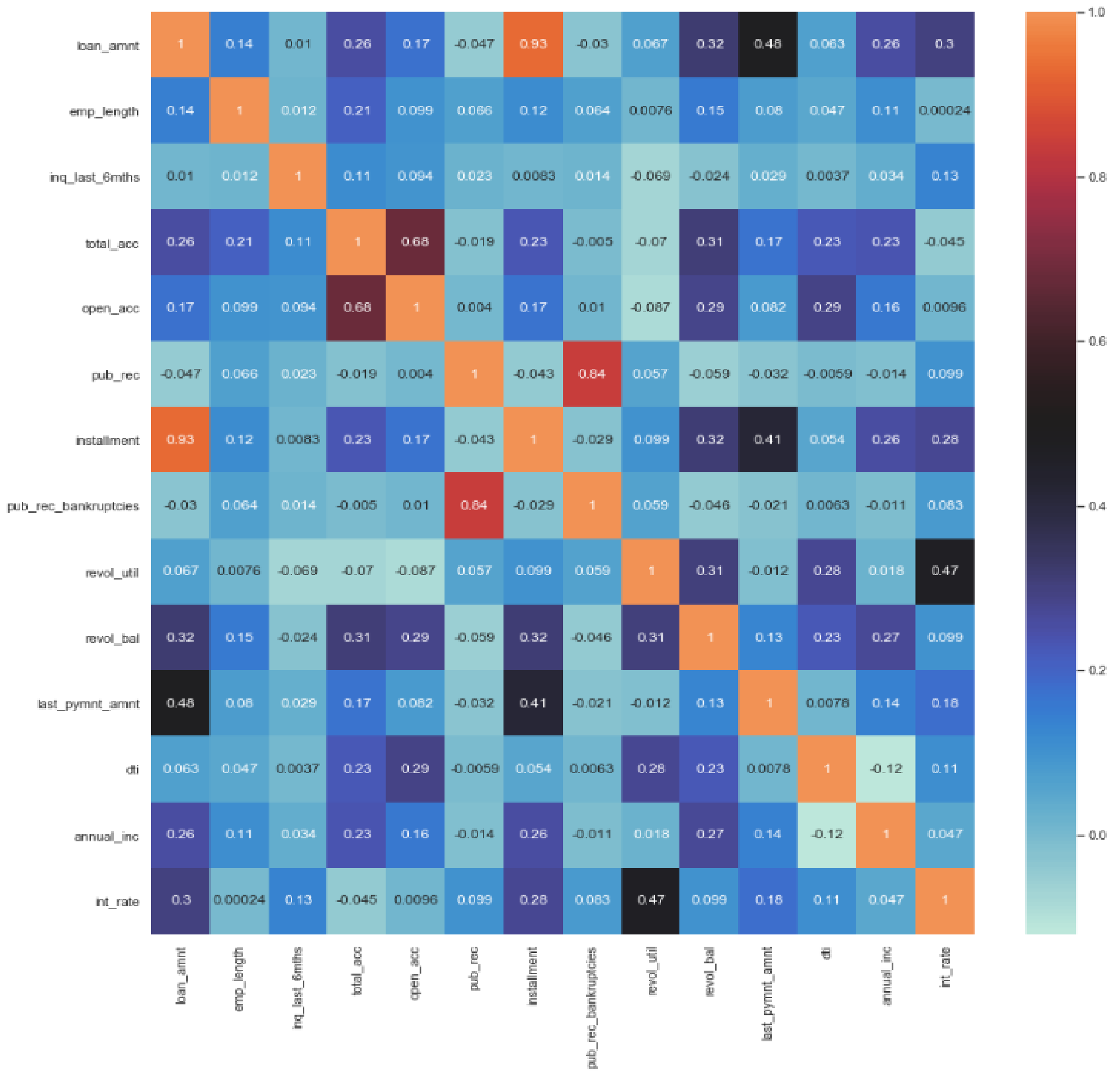






Bivariate Analysis

- The loan amount is directly correlated to installment, int_rate, revol_bal, last_payment_amnt and annual_inc
- Total_acc is negatively correlated with int_rate(minor), positively correlated to revol_bal, dti, installment, loan_amnt and positively correlated with open_acc
- Pub_rec and pub_rec_bankruptcy are positively correlated
- DTI increases as Interest Rate Increases
- We can see that DTI and Open_Acc are also positively correlated



Summary – Potential Risks and Possible Solutions

What LC should do?

- Make the approval for 5 years tenure more stringent. Since, 45% off charged off category comes from 60 month tenure period which constitutes a meagre 25% of all the records.
- Since the charge off percent is almost 40% for people with 2 public recorded bankruptcies, do not extend loan to people with >=2 records.
- Be careful when lending to home ownership category as “others” since almost 20% of the loans are charged off in this category.
- Prioritize the loans according to the annual income of the individual. People with low annual income seem to have higher charge off rate.
- LC can come up with an additional waiver for early payments in riskiest months like December.
- LC should be careful in lending loans where loan amount > 20% of total income.
- LC should investigate approving to Small business purpose since there is 26.5% charged off rate for Small Business category.
- There is a high density where borrowers with annual income of ~50000 are approved a loan of more than ~25000. These are risky loans which LC should take care.
- Assumption: LC should consider % of loan repaid for charged off should always be >= 50% otherwise consider it as a risk. Currently it is 57.1% for charged off and LC should make sure that the % is not going less than this.