LENDING CLUB CASE STUDY

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PROBLEM STATEMENT:

- A consumer finance company specializes in lending unsecured loans to urban customers. A customer can opt for personal loans, business loans, etc. with decent annual interest rates instead of going for major financial services like banks.
- The appropriate decision of lending loans to appropriate types of customers by examining their profile is of greatest importance to avoid financial loss for the organization and save the business as well.
- Decisions like rejecting loan applications of customers who are likely to repay the loan in time is a business loss for the company and approving loans of customers who are not likely to repay the loan in time will take no time for a company to dive deep into financial losses.

- Two types of risks are associated with the decision that banker makes-

Rejecting loans

- Rejecting loan applications of customers who are likely to repay the loan amount in time.

Approving loans

- Approving loans of customers who are not likely to repay the loan in time.

Loss

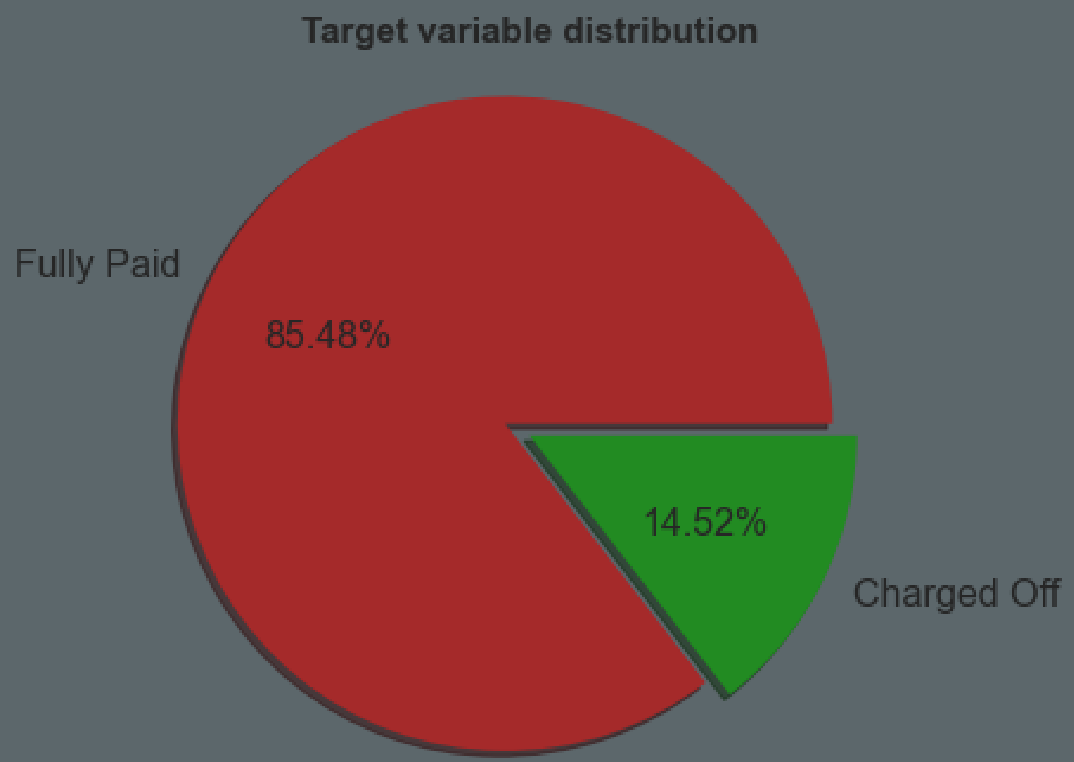
AIM-

- There are 3 different types of customers-

1. Fully paid	2. Current	3. Charged off
• The applicants has fully paid the loan (the principal and the interest rate).	• Applicants are in the process of paying the installments, i.e. the tenure of the loan is not yet completed.	• The applicant has not paid the installments in due time for a long period of time, i.e. he/she has defaulted on the loan

- We have rich data containing detailed information about past loan applicants. The data tells us whether the applicant was successfully able to pay off the loan in time, is currently paying the loan, or defaulted.
- Our aim is to visually analyze the given data and identify patterns between customers who paid off the loan and the ones who didn't. We can use these patterns on future customers to predict if he is a businesses booster or a loss-maker.
- This analysis can be used for taking various actions such as denying a loan, approving less loan amount, and lending loans at higher interest rates.

I. LET'S HAVE A LOOK AT OUR TARGET VARIABLE-



Total no. of applicants-	35753
Total no. of defaulters-	5191
Total no. of fully paid applicants-	30562

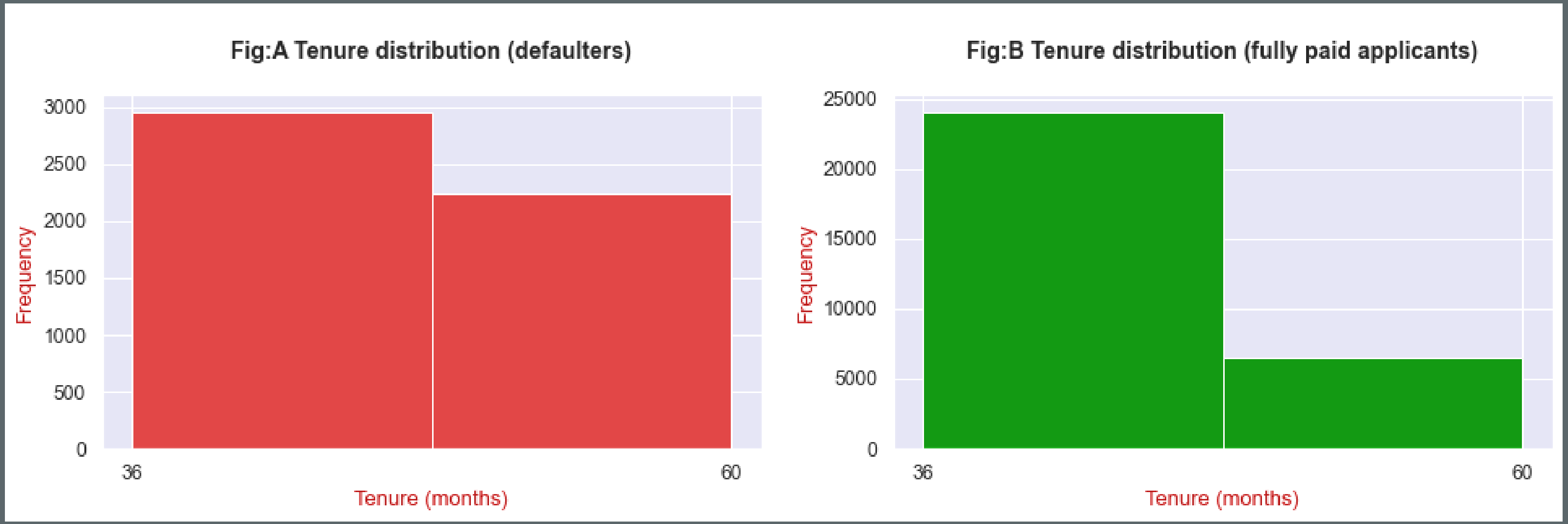
- We have considered two types of customers as our target variable for our analysis-

    1. Fully paid customer.
    2. Charged off customers.

- The customers who have fully paid the loan along with the interest rate constitute about **85.48%** of the total population of the lending club customers.

- Customers who have not paid the installments in due time and defaulted on loan contribute the rest **14.52%** of the total customer population of the lending club.

2. TENURE OF LOAN CAN BE A REASON-



Total number of defaulters-

5191

Total number of fully paid applicants-

30562

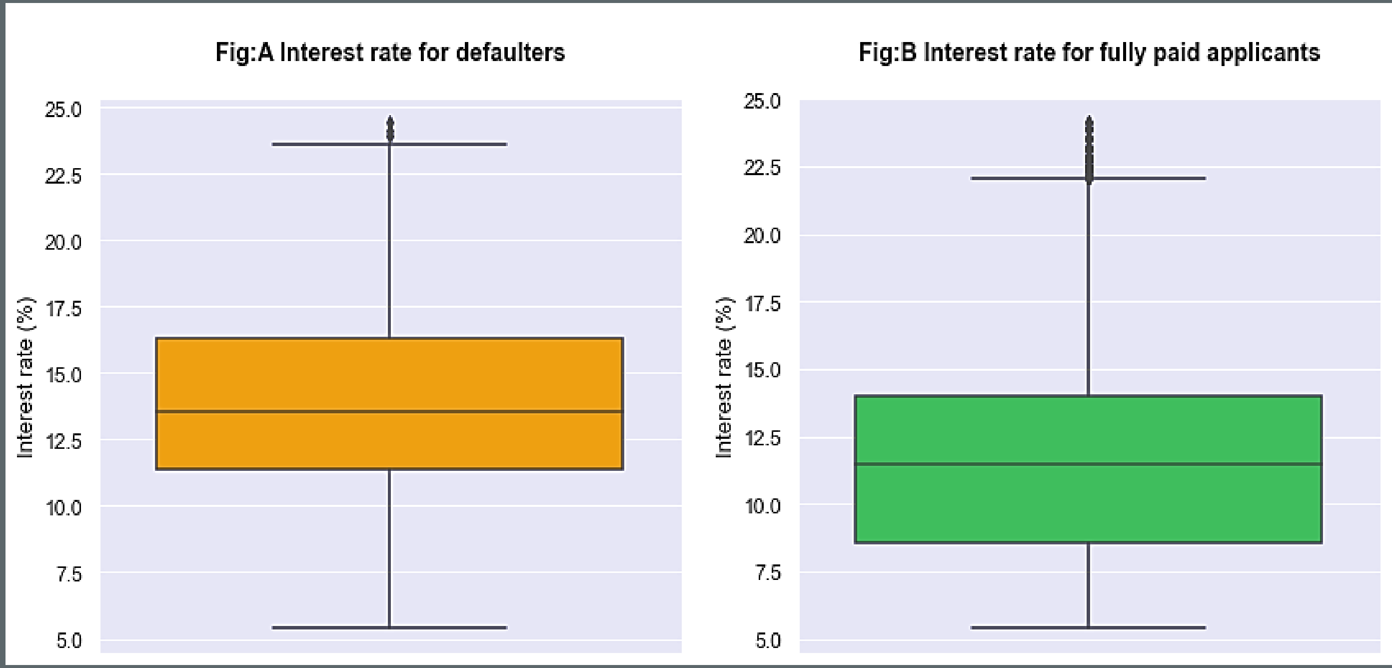
- Fig: A which is for defaulters, there are roughly 3000 applicants out of a total of 5191 charged-off applicants who opted for 36 months of tenured loans. The rest of the defaulters opted for 60 months. Hence, about 58%, almost a little over half the population, opted for the short term and the rest went for the long term.

- Fig: B, which is for good applicants, approximately 24000 out of 30562 good applicants had loans with 36 months tenure, and the rest opted for 60 months stating that a high proportion of good applicants (about 79%) opted for short term loans and 21% went for long term loans.

- Long tenured loans accumulate huge interest and we can speculate that defaulters who had long-tenured loans(60 months), would have eventually charged off. If we overlooked the fact that 58% of defaulter applicants charged off despite their short-termed loans, long-term loans if had not been opted by defaulters, would not have made some of them defaulters anymore. However, the majority of their counterparts(good applicants), chose a less tenured loan.

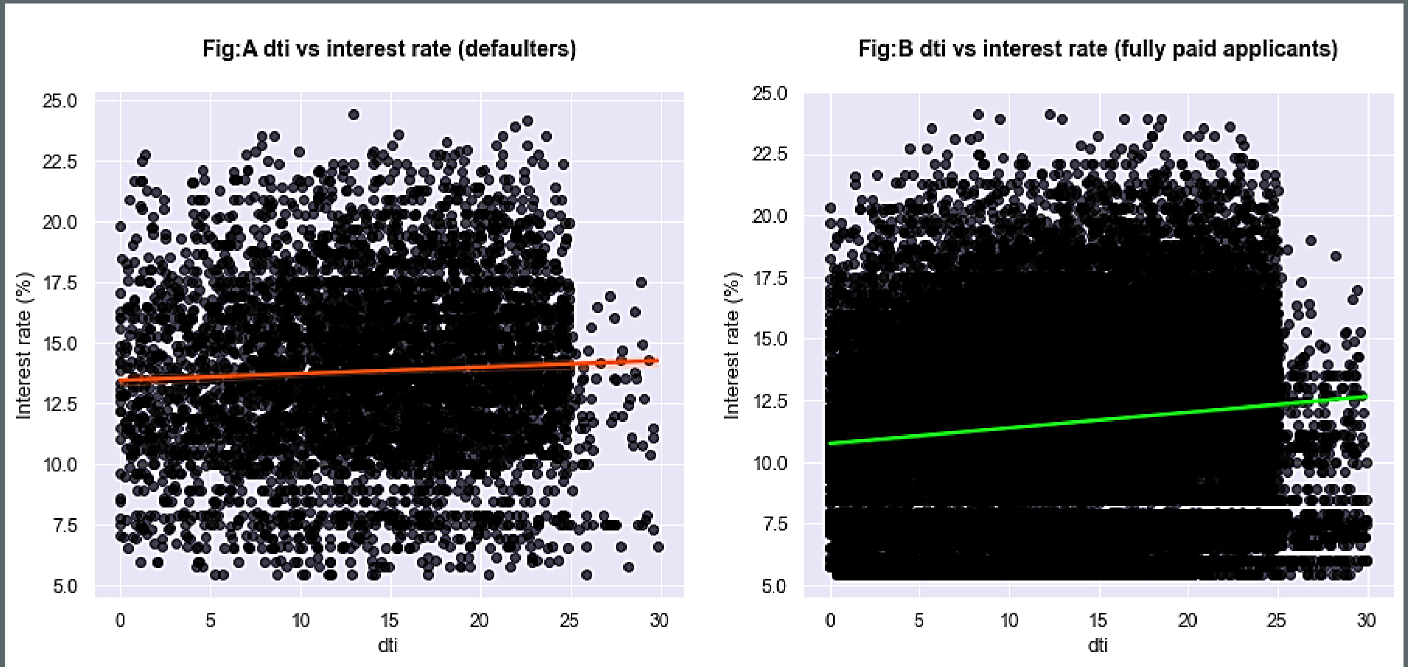
- Hence, the type of tenure one opts for, may give us a vague forthcoming insight for defaulters.

3. A HIGHER SLAB OF INTEREST RATES-



- From Fig: A, apparently the interest rates for the interquartile population of defaulters approximately lie between 11.5% to 16.5%. The median is somewhere around 13.5%.
- On the other hand, from Fig: B, the interquartile population of fully paid customers falling between 8.5% to 14%, are having a relatively lower range of interest rates. These customers have a median of 11.5%.
- We can infer that a higher slab of interest rates could be one of the causes for applicants to not pay the loan and hence they defaulted.

4. DTI VS INTEREST RATES-



dti-

1. A debt to income ratio is the ratio of the sum of all monthly debts to monthly gross salary before tax.
2. Low dti, indicates that the applicant either has less monthly expenditure or sufficient annual income.
3. Having low dti is good and preferred.

- From the above visual analysis, we can depict that the regression line in Fig: A, more or less, shows a close-to-zero correlation between the dti ratio and the interest rate for defaulters. The latter case which is for fully paid applicants comparatively communicates a more positive correlation between the dti ratio and the interest rate.
- One can easily manifest that at any point on the dti-axis, the corresponding interest rates for defaulters are in the higher slab. Therefore we can say that, even if defaulters try to maintain or have low dti, they have to pay more interest compared to the fully paid ones. The effects are less in short term, but a long-tenured loan can put a tag on the borrower as Charged-off due to paying higher interest rates.
- On the other hand, in Fig: B, the regression line is playing a fair game- people with low dti are awarded low-interest rates and the ones with higher dti have a little higher interest rates.
- Had been the defaulters with lower dti imparted with lower interest rates, few of them might not be defaulters anymore.

5. EMPLOYMENT LENGTH AND ANNUAL INCOME-

- At any given employment length, the annual income of defaulters is low relative to the annual income of the fully paid applicants.
- Hence, gauging a particular annual income at a particular employment length can be one of the qualifying parameters to differentiate between a future good customer who repays all the loan in time and a to-be defaulter.

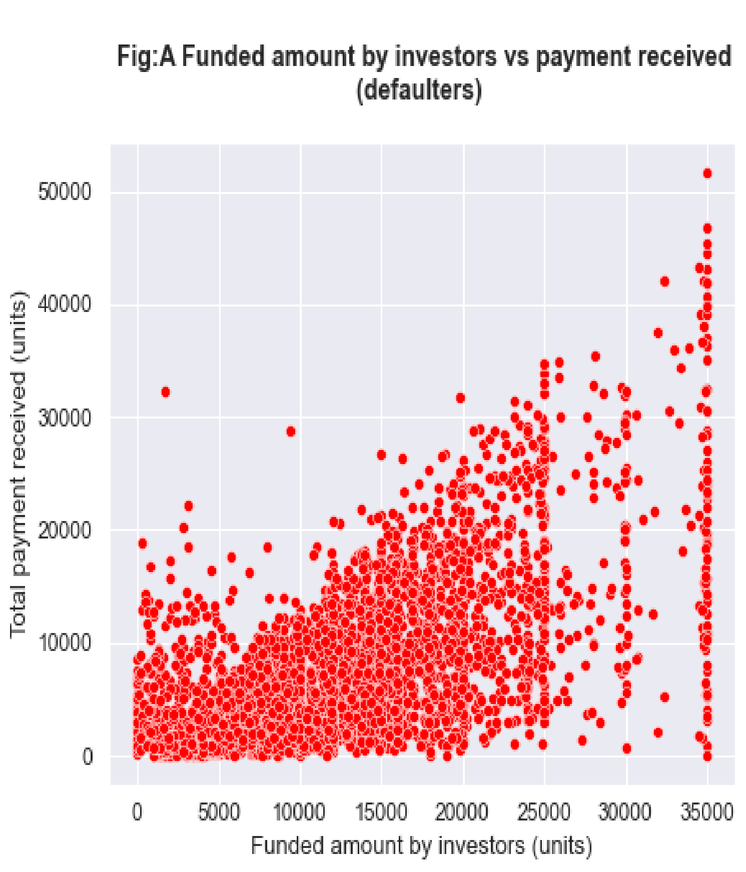
6. REVOLVING BALANCE AND EMPLOYMENT LENGTH-

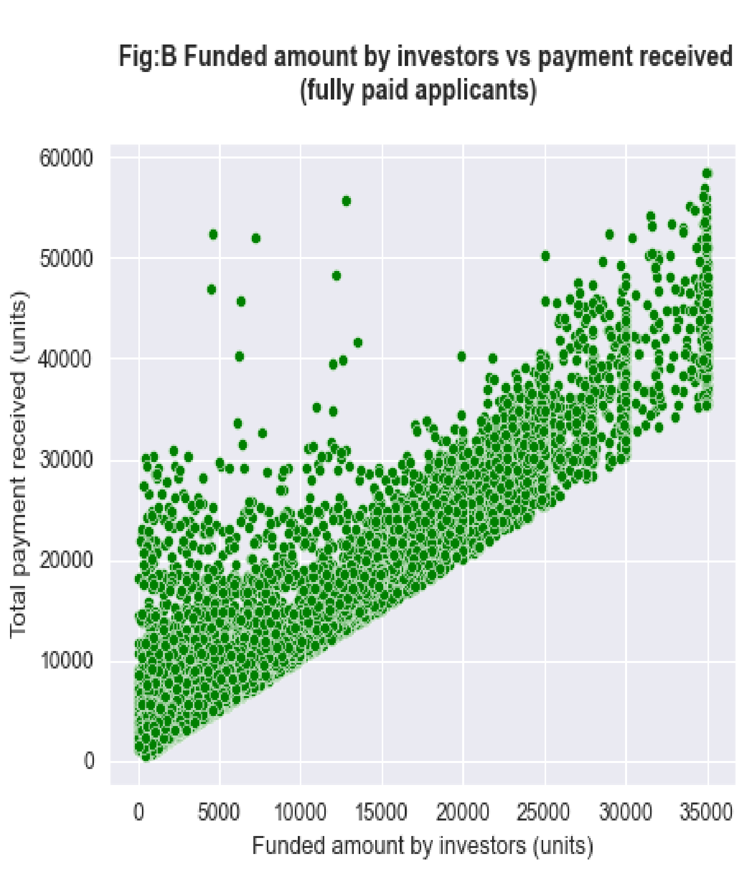
Revolving balance-

- The unpaid portion of the used amount from the line of credit that carries over to the next month.

- The distorted nature of the line for charged-off customers shows that some defaulters with employment lengths between 2 years to 3.5 years seem to have a normal revolving balance as compared to the good customers with the same employment length.
- The ones falling in the employment length range of 3.5 years to 8.5 years appear to have a hard time repaying their balance.
- All in all, we can say that a higher revolving balance history concerning the employment length of any applicant could be a good indicator to detect a potential future defaulter.

7. RELATION BETWEEN THE FUNDED AMOUNT BY INVESTORS AND TOTAL PAYMENT RECEIVED-

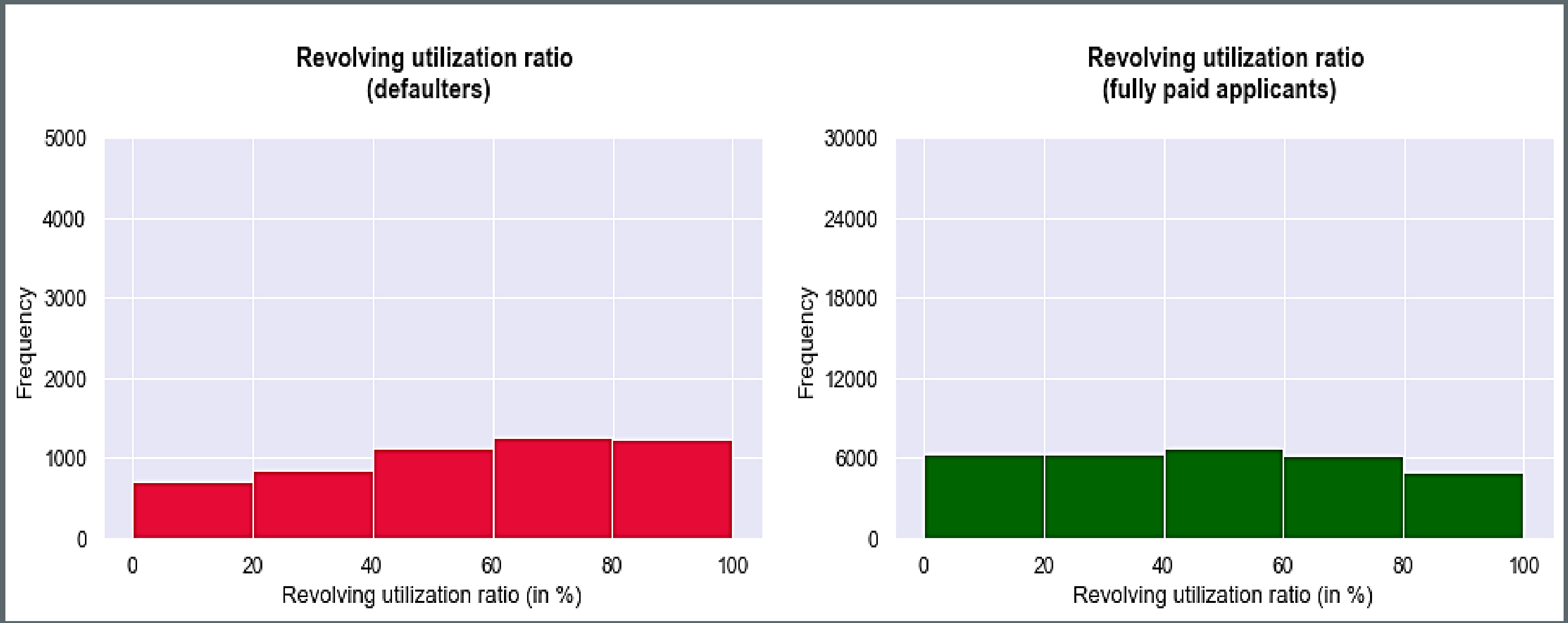




- From Fig:A shows that after giving loans above 5000 units to defaulters, the total amount received is mostly less than the amount they were funded by investors. This can be seen by the presence of markers laying below the imaginary low inclined diagonal if drawn left to right upwards.
- Scatter plots, when drawn from the payback history of a customer, if lie below this imaginary diagonal, can help detect a defaulter.
- On the contrary, in Fig: B, the good customers, are maintaining a close to perfect positive correlation between the funded amount and paying back the total amount. These good customers are even paying interest rates regularly corresponding to their funded amount which can be seen by the presence of densely populated marker sitting above an imaginary diagonal if drawn from left to right upwards.

- Therefore we can infer that a fixed limit of lending loans should be set by referring to the past repaying history of a customer.

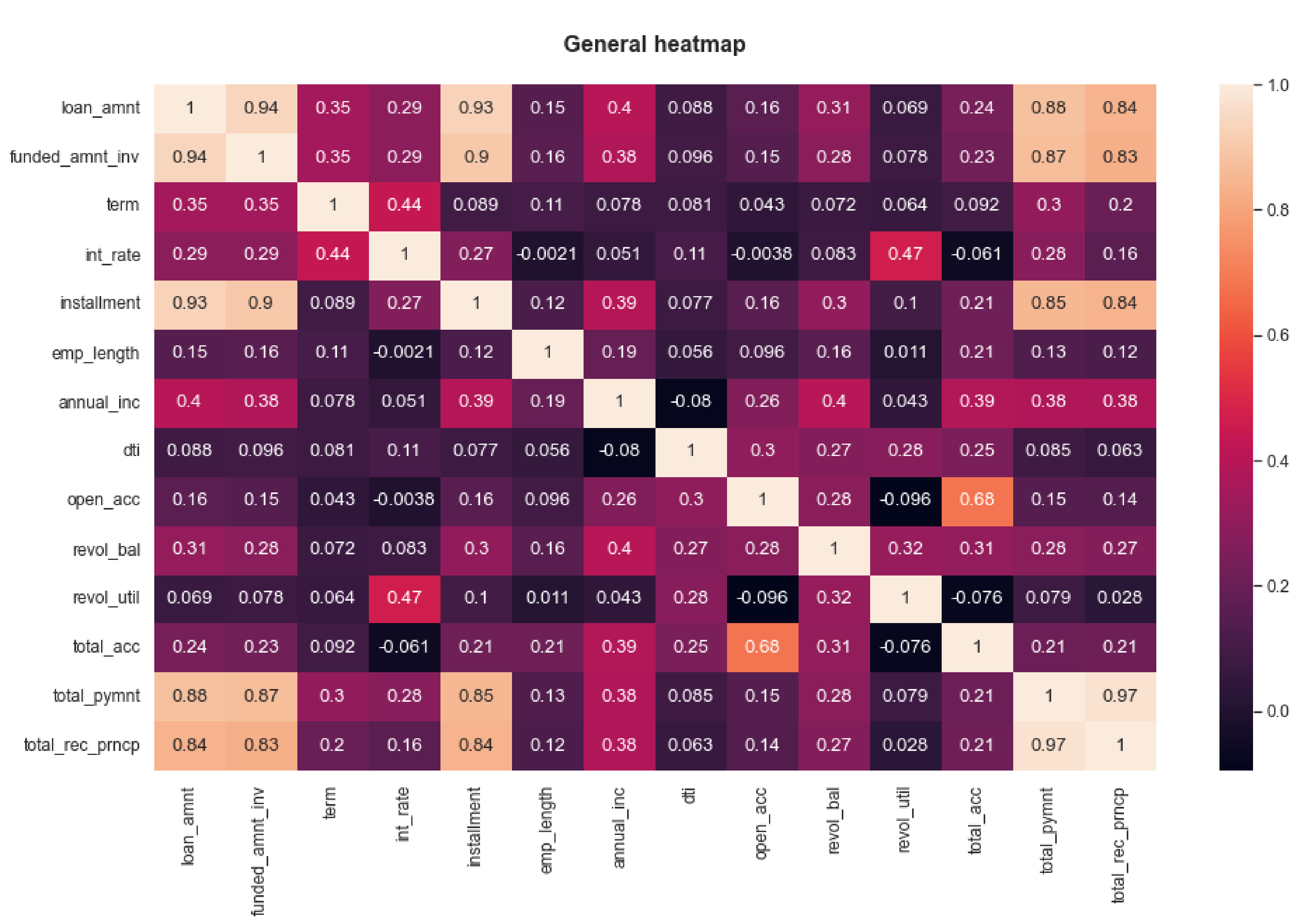
8. REVOLVING UTILIZATION RATIO-



Total no. of applicants-	• 35753
Total no. of defaulters-	• 5191
Total no. of fully paid applicants-	• 30562

- Revolving utilization ratio is the percentage of utilization of credits from the available line of credits that a borrower has.
- From Fig: A, we can see that less portion of defaulters(about 700) have maintained their revolving utilization ratio below 20% and a high portion of the defaulters (about 2000) has a revolving balance utilization ratio above 60%. This means that defaulters are relying too much on credits and using their available credit lines to the fullest.
- On the other hand, from Fig: B, we can see that the maximum population of good applicants(about 18000) has maintained their revolving utilization ratio below 60% and a very less population of them(about 4000) have a higher revolve utilization ratio(above 80%).
- Hence, the revolving utilization ratio can be a rescuing parameter for the lending club which can help detect a potential defaulter.

9. HEATMAP-

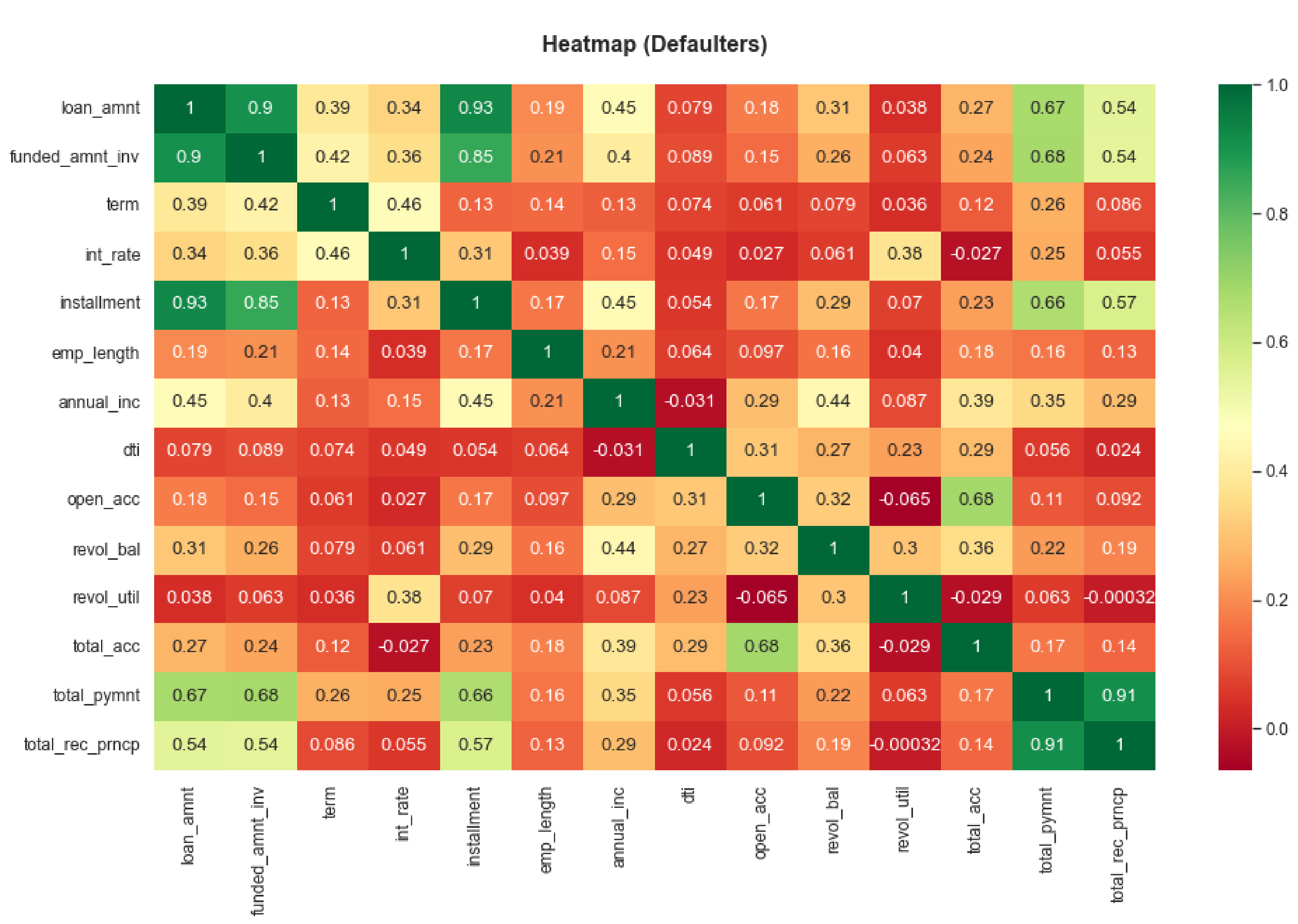


1. From the heatmap, we can see that the interest rate are somewhat negatively correlated with- **a). the employment length of borrowers-**(less employment length will result in higher interest rates and vice versa), **b).the number of total credit lines and the total active credit lines they have-**(holding and maintaining more lines of credits will help one to keep their utilization ratio low which helps in increasing their credit score).

2. The annual income of a borrower is also seen to have a negligible negative correlation with the debt to income ratio. –(having a low annual income will lead one to utilize more credits from credit lines and vice versa).

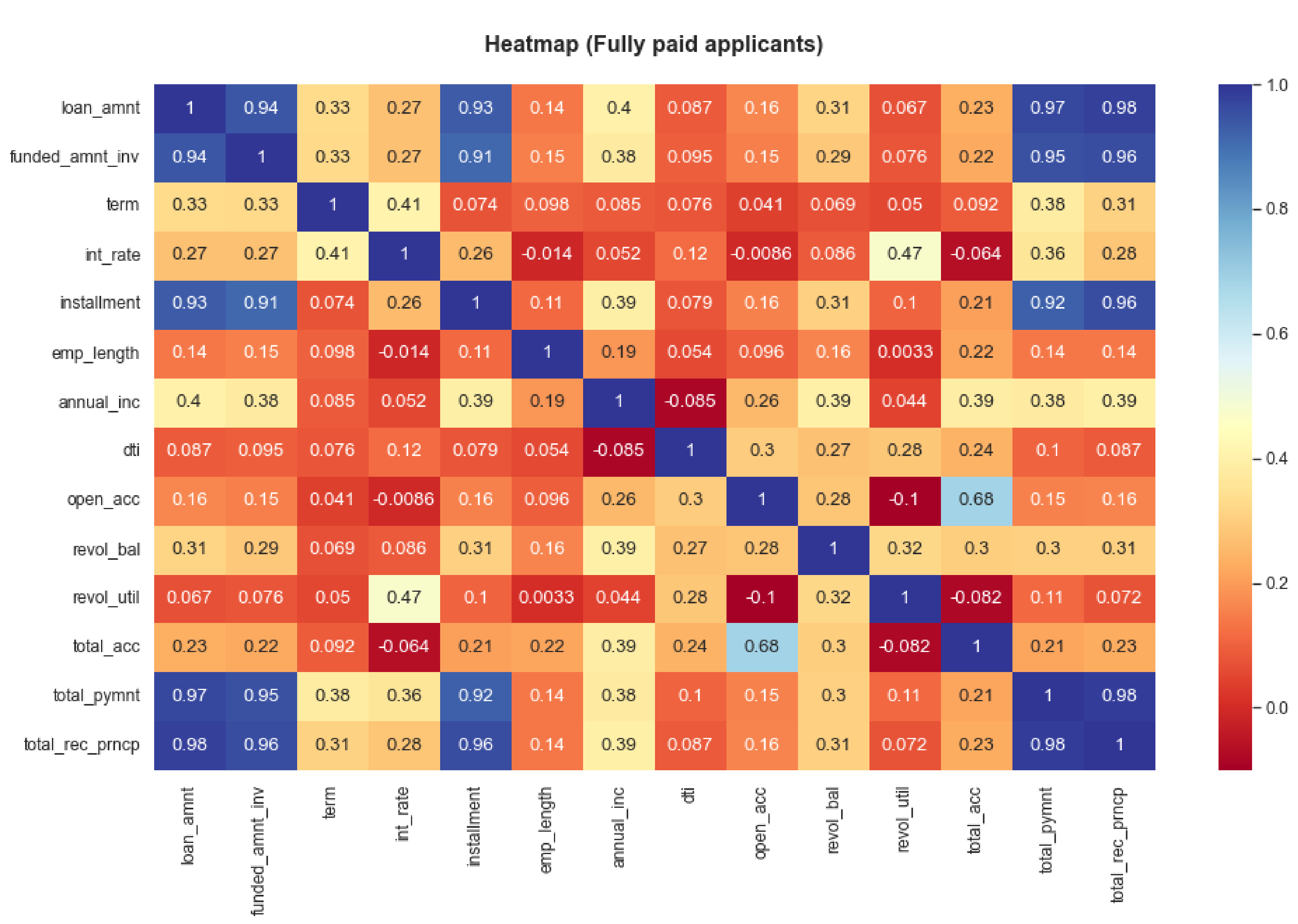
3. The number of credit lines and the number of active credit lines a customer holds is also somewhat negatively correlated to the revolving credit utilization ratio. -(higher utilization ratio means maximum use of available credit lines).

10. HEATMAP FOR DEFAULTERS-



1. The heatmap for defaulters depicts that the low annual income of defaulters makes it hard for them to carry all their monthly debts resulting in shooting up their dti ratio.
2. Holding too many credit lines result in lower interest rates (having multiple credit lines and using some portion of each of them over having one credit line and using it to the fullest, will result in maintaining a good and low utilization ratio eventually resulting in building a good credit score.)
3. Revolving utilization ratio is negatively correlated with the total received principal. Customers(here defaulters) having higher utilization ratio are very unlikely to repay the complete principal amount.
4. Having fewer lines of total and active credits will surely increase the utilization ratio of available credit sources.

11. HEATMAP FOR FULLY PAID APPLICANTS-



1. In the heatmap for fully paid applicants, the additional information we can gain is that the higher employment length of good customers is awarding them with lower interest on loans.

2. The holding and using of multiple open credit lines and active credit lines and timely repaying of the used credits from them, also help good applicants to attract loans at lower interest rates.

3. Moreover, the higher annual income of good customers helps them to maintain a low dti ratio.

4. Apart from this, as opposed to defaulters, the revolving utilization ratio in this heatmap is positively correlated with the total received principal, again stating that good applicants are repaying the entire principal amount in time.

CONCLUSION-

Hence, we can conclude that the following parameters are the driving factors and when combined and analyzed together can help us predict a potential defaulter-

1. Applicant opting for long-tenured loans.
2. Applicant is having higher interest rates on loans even after having a low dti ratio.
3. Low annual income of the applicant.
4. Higher revolving balance history of the applicant.
5. Payback history of the applicant.
6. Higher revolving utilization ratio of the applicant.

RECOMMENDATION-

1. Even after having a low dti ratio, few applicants were imparted with higher interest rates on the loans which they opted for which seems unjust. Applicants having low dti should be awarded with relatively lower interest rates to avoid them from getting defaulted.

Thank you!