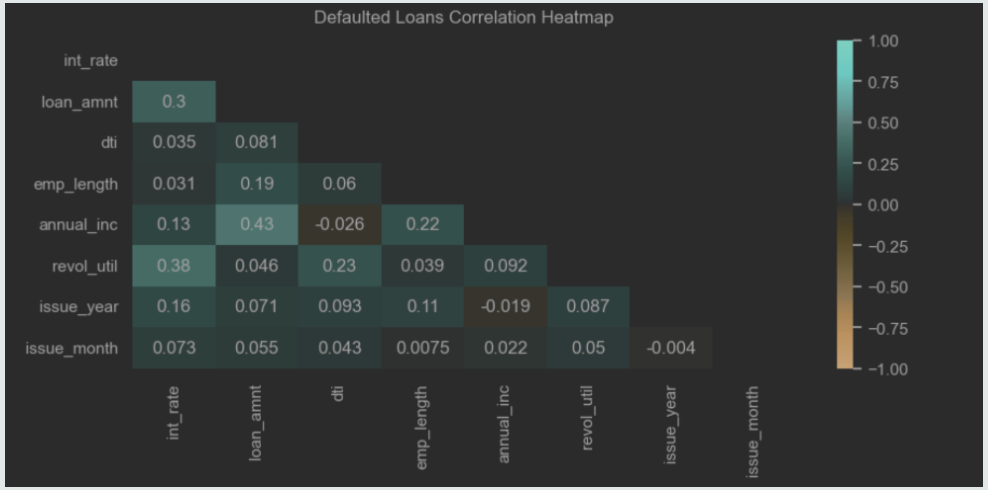
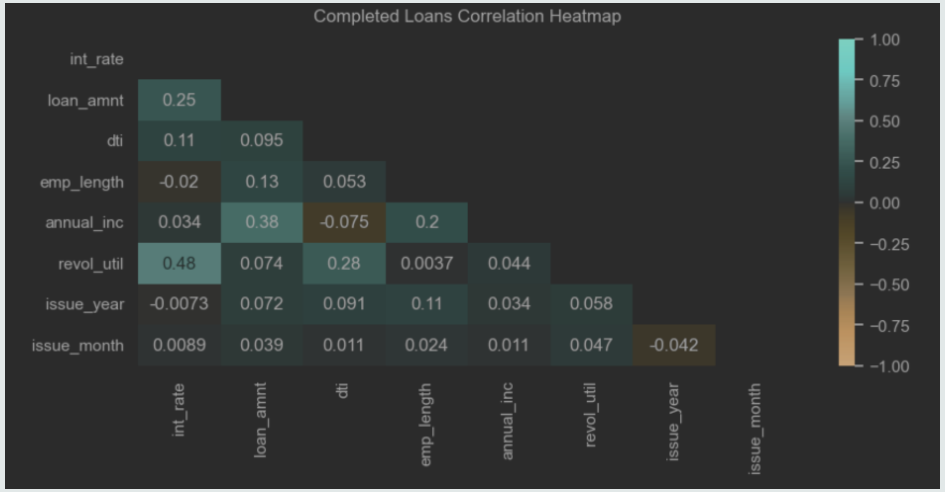
Lending Club

Case Study

By Jubin Thomas Kuriakose





Correlation HeatMap

Moderate correlation with the continuous variables

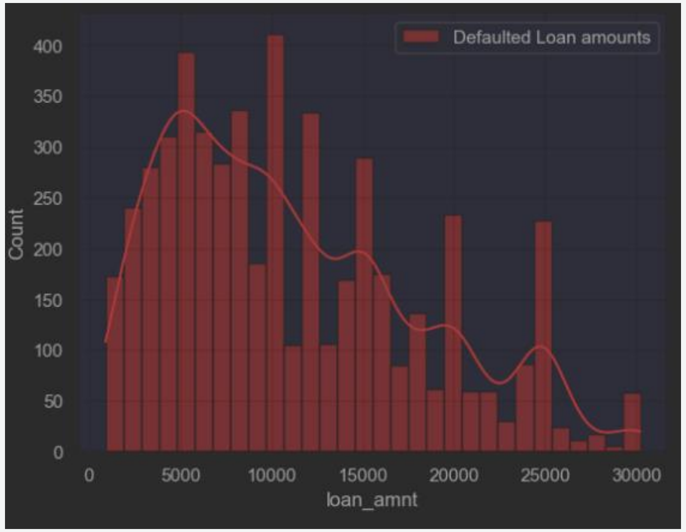
- Loan amount to Interest rates
- Annual income to Loan Amount
- Revolving Utilization to Interest Rate

As the correlation isn't stronger (ie > 0.7 or < -0.7), we will rely on segmented Bivariate analysis on categorical variables

Univariate Analysis on Continuous Variables

Analyze the variables picked up in the correlation matrix for frequency distribution

- Loan Amount
- Loan Interest Rate
- Annual Income



Defaulted Loan Amount

The defaulted loans seem to be more prevalent to the first 10,000 but also large spikes are seen in every 5000 increment

Suggest to break down the loan amount into buckets of 5000

<5000 - XS-Amount

5000-10000 - S-Amount

10000-15000 - M-Amount

15000-20000 - L-Amount

20000-25000 - XL-Amount

25000-31000 - XXL-Amount

Defaulted Loan Interest Rate

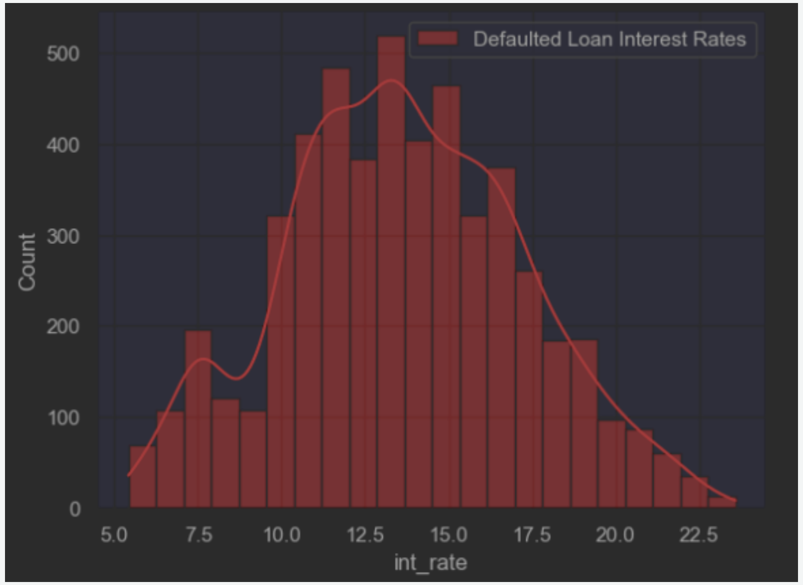
Interest rate defaults maximum seems to occur between 10 - 20% buckets

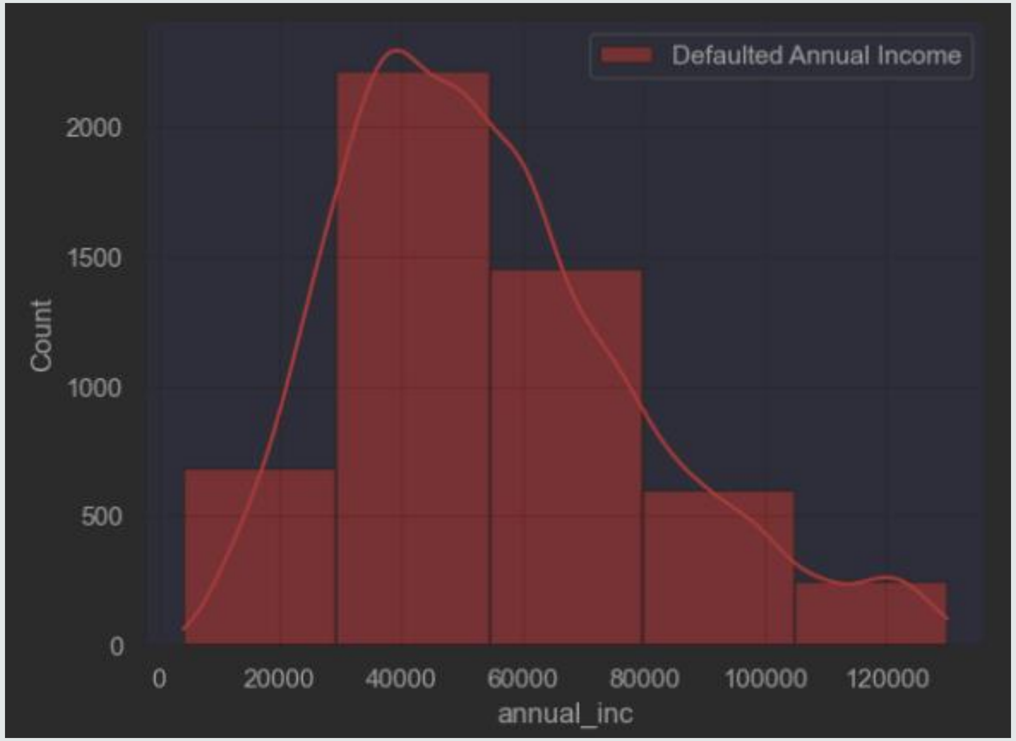
Suggest to break down if Interest rates into buckets

< 10%   - M-IR

10% - 20%   - L-IR   (Maximum defaults)

20% – 30%   - XL-IR





Defaulted Annual Income

Maximum defaults seem to happen for income that are between 40,000 to 80,000

< 26000 - S-Inc

26000 - 52000 - M-Inc (max defaults)

52000 - 78000 - L-Inc (high defaults)

78000 - 104000 - XL-Inc

104000 - 130000 - XXL-Inc

Defaulted DTI

Maximum defaults seem to happen for DTI ration between 5 to 24

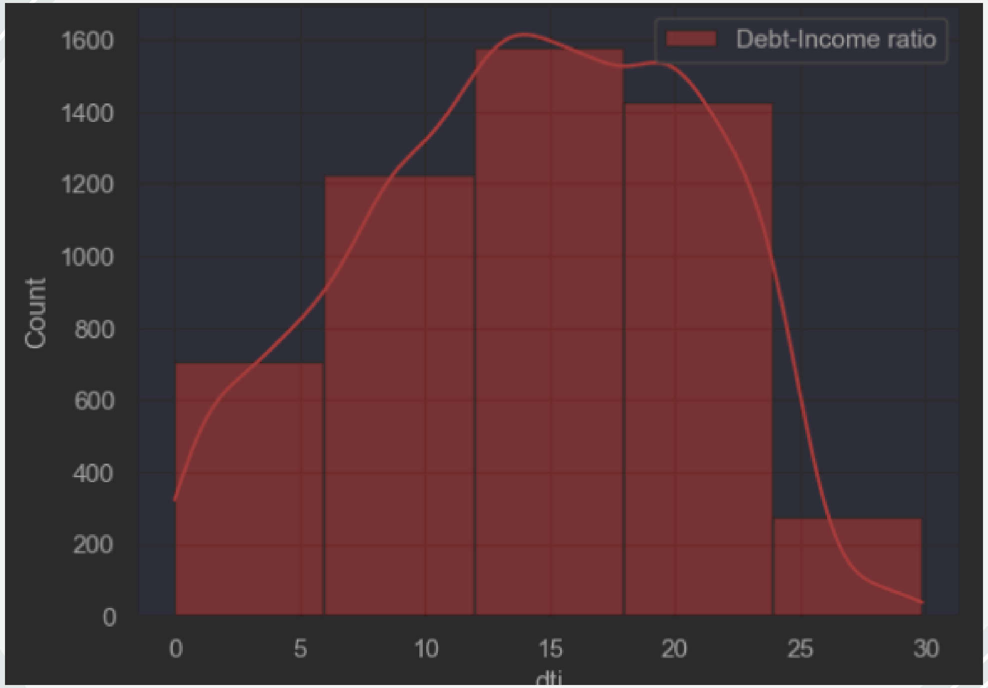
< 5 - XS-DTI

5-10 - S-DTI

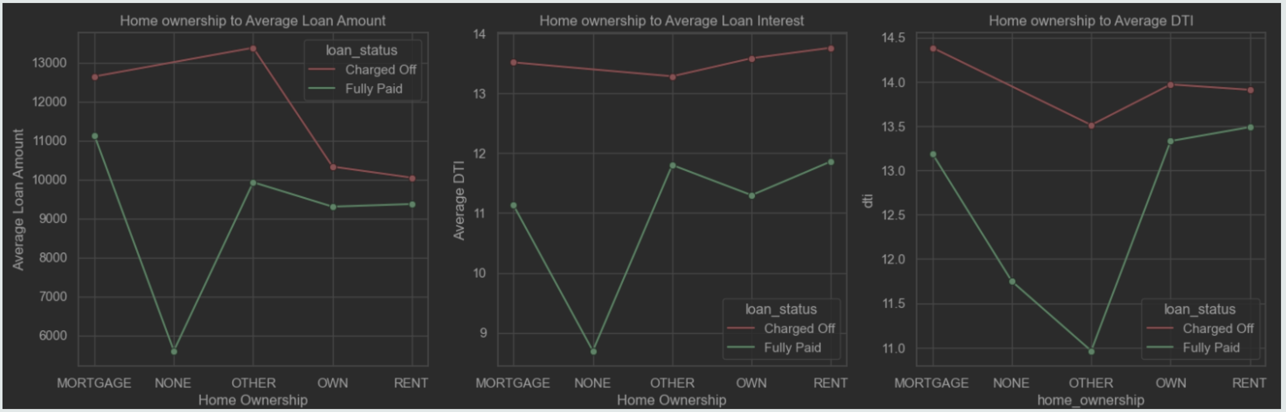
10-15 – M-DTI

15-20 – L-DTI

20-25 – XL-DTI

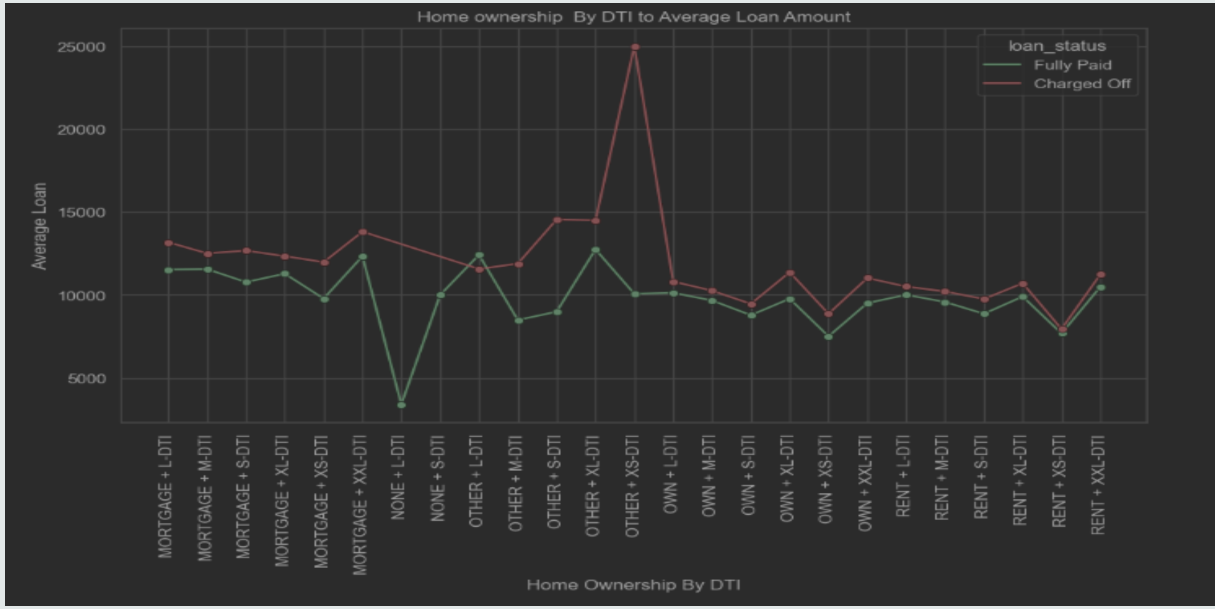


Segmented Bivariate Analysis



Home ownership

- Defaulted customer have higher average Loan Amount and Interest Rate across all the types home-owners
- The high interest rate seem to go hand in hand with the high average DTI seen across home-owners that default
- Completed loans tend to have lower DTI



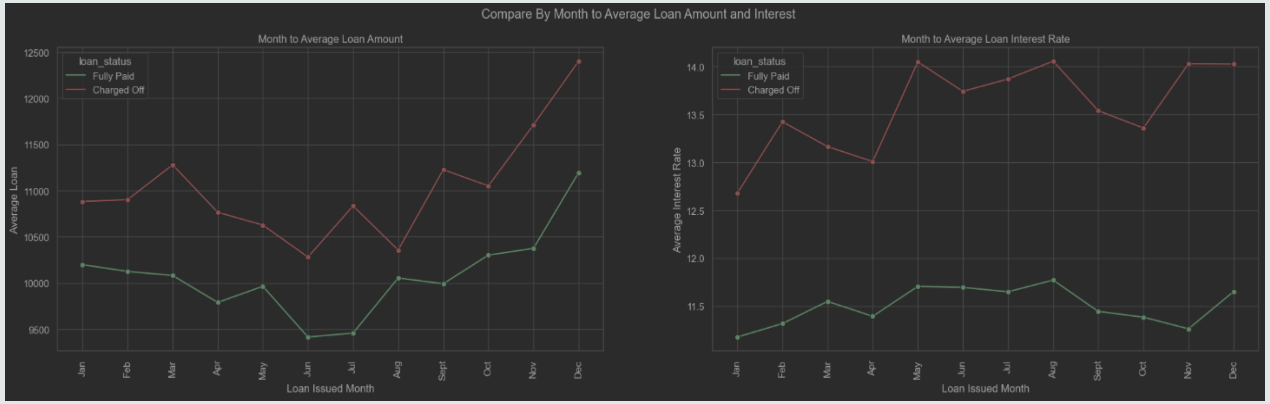
The Average Loan Amount or interest rate seems to not be significantly different across the various buckets of DTI to the home-ownership

The only deviation seems to be for customers high average loans in the following bucket:

OTHER - XS-DTI (dti < 5.0) where average loan amount was close to 25,000

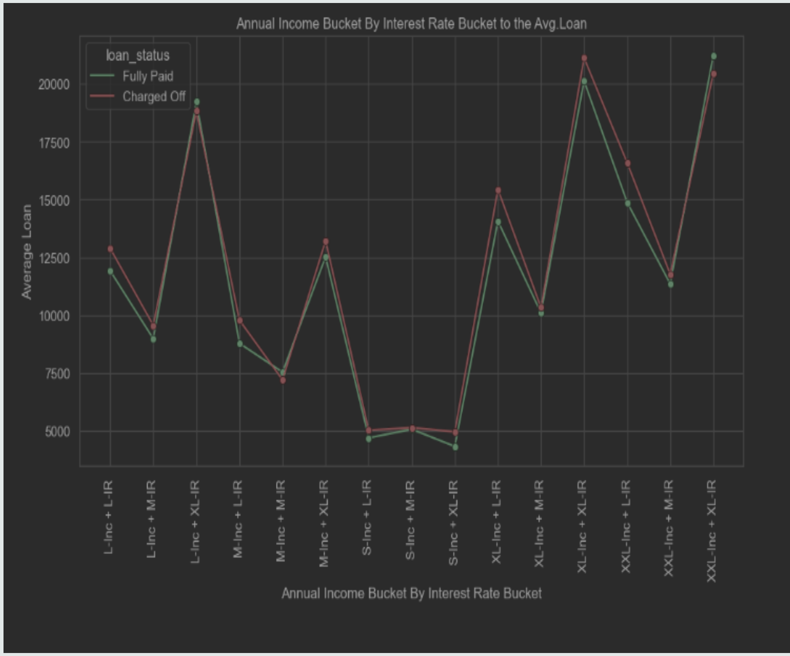
OTHER - XS-DTI also had th highest interest rate 18% which could be the main reason

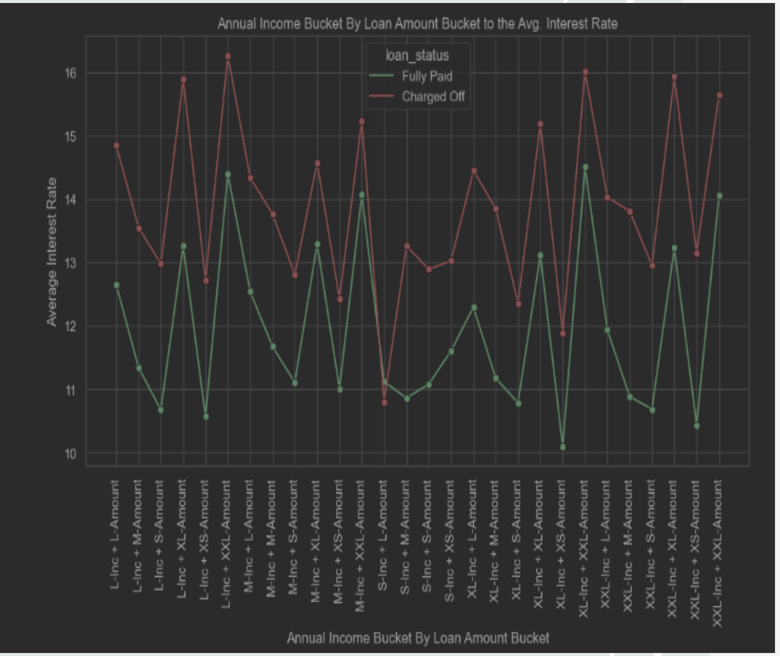
This could imply that not disclosing home-ownership should considered High-Risk and offer higher interest rates and loans



On Basis of Month

- The average of the loan amounts and the interest rate seems to increase and especially towards the year-end
- Defaults happen for those interest rates that are above 12% on average monthly
- ***Would be advisable to keep the interest low to prevent defaults***

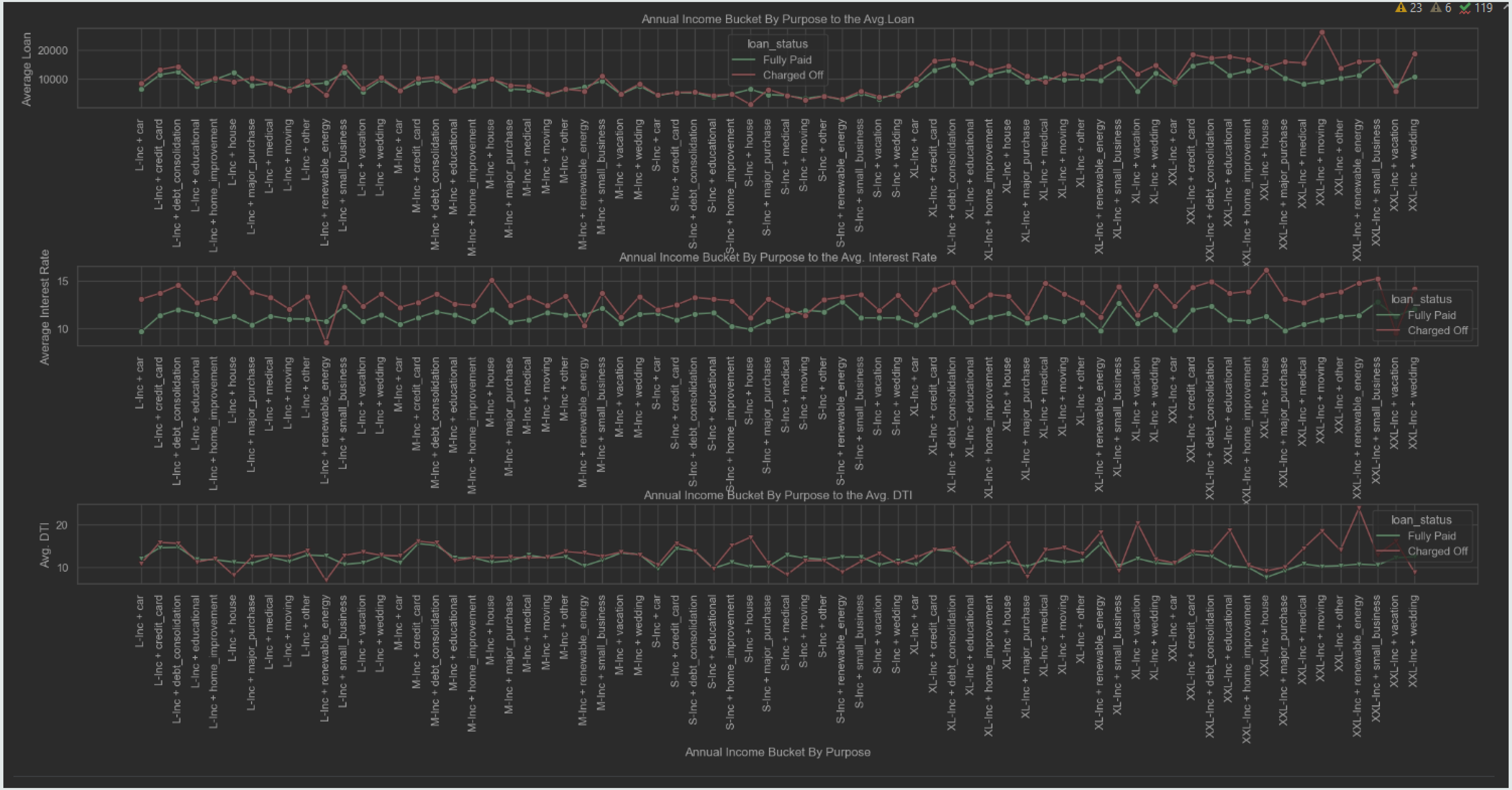




On Basis of Annual Income

- Annual Income bucket coupled with interest rates buckets seem to have similar average loans amounts for defaulted and completed loans
- This could indicate the loan amount as such doesn't contribute to the defaulting
- However, when we do the same for buckets on loan amount we see that the defaulted loans have higher average interest rates
- An exception is found at the data-point S-Inc (0-26,000 income) + L-Amount (15,000 - 20,000 Loan) where the interest rate is also low (< 11%)

This could mean that interest rates primarily contribute the loan defaulting


23 6 119
Annual Income Bucket By Purpose to the Avg.Loan
Average Loan
20000
10000
loan_status
Fully Paid
Charged Off
Annual Income Bucket By Purpose to the Avg. Interest Rate
Average Interest Rate
15
10
loan_status
Fully Paid
Charged Off
Annual Income Bucket By Purpose to the Avg. DTI
Avg. DTI
20
10
loan_status
Fully Paid
Charged Off
L-Inc + car
L-Inc + credit_card
L-Inc + debt_consolidation
L-Inc + educational
L-Inc + home_improvement
L-Inc + house
L-Inc + major_purchase
L-Inc + medical
L-Inc + moving
L-Inc + other
L-Inc + renewable_energy
L-Inc + small_business
L-Inc + vacation
L-Inc + wedding
M-Inc + car
M-Inc + credit_card
M-Inc + debt_consolidation
M-Inc + educational
M-Inc + home_improvement
M-Inc + house
M-Inc + major_purchase
M-Inc + medical
M-Inc + moving
M-Inc + other
M-Inc + renewable_energy
M-Inc + small_business
M-Inc + vacation
M-Inc + wedding
S-Inc + car
S-Inc + credit_card
S-Inc + debt_consolidation
S-Inc + educational
S-Inc + home_improvement
S-Inc + house
S-Inc + major_purchase
S-Inc + medical
S-Inc + moving
S-Inc + other
S-Inc + renewable_energy
S-Inc + small_business
S-Inc + vacation
S-Inc + wedding
XL-Inc + car
XL-Inc + credit_card
XL-Inc + debt_consolidation
XL-Inc + educational
XL-Inc + home_improvement
XL-Inc + house
XL-Inc + major_purchase
XL-Inc + medical
XL-Inc + moving
XL-Inc + other
XL-Inc + renewable_energy
XL-Inc + small_business
XL-Inc + vacation
XL-Inc + wedding
XXL-Inc + car
XXL-Inc + credit_card
XXL-Inc + debt_consolidation
XXL-Inc + educational
XXL-Inc + home_improvement
XXL-Inc + house
XXL-Inc + major_purchase
XXL-Inc + medical
XXL-Inc + moving
XXL-Inc + other
XXL-Inc + renewable_energy
XXL-Inc + small_business
XXL-Inc + vacation
XXL-Inc + wedding
Annual Income Bucket By Purpose

The average loan amount for the reason in taking a loan bucketed by the Income is similar for defaulted and completed loans except for:

- XXL-Inc(104K - 130K) + major purchase
- XXL-Inc(104K - 130K) + medical
- XXL-Inc(104K - 130K) + moving
- XXL-Inc(104K - 130K) + home improvement
- XXL-Inc(104K - 130K) + educational

The average interest rate for the reason in taking a loan bucketed by the Income is much higher in the defaulted loans as compared to completed loans

Specifically, for the above, the interest rates have been > 12%

- XXL-Inc(104K - 130K) + major purchase > 12%
- XXL-Inc(104K - 130K) + medical - > 12 %
- XXL-Inc(104K - 130K) + moving - > 12%
- XXL-Inc(104K - 130K) + home improvement - > 14%
- XXL-Inc(104K - 130K) + educational - > 13%
- L-Inc - debt_consolidation > 14%
- L -Inc - House > 16%

The average DTI for above sectors are also mostly greater than 10:

- XXL-Inc(104K - 130K) + major purchase > 15
- XXL-Inc(104K - 130K) + medical - = 15
- XXL-Inc(104K - 130K) + moving - > 15
- XXL-Inc(104K - 130K) + home improvement - > 10
- XXL-Inc(104K - 130K) + educational - > 15
- L-Inc - debt_consolidation > 15
- L -Inc - House < 10

This could mean large projects tend to be riskier even if the annual income of the person is large but also carry a lot of debt

On Basis Loan Term

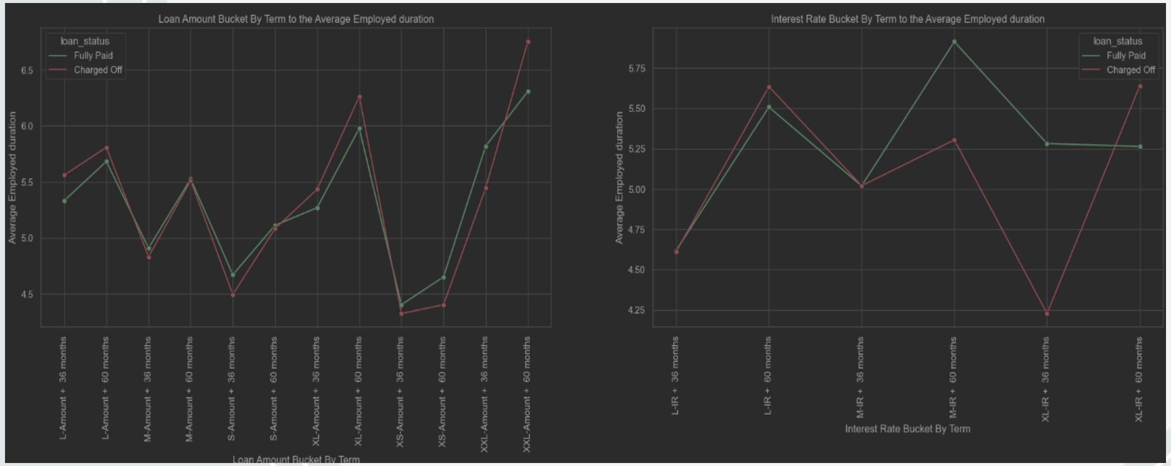
- The average employed duration of the customer has no bearing when taken against buckets of Loan amount by Loan term
- There does show a difference when done against buckets of interest rate by Loan term

M-IR (< 10 %) for 60-Month term defaults at lower employed duration (avg. 5.25 - 5.5)

XL-IR (20-30%) for 36 months terms defaults at even lower employed duration (avg. 4.25)

XL-IR (20-30%) for 60 months terms defaults at higher employed duration (avg. 5.5-5.75)

This might mean that longer terms might have stronger chance to leading to successful loans

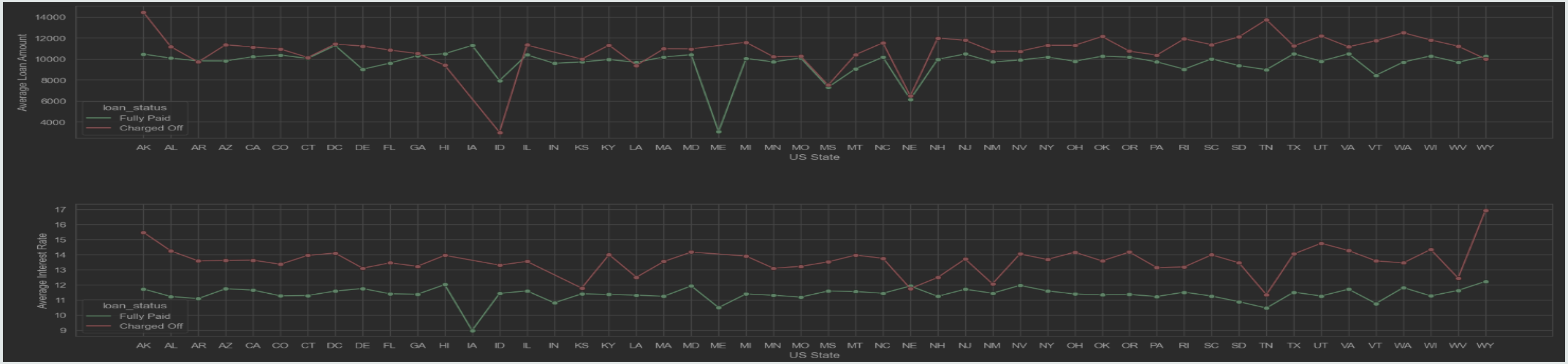


On Basis US State

- Most defaulted loans have interest rates roughly >= 14%
- ID has the highest average DTI for defaulted loans and hence defaults happen for lower loan amount as compared to other states
- TN has the lowest DTI (< 5) for defaulted loans, and they tend to have the same average interest rates for defaulted and completed loans
- The average income across states is generally higher for the completed loans as opposed to the defaulted loans

In General

- ***High Income states with low DTI can get lower interest rates***
- ***Low-income states with high DTI should get higher interest rates for their loans***


Average Loan Amount
14000
12000
10000
8000
6000
4000
loan_status
Fully Paid
Charged Off
AK AL AR AZ CA CO CT DC DE FL GA HI IA ID IL IN KS KY LA MA MD ME MI MN MO MS MT NC NE NH NJ NM NV NY OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY
US State
Average Interest Rate
17
16
15
14
13
12
11
10
9
loan_status
Fully Paid
Charged Off
AK AL AR AZ CA CO CT DC DE FL GA HI IA ID IL IN KS KY LA MA MD ME MI MN MO MS MT NC NE NH NJ NM NV NY OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY
US State


Average DTI
25
20
15
10
5
loan_status
Fully Paid
Charged Off
AK AL AR AZ CA CO CT DC DE FL GA HI IA ID IL IN KS KY LA MA MD ME MI MN MO MS MT NC NE NH NJ NM NV NY OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY
US State
Average Annual Income
70000
60000
50000
40000
30000
loan_status
Fully Paid
Charged Off
AK AL AR AZ CA CO CT DC DE FL GA HI IA ID IL IN KS KY LA MA MD ME MI MN MO MS MT NC NE NH NJ NM NV NY OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY
US State

Recommendations

- High DTI indicates higher risk so should be provided with higher Interest Rates
- Even if lower DTI, if there is no sufficient information of annual income, home-owner ship etc. should be considered a Riskier Loan
- At year end customer tend to take riskier loans and defaults. It might be better to avoid the holiday season or only take customers with good credit history during this time
- Balance should be struck between the loan term and the interest rate – Longer the term for moderate interest rate, the less chance the customer will default
- Customers with high salary and high DTI will most probably default when taking on large projects / investments
- High Income states with low DTI can get lower interest rates
- Low-income states with high DTI should get higher interest rates for their loans as they are riskier