GRAMENER CASE STUDY

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Abstract

Business Problem

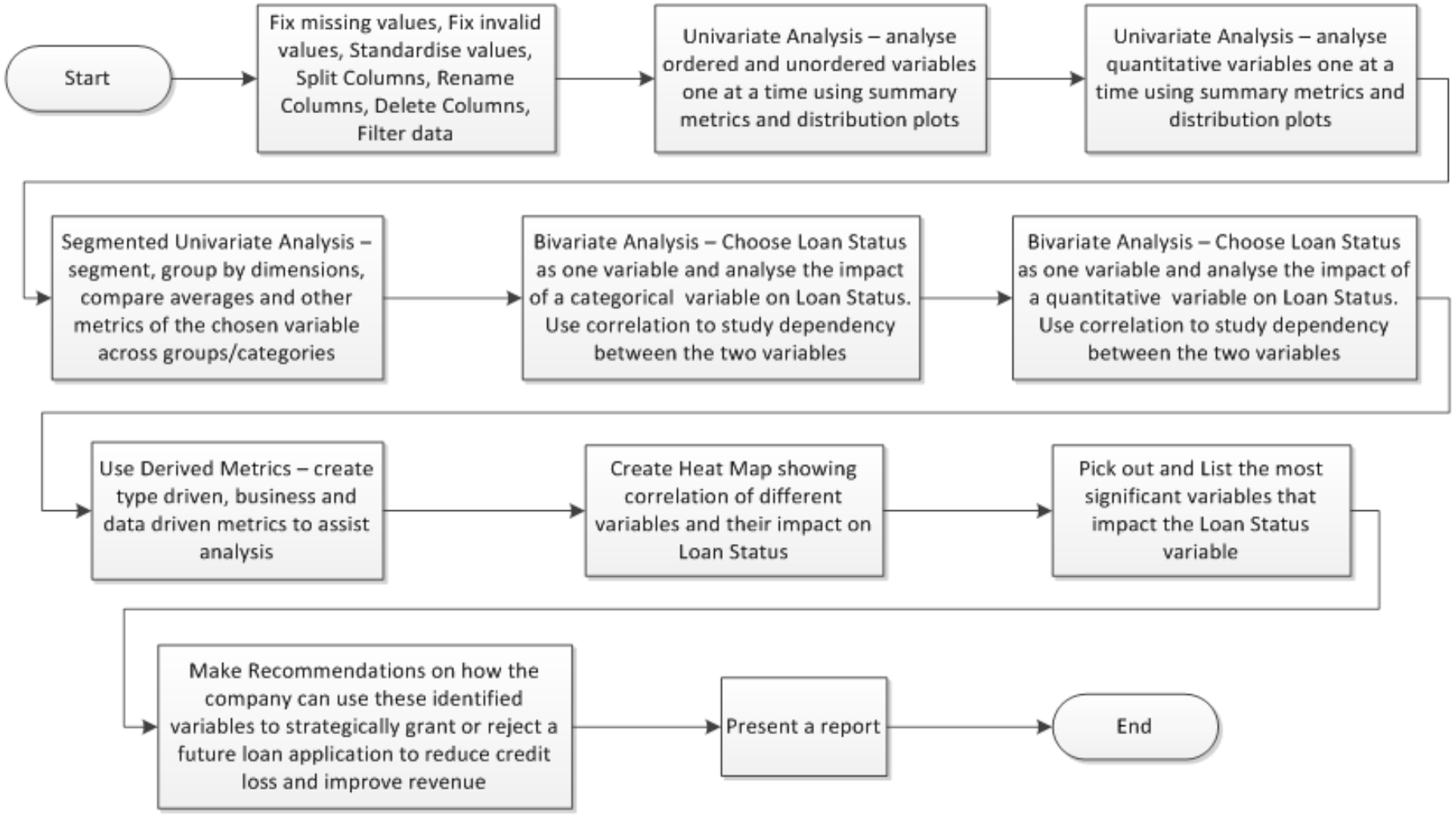
- Company faces a risk of losing money by lending to risky loan applicants
- Company may lose business if loan is not granted to an individual who is able to repay the loan
- How to minimise risk of losing money while lending money to customers

Objectives

Carry out research in risk analytics and conduct analysis using data from previous loan applicants to,

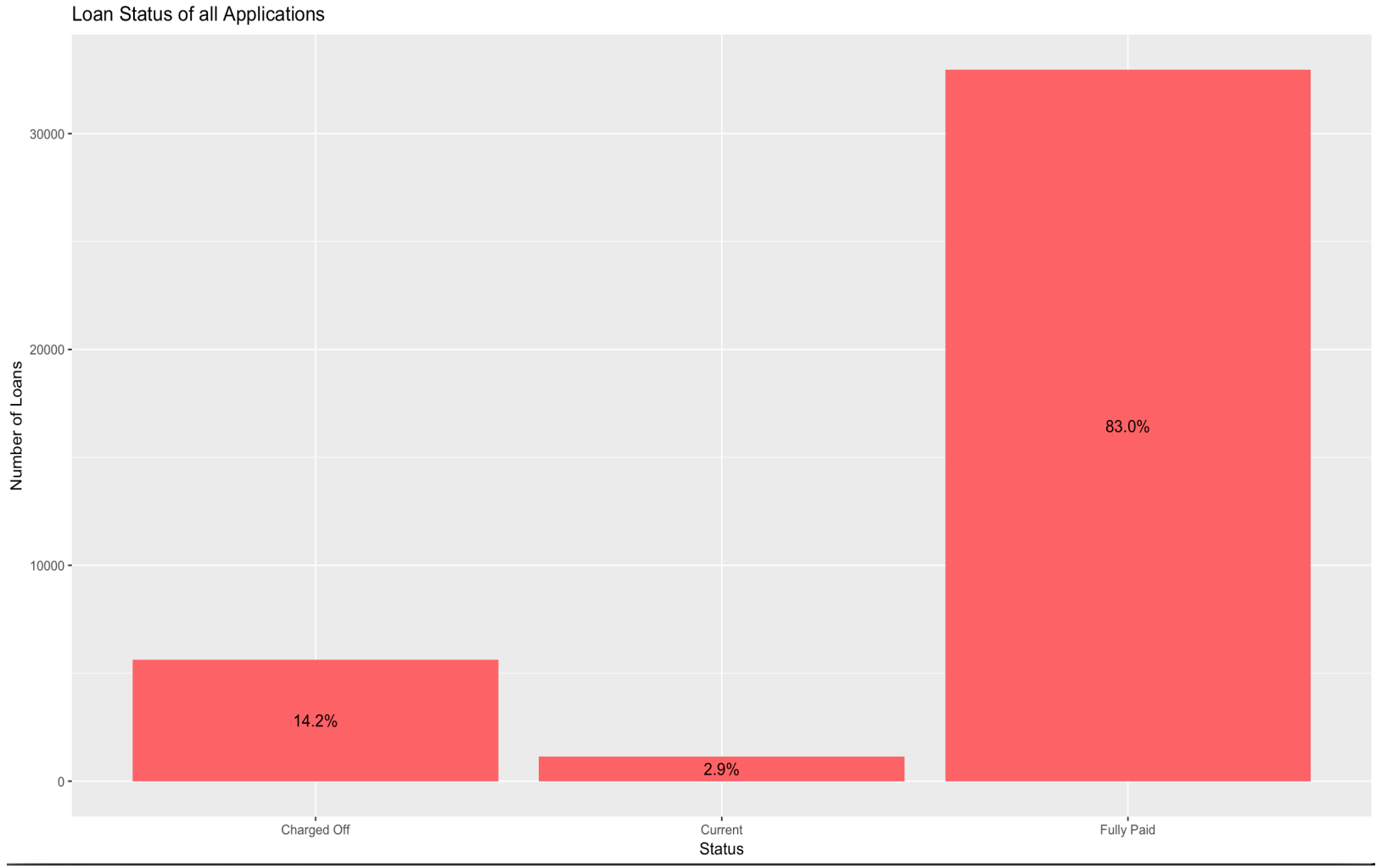
- Understand the consumer and loan attributes that influence the tendency to default
- Identify driving factors behind loan default
- Identify borrowers who are capable of defaulting on their loans
- Identify risky loan applicants
- Reduce credit loss to company by not lending loans to risky applicants

Problem Solving Methodology



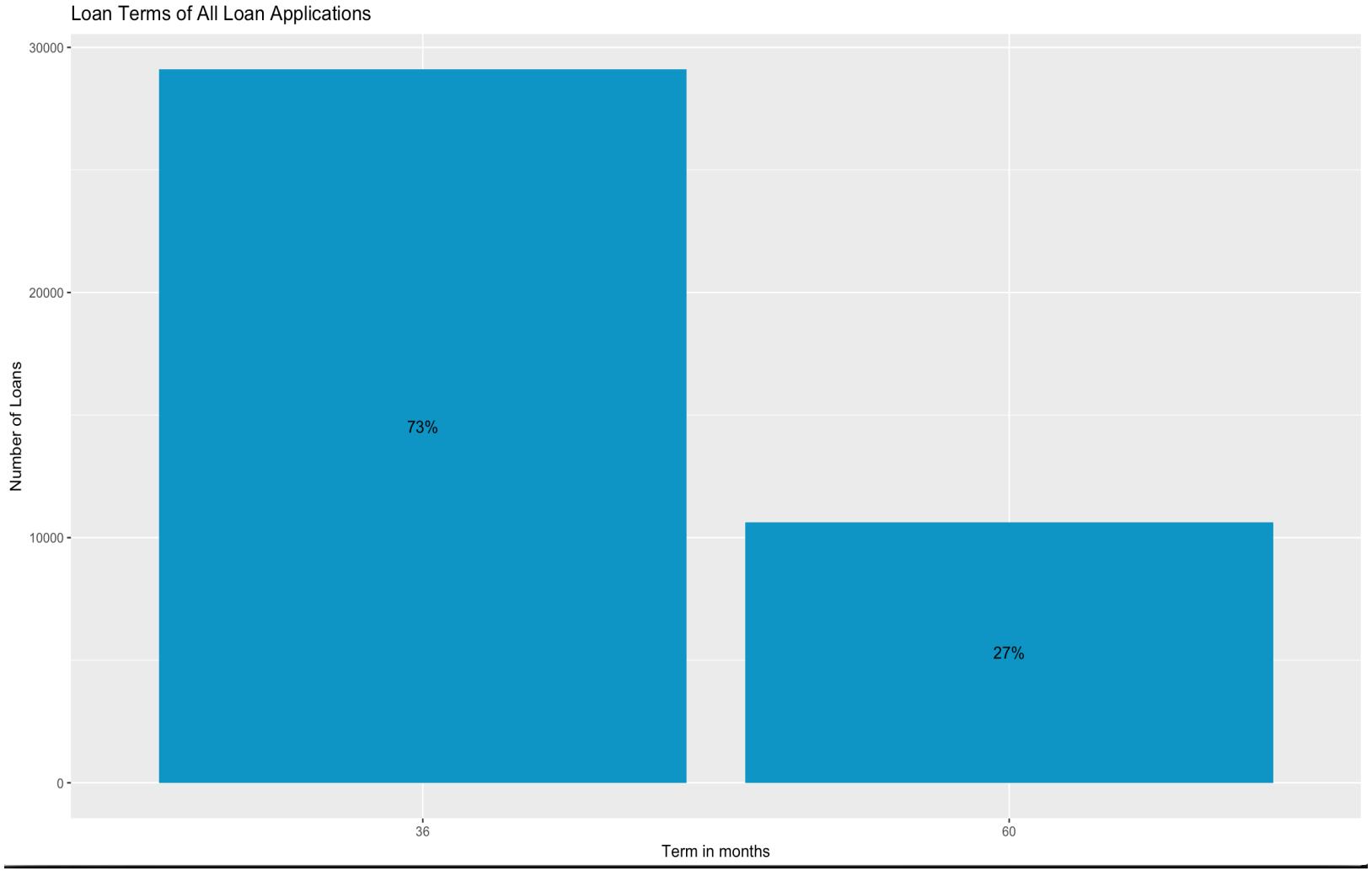
Univariate Analysis – Loan Status

- 83% of the total loans were Fully Paid by customers.
- **14.2% of total customers defaulted on their loans.**



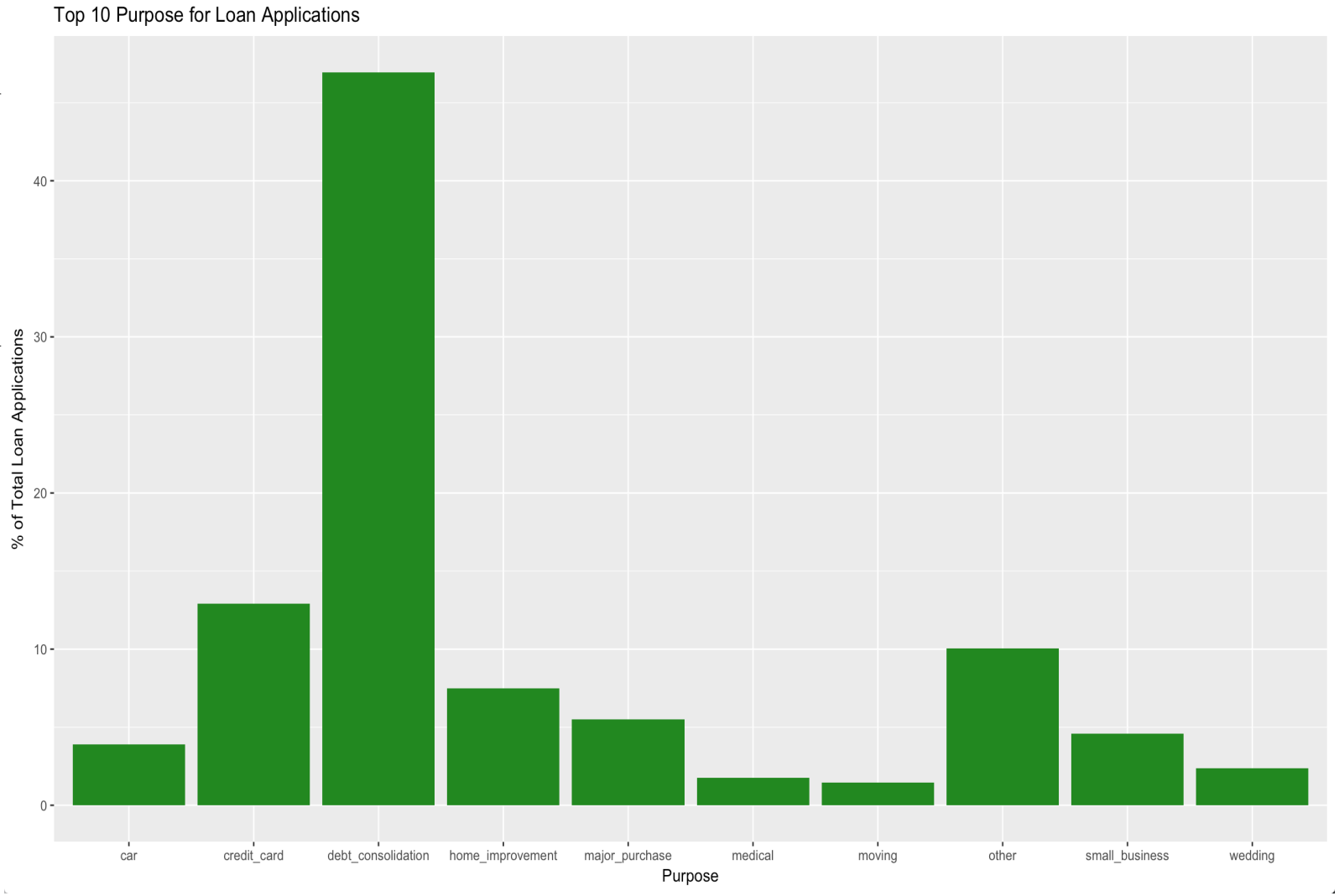
Univariate Analysis – Loan Term

- 73% of people chose a loan term of 3 years i.e 36 months
- 27% of people chose a long term loan of 5 years ie 60 months



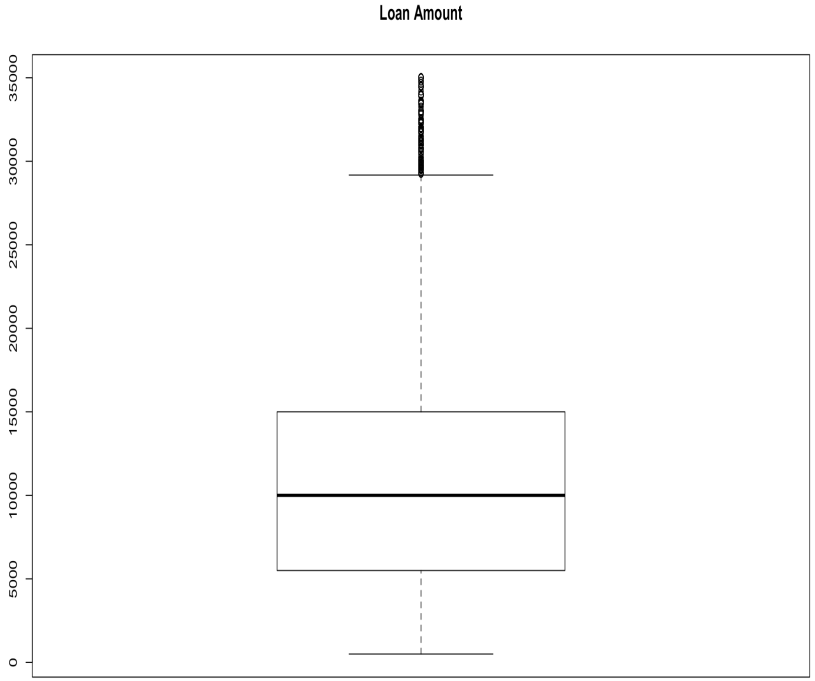
Univariate Analysis – Loan Purpose

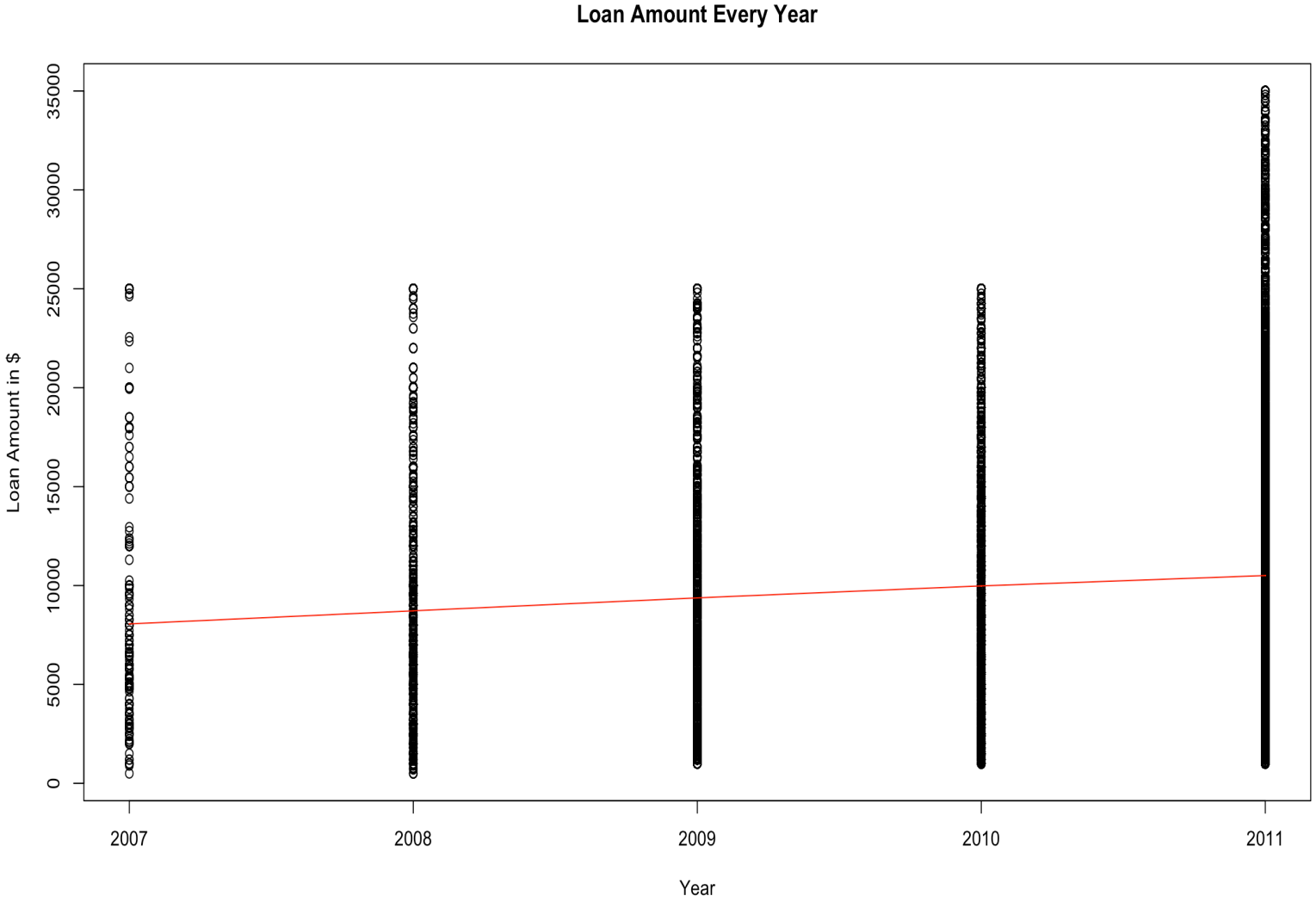
- 47% of people applied for a loan for the purpose of Debt Consolidation
- 13% of people applied for a loan for the purpose of Credit Card
- Other popular reasons include Home Improvement, Major Purchase, Small Business, Car, Wedding, Medical and Moving



Univariate Analysis – Loan Amount

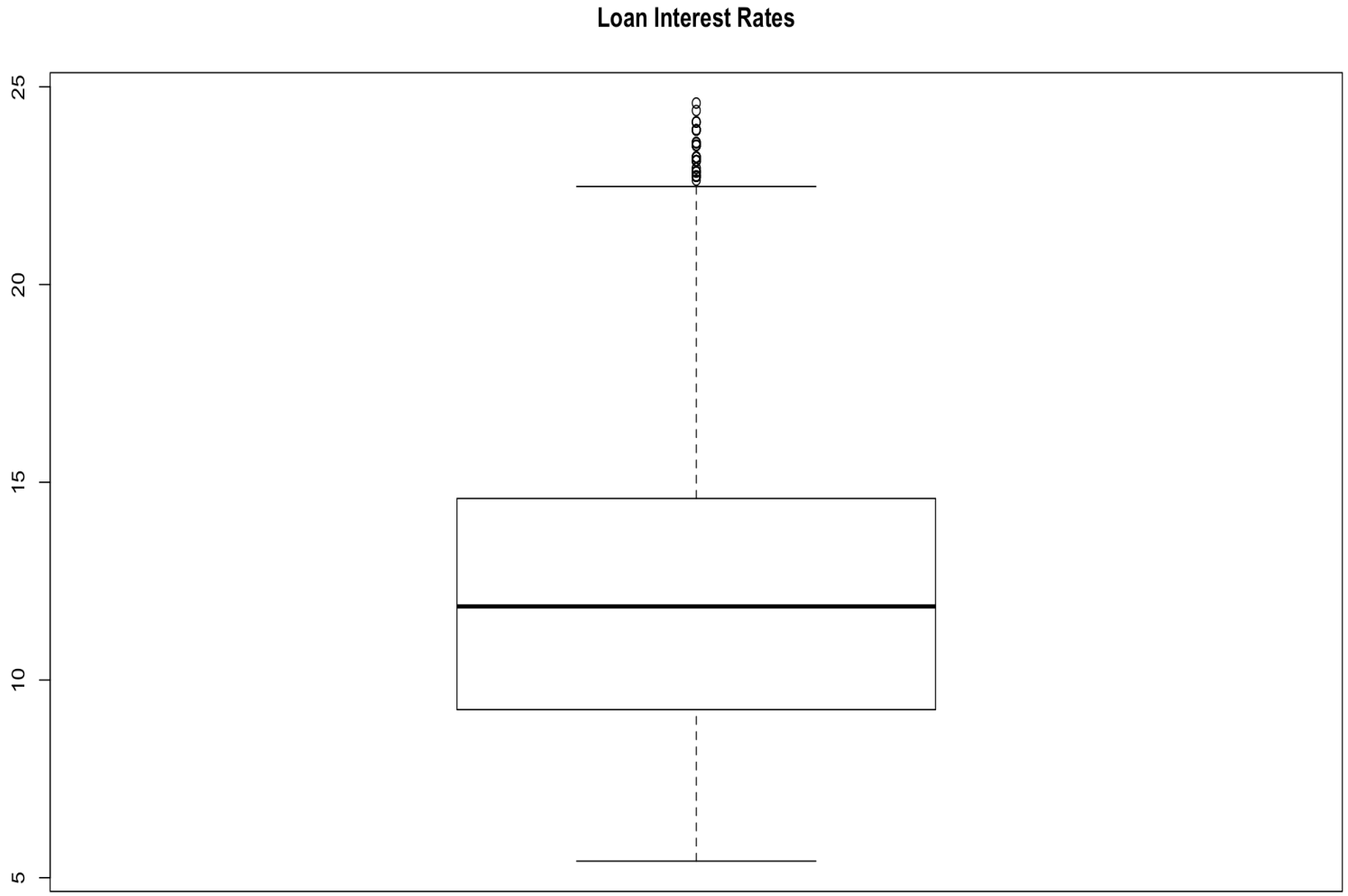
- Average loan amount is $10000
- Average Loan amount has been increasing each year and shows a steady positive trend





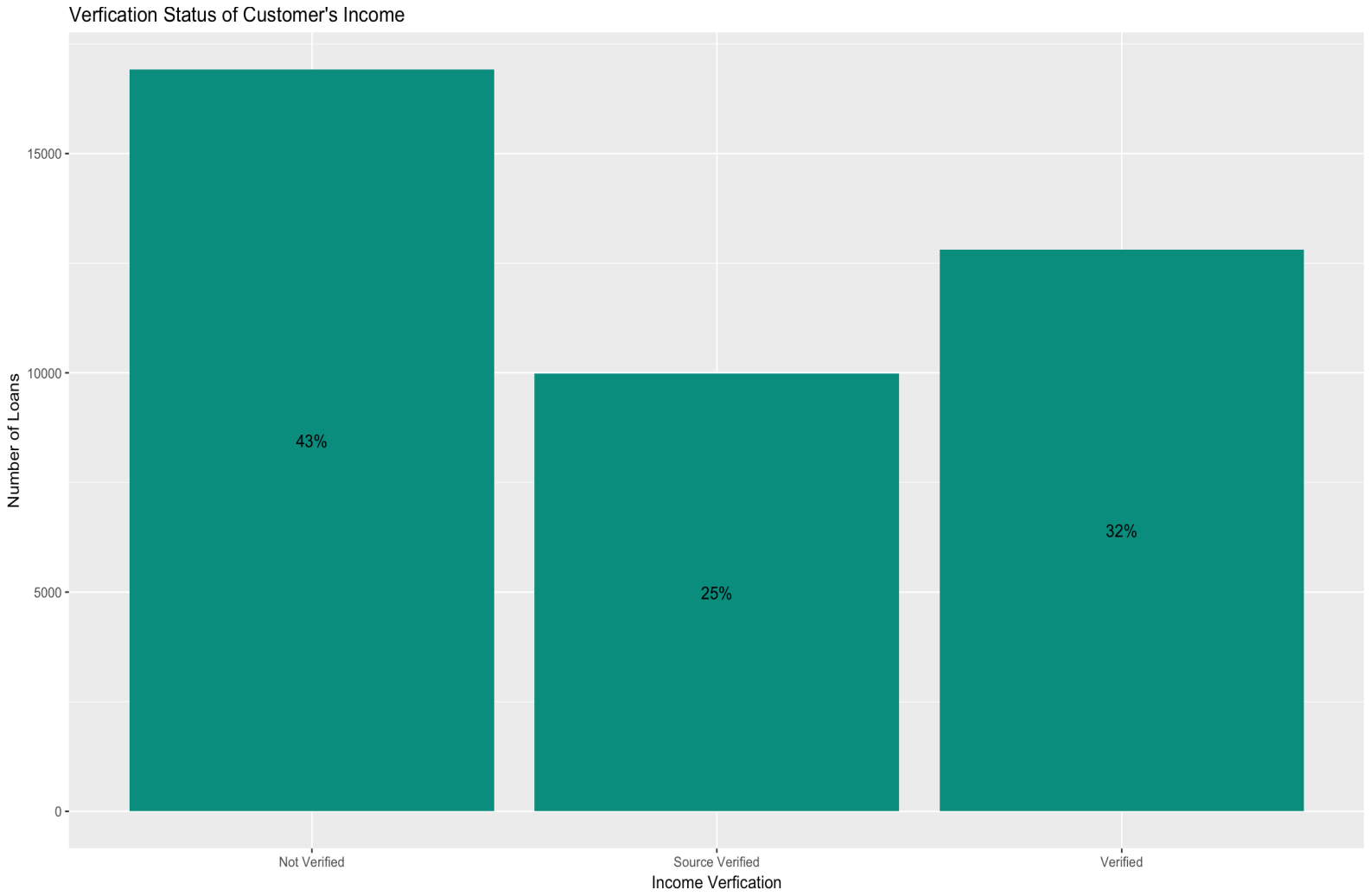
Univariate Analysis – Loan Interest Rate

- Average interest rate for a loan is 12%
- There are 9832 customers out of a total 39717 who have loans with interest rate in excess of 14.6
- Nearly 25% of loans have a high interest rate



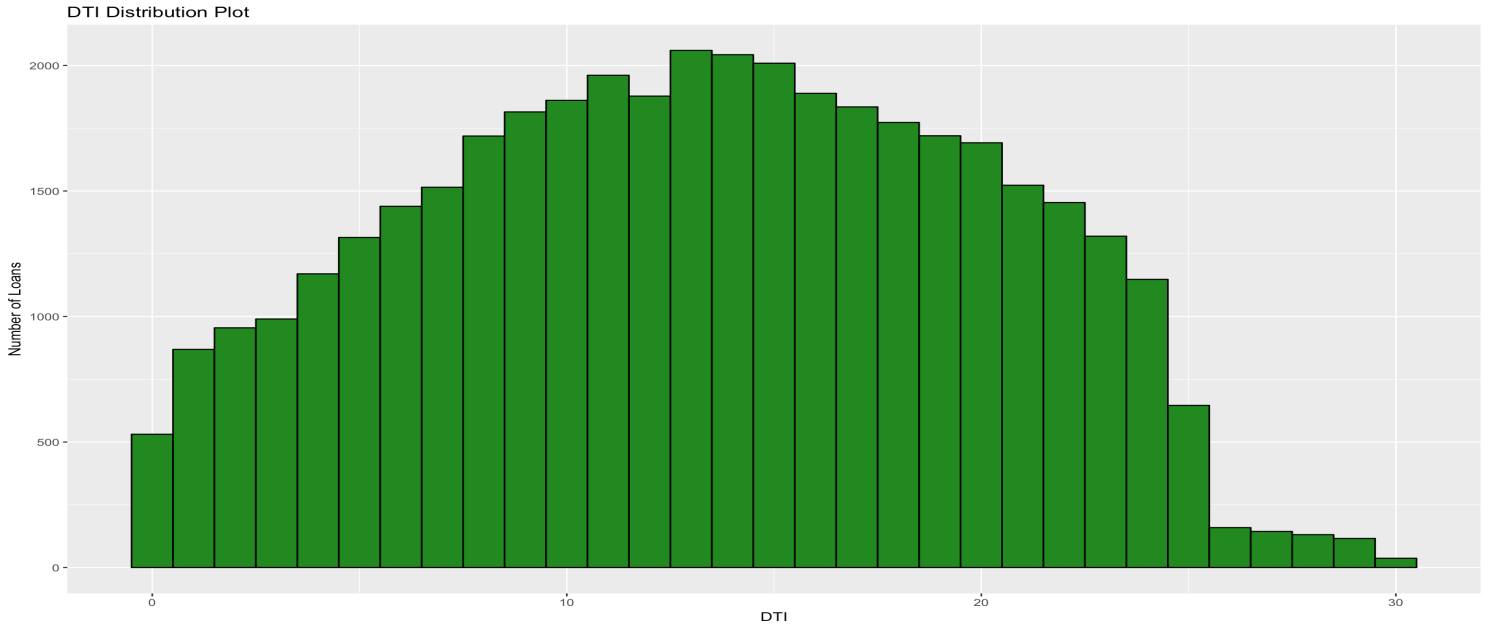
Univariate Analysis – Verification Status

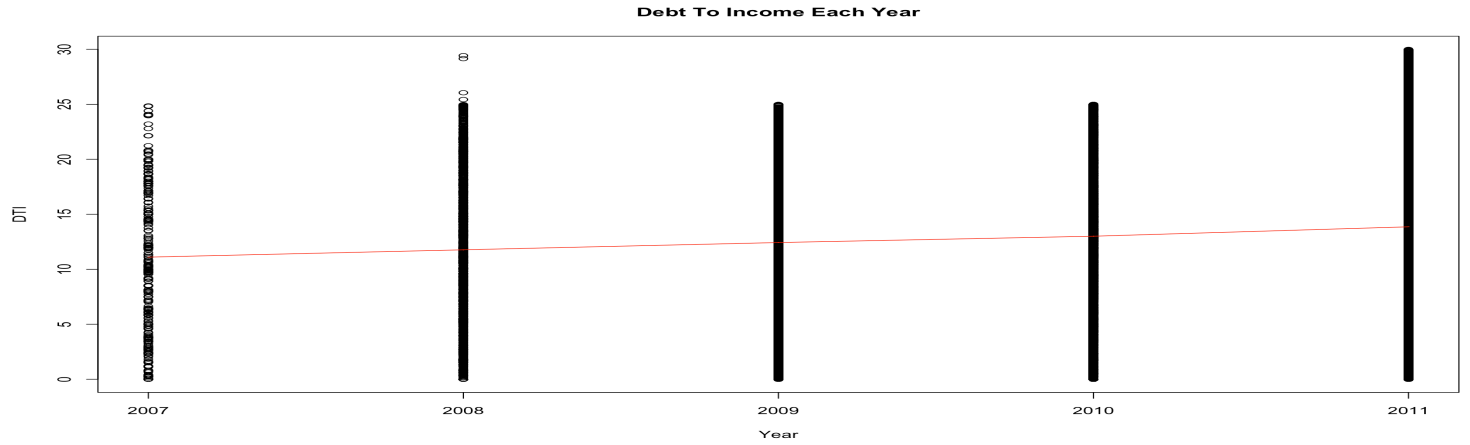
- 43% of loans did not have either the customer's income or its source verified
- 25% of loans had both the customer’s income and its source verified
- 32% of loans had the customer’s income verified but not its source



Univariate Analysis – Debt To Income

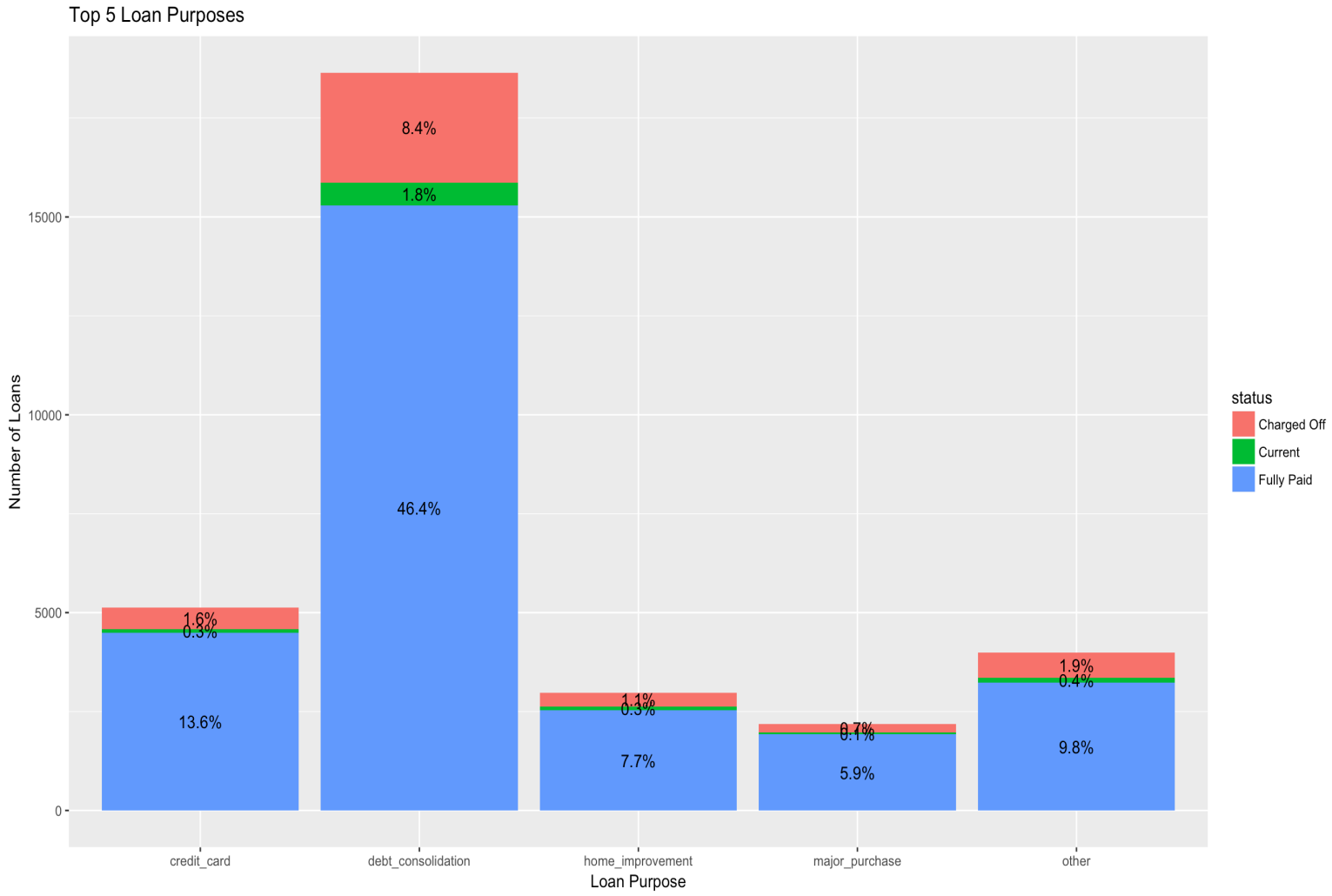
- Average DTI of loan applicants was 13
- Debt in the population is growing as there is a steady increase in DTI every year





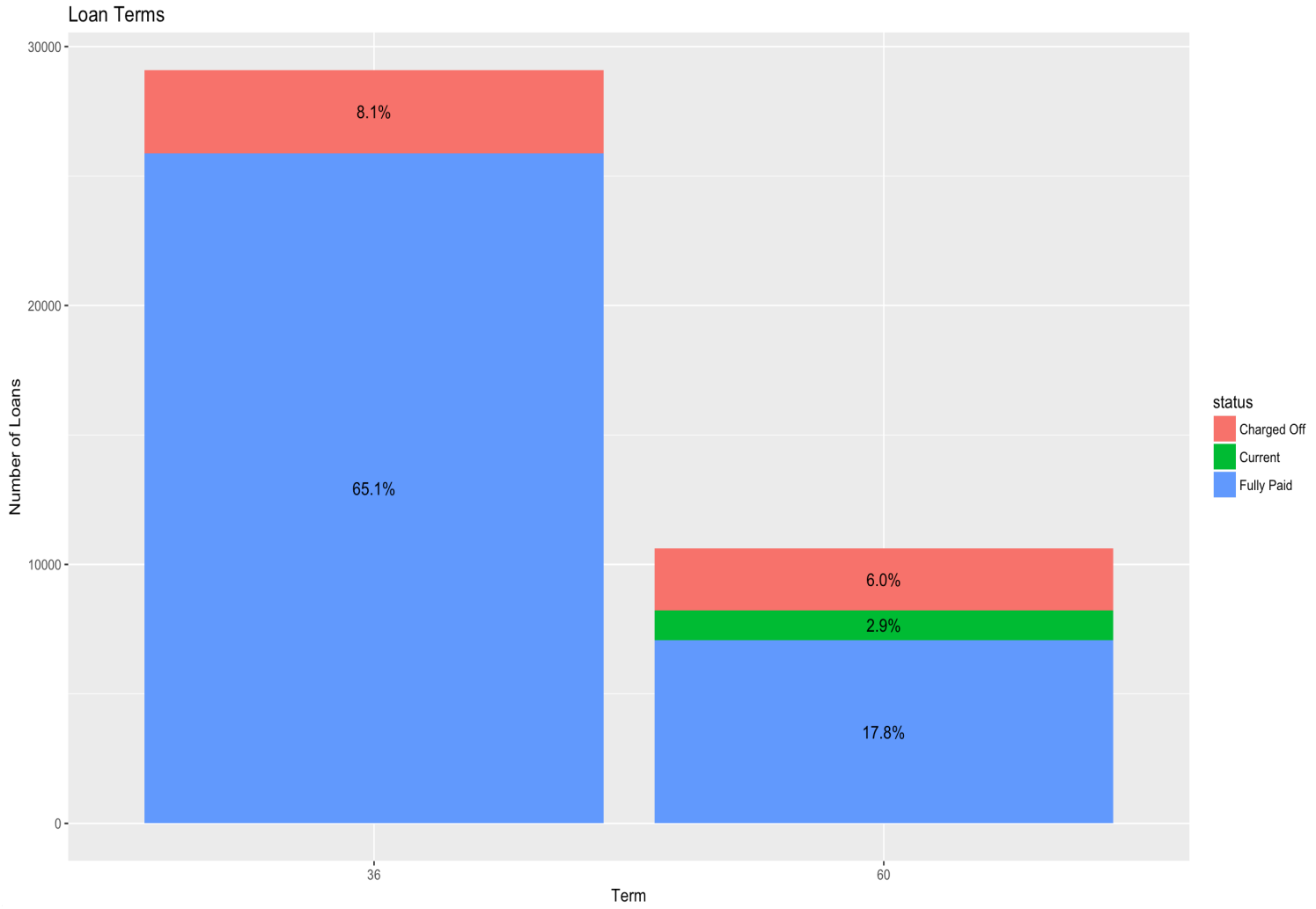
Bivariate Analysis – Purpose vis-à-vis Status

- 57% of people borrowed loan for debt consolidation and 8% of those defaulted on their loans
- Highest defaulters were when the purpose for loan was Debt Consolidation
- A total of 10% people defaulted when purpose for loan was either debt consolidation or credit cards



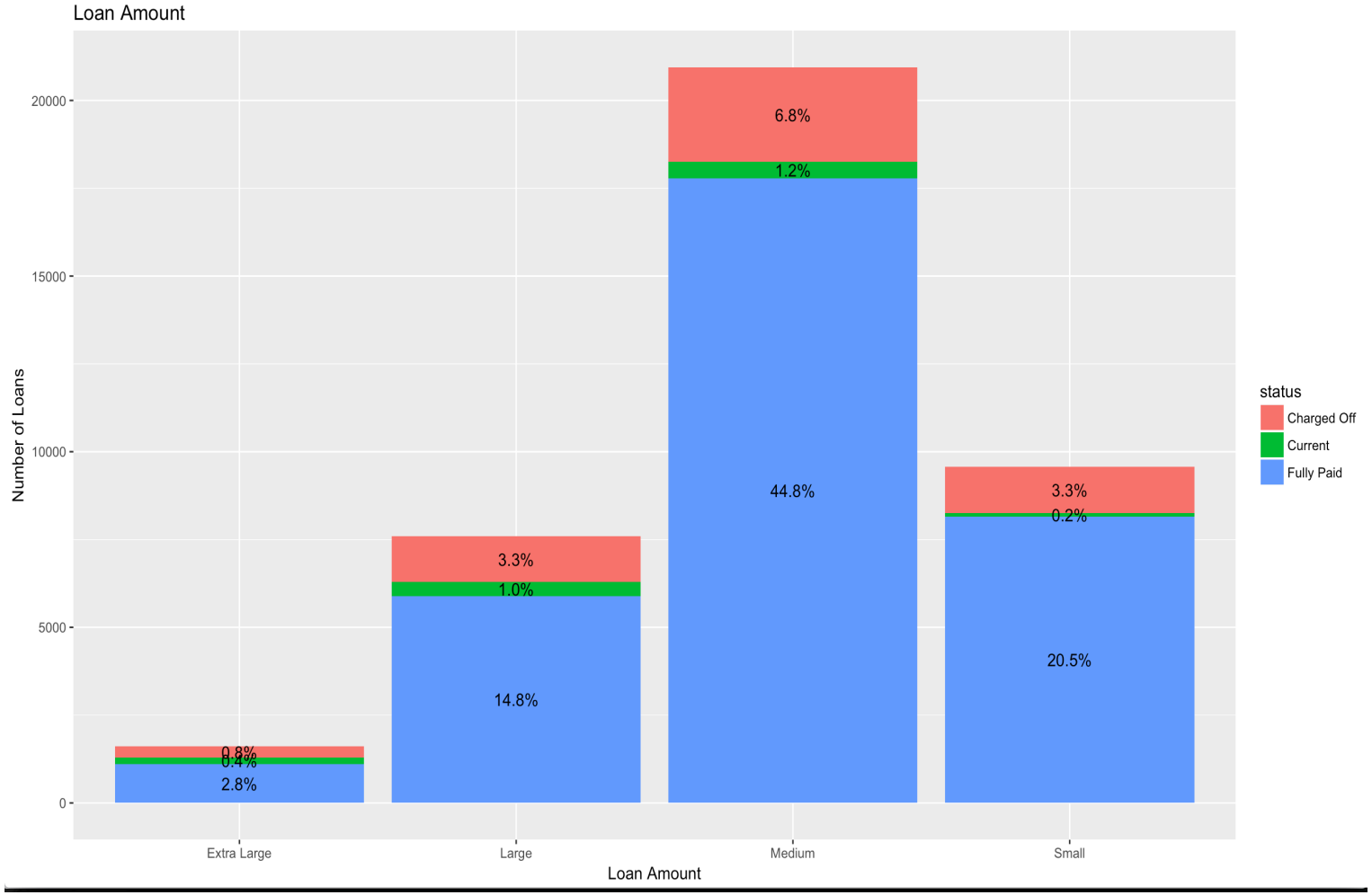
Bivariate Analysis – Term vis-à-vis Status

- 73% of applicants applied for a 3 year loan compared to 27% people who required a 5 year loan
- 8.1% of people defaulted when loan term was 36 months and 6% of people defaulted when it was 60 months
- If loan term in months increases there is a tendency for customers to default on their loans
- Customers on a longer duration loan term tend to be more risky



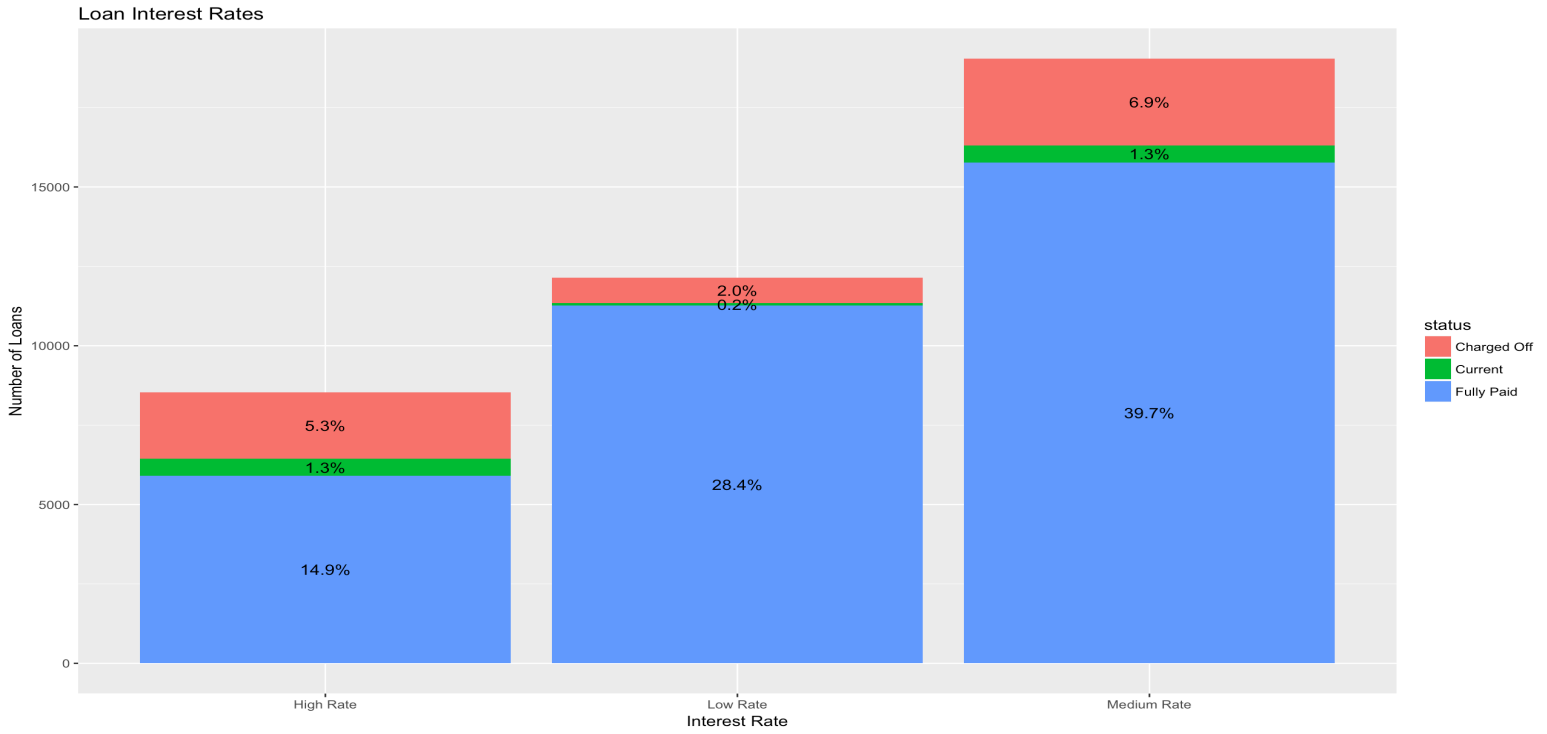
Bivariate Analysis – Amount vis-à-vis Status

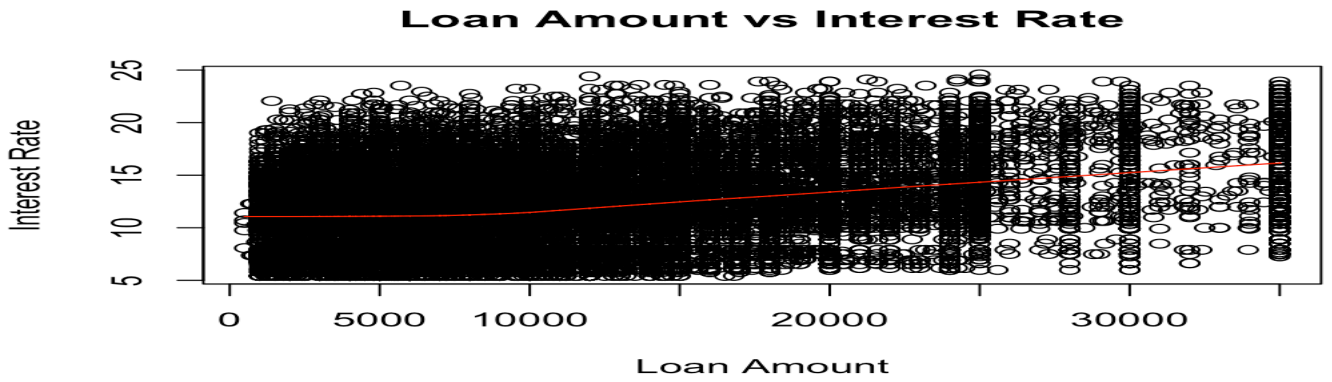
- More that 50% of the loan amounts were between $5000 and $15000 i.e Medium group
- Nearly 7% of the customers in the medium loan group defaulted
- There is a positive relationship between the two variables
- As the loan amount increases there is tendency for customers to default



Bivariate Analysis – Interest Rate vis-à-vis Status

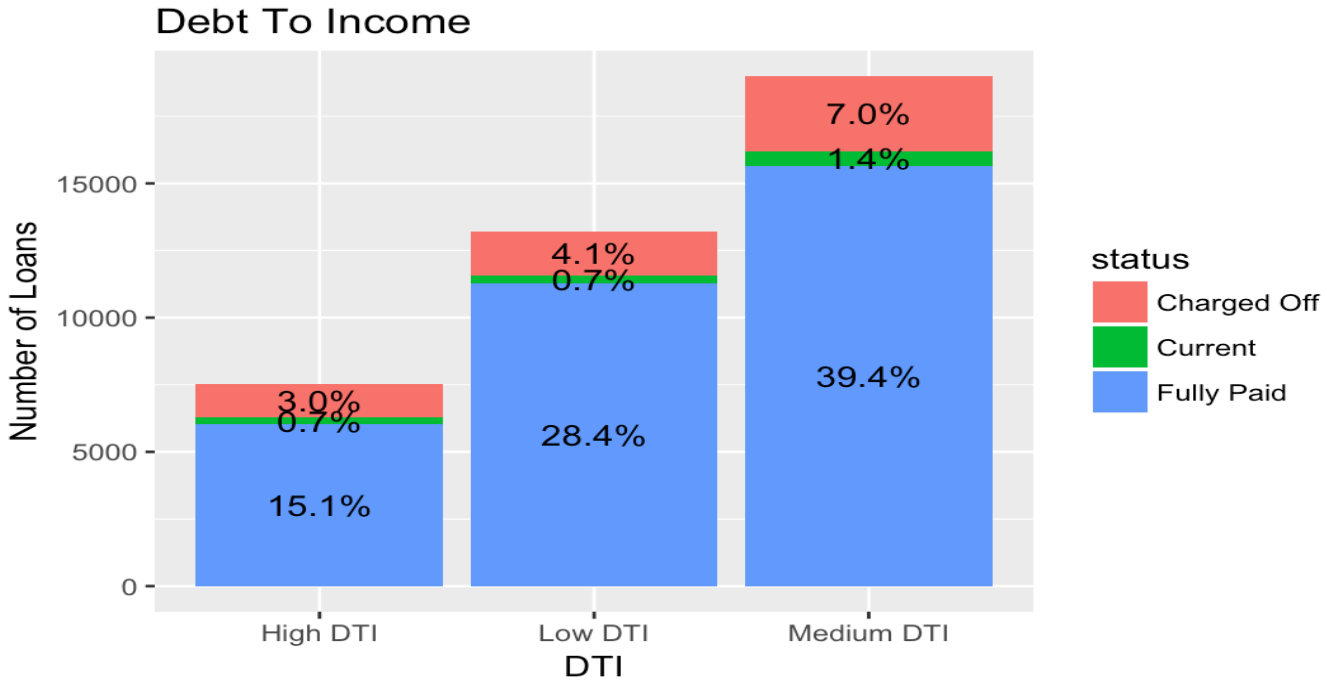
- Nearly 48% of customers have a medium loan rate i.e between 10% and 15% interest rate
- Only 2% of customers with low interest rate i.e below 10% defaulted on their loans
- Default rate is highest (6.9%) when loan rate is medium
- Around 20% of customers were on a high loan rate i.e above 15%.
- Nearly 5% of the high loan rate payers defaulted
- When Loan amount increases after $5000 the interest rate increases steadily

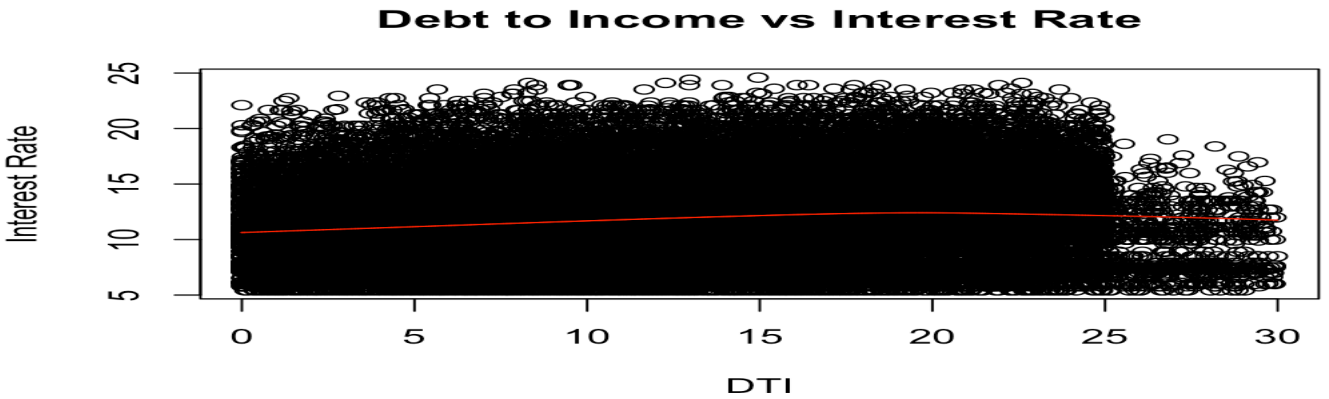




Bivariate Analysis – DTI vis-à-vis Status

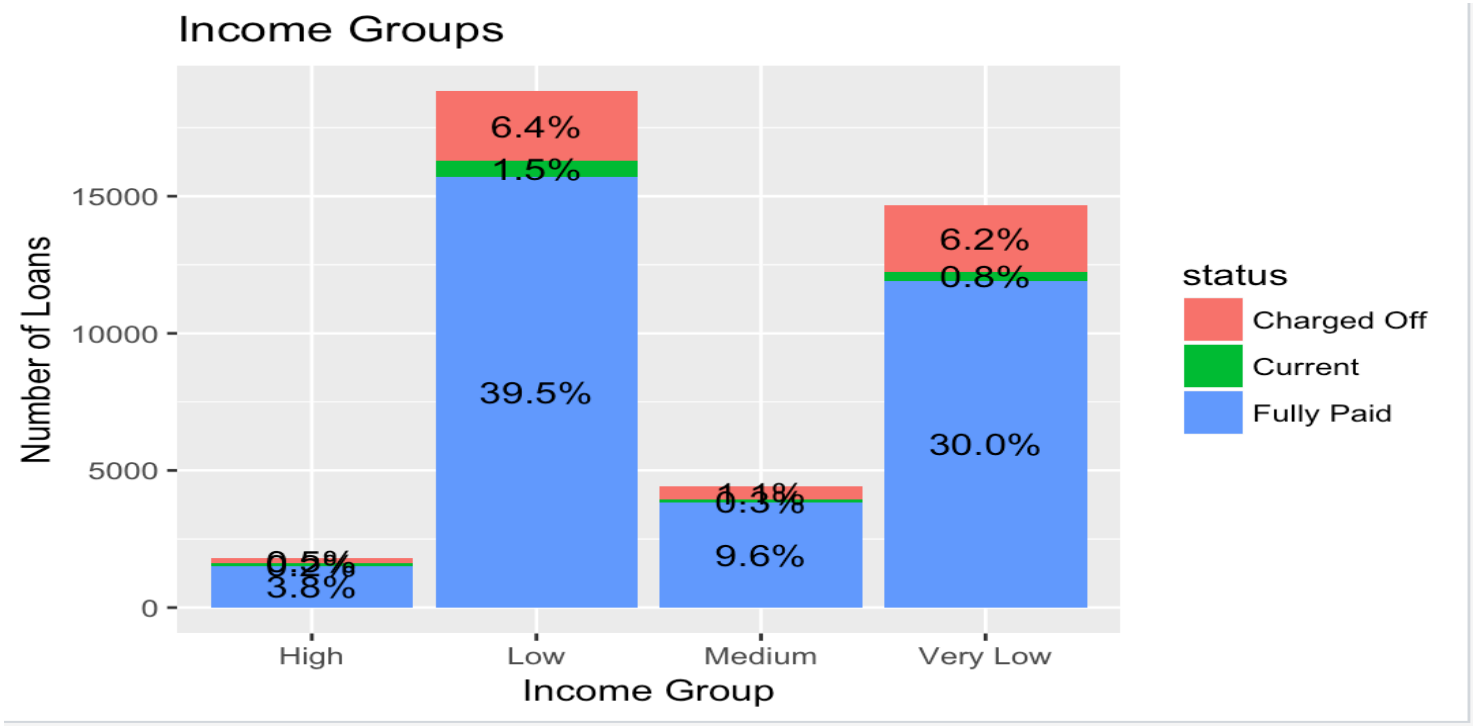
- Nearly 48% of loans had Medium (>=10 and <20) DTI percentage. Around 7% of these defaulted on their loans
- Only 3% of people with a High (>=20) DTI percentage defaulted on their loans
- When the DTI of a customer increases then the loan rate tends to marginally increase

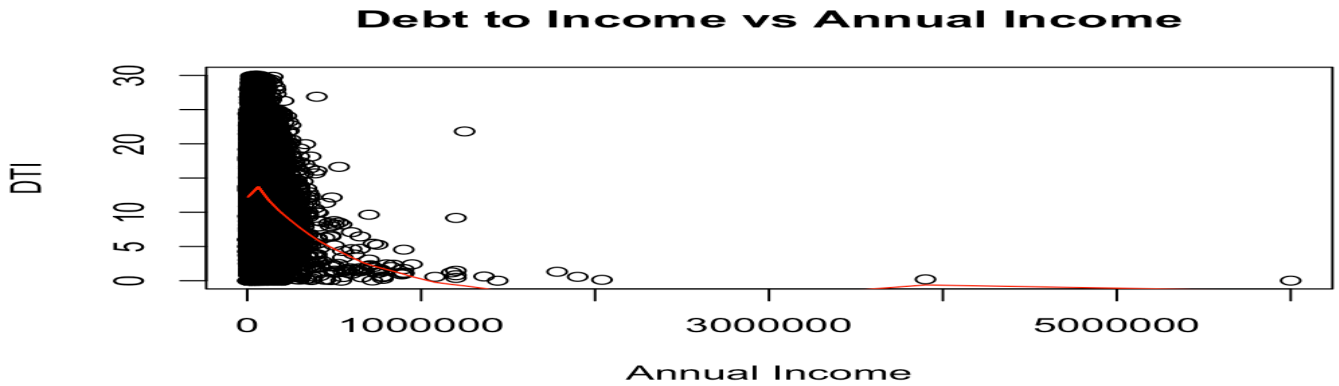




Bivariate Analysis – Annual Inc vis-à-vis Status

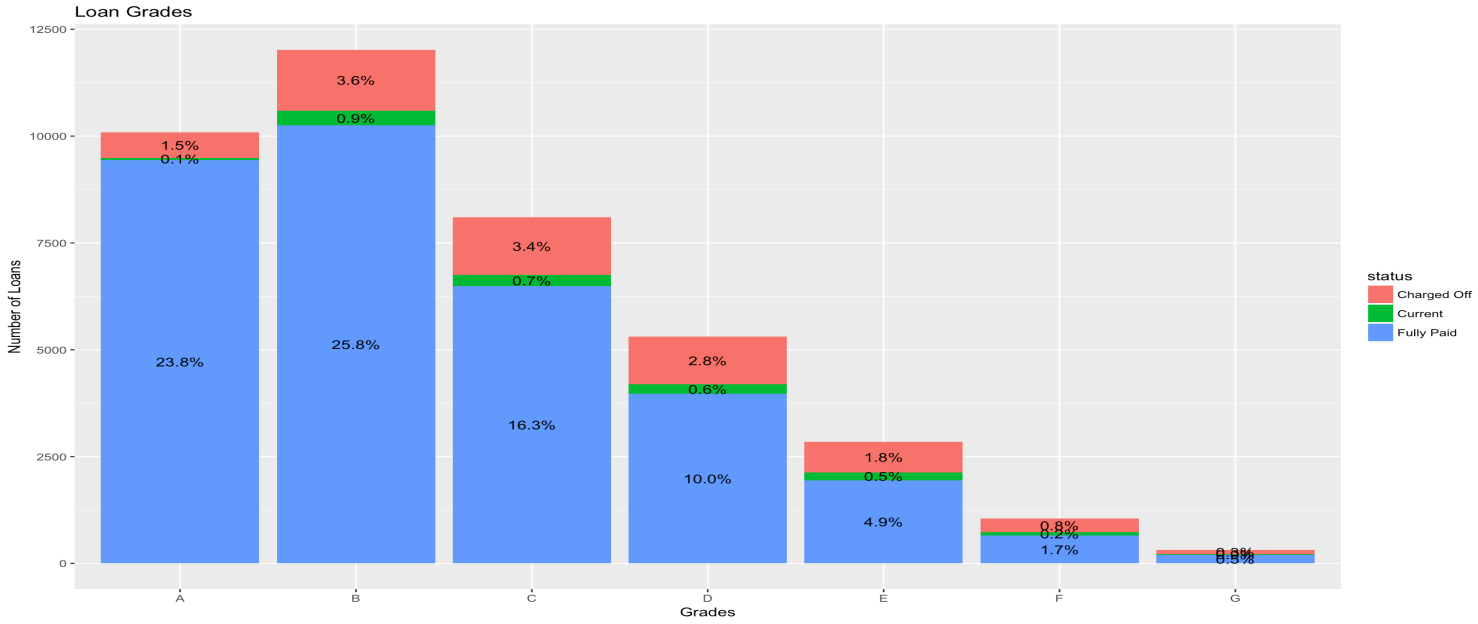
- 84% of the borrowers were in very low and low income groups
- Default rate was 6% in both very and low income groups
- Risk of default is high in very low and low income groups and low in High income group
- When annual income increases the debt to income tends to decrease

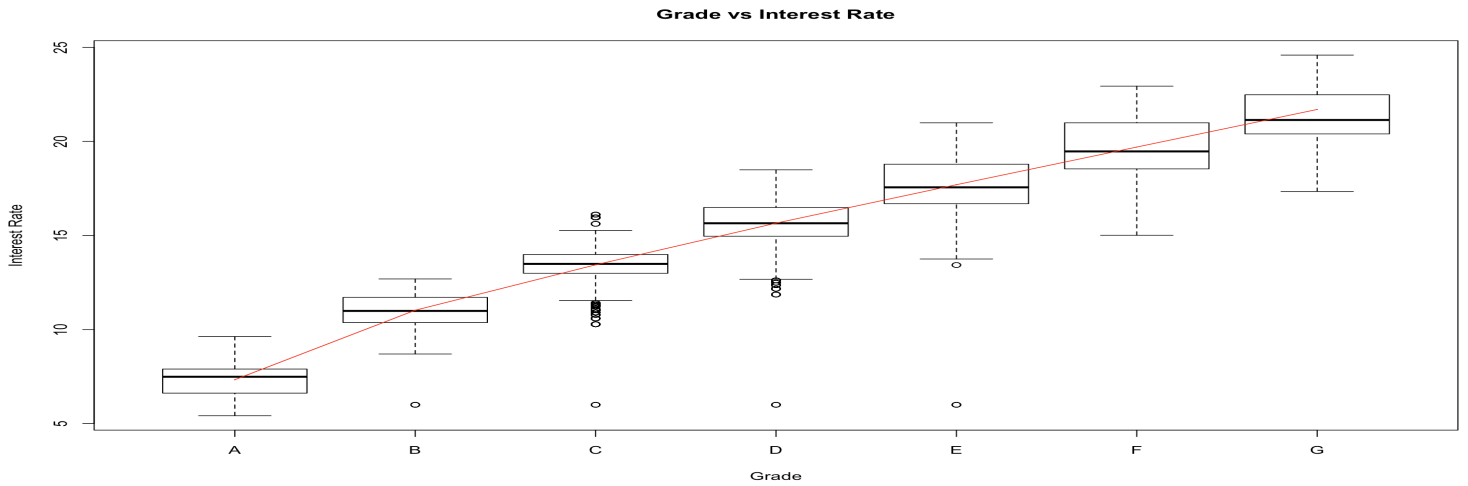




Bivariate Analysis – Grade vis-à-vis Status

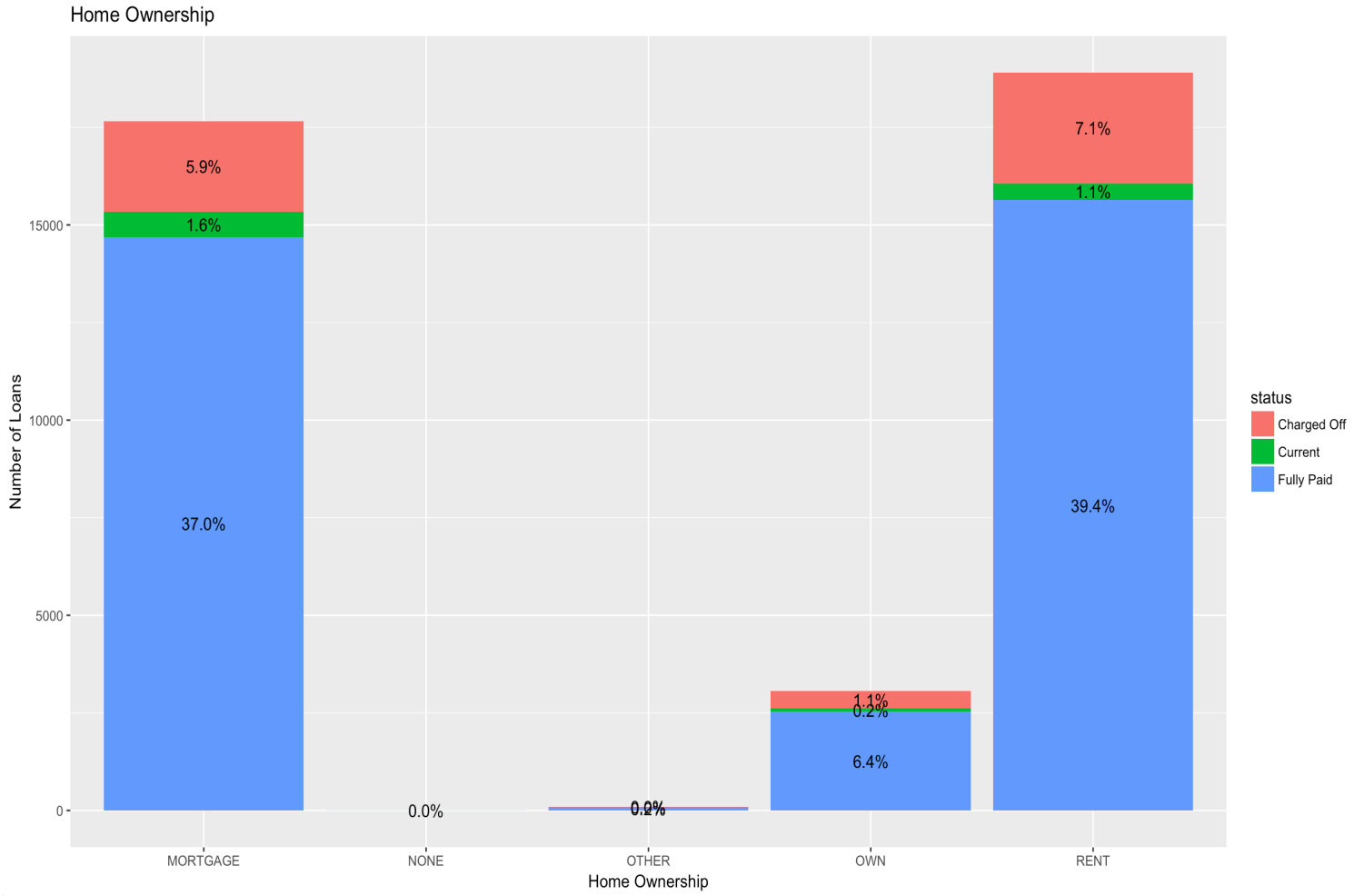
- Maximum number of loans were in grade B, which accounts to 31% of all loans
- Most number of defaults were in Grades B and C
- When loan grade decreases interest rate increases steeply
- Default risk increases as loan grade decreases





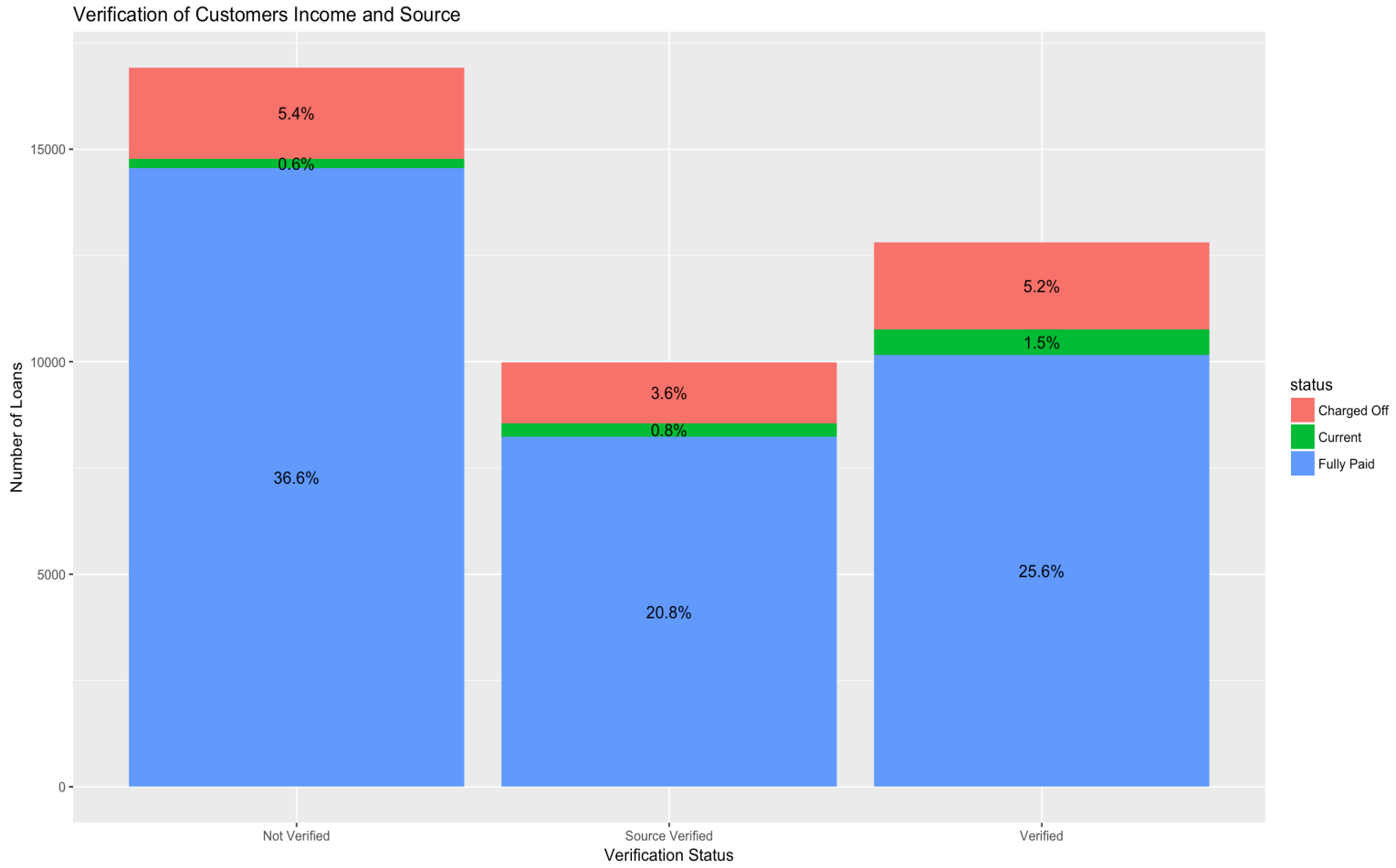
Bivariate Analysis – Home vis-à-vis Status

- 47.6% of loan applicants lived in rental homes and 7.1% of these customers defaulted
- 44.5% of customers were currently paying mortgage and out of which 5.9% defaulted on their loans
- Only 1.1% of customers who owned their property defaulted on their loans
- Customers living on rent or paying mortgages have more tendency to default than people who own a property
- If customers are owners of a property then the chance of defaulting decreases



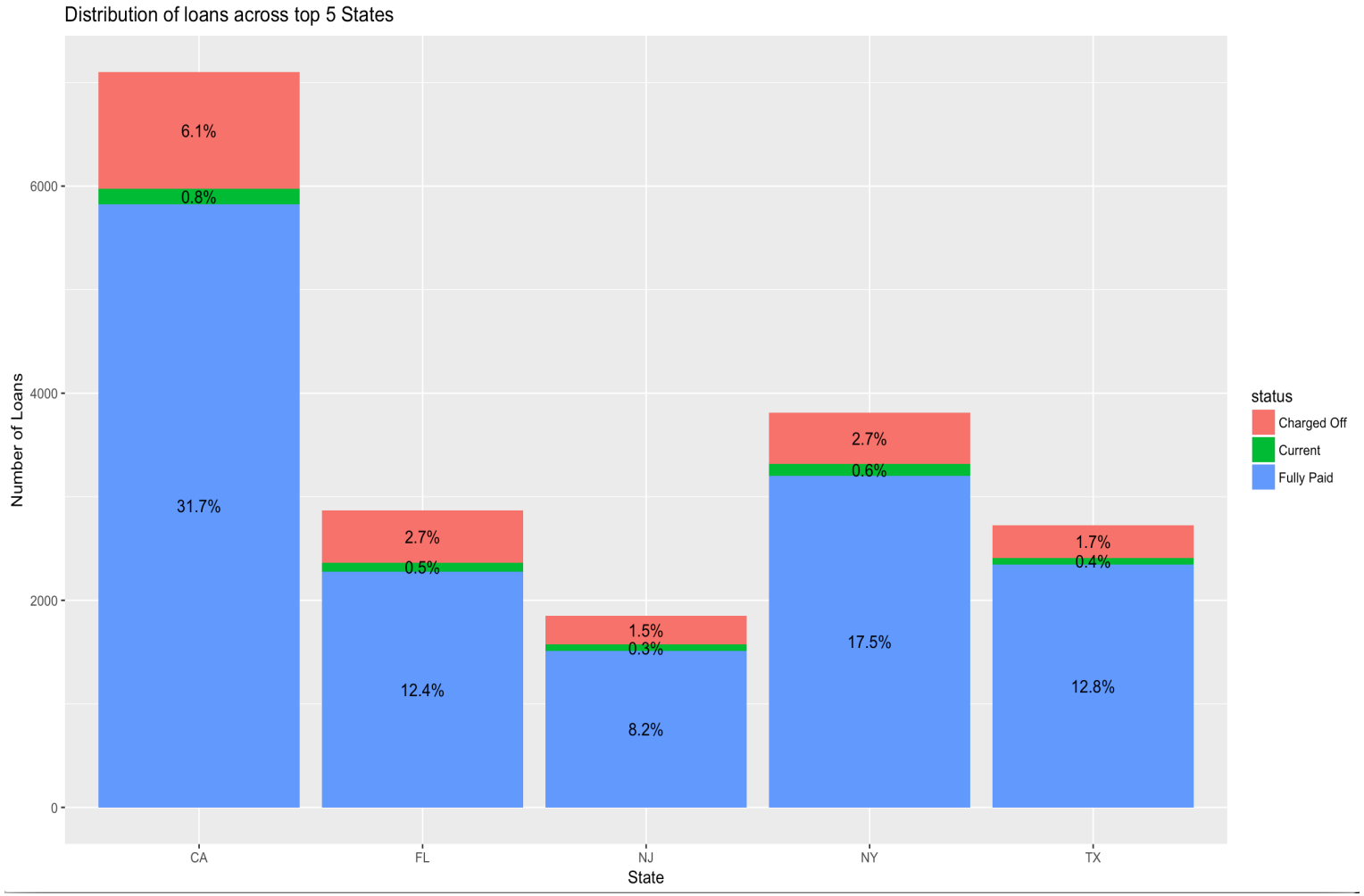
Bivariate Analysis – Verification vis-à-vis Status

- 5.4% Defaulted when customer's income was not verified
- Low default rate of 3.6% when the customer's source of income was verified



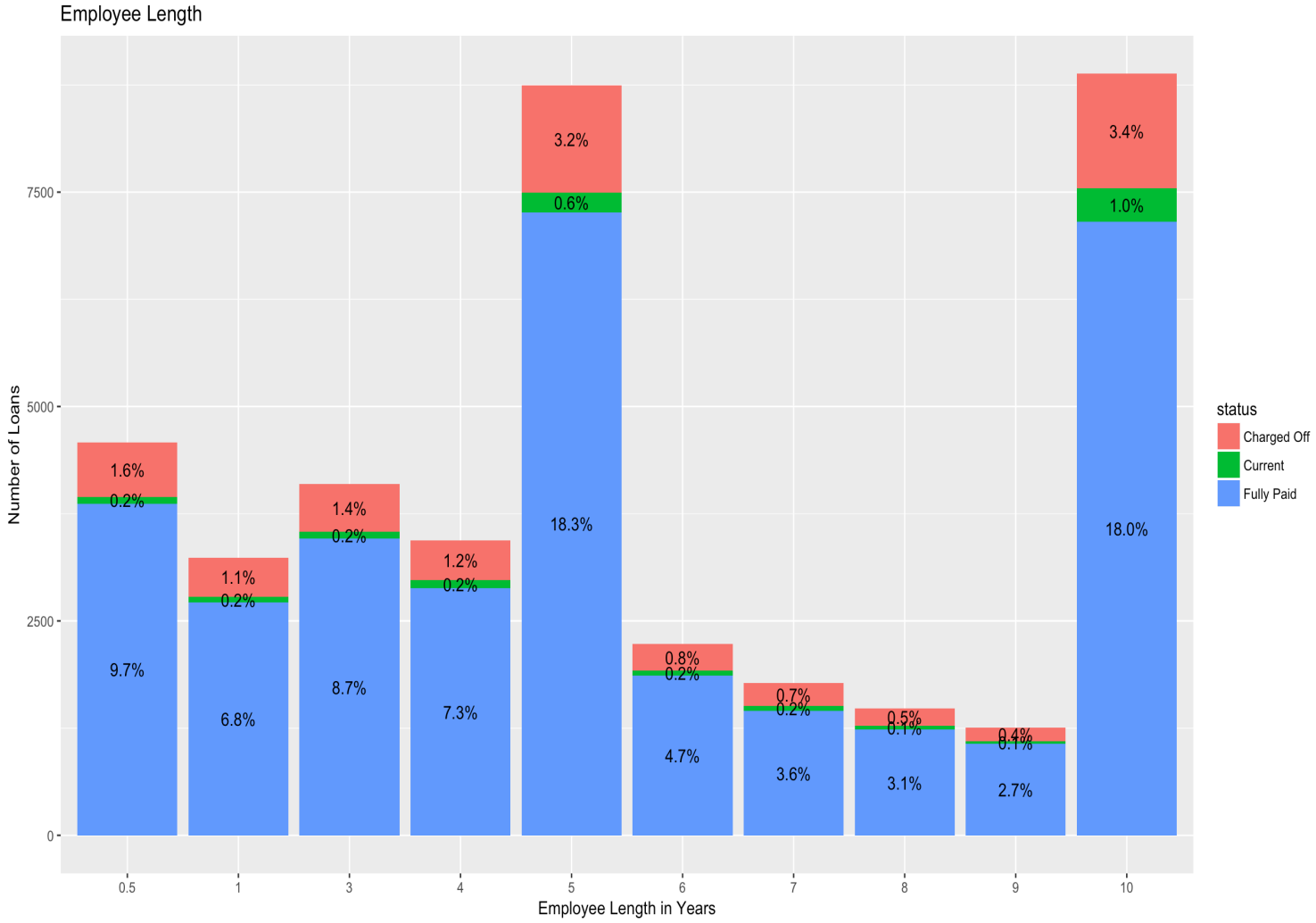
Bivariate Analysis – State vis-à-vis Status

- Top 5 states for loan applications were CA, NY, FL, TX and NJ
- CA had the most defaulters of 6.1% followed by NY of 2.7% and FL of 2.7%

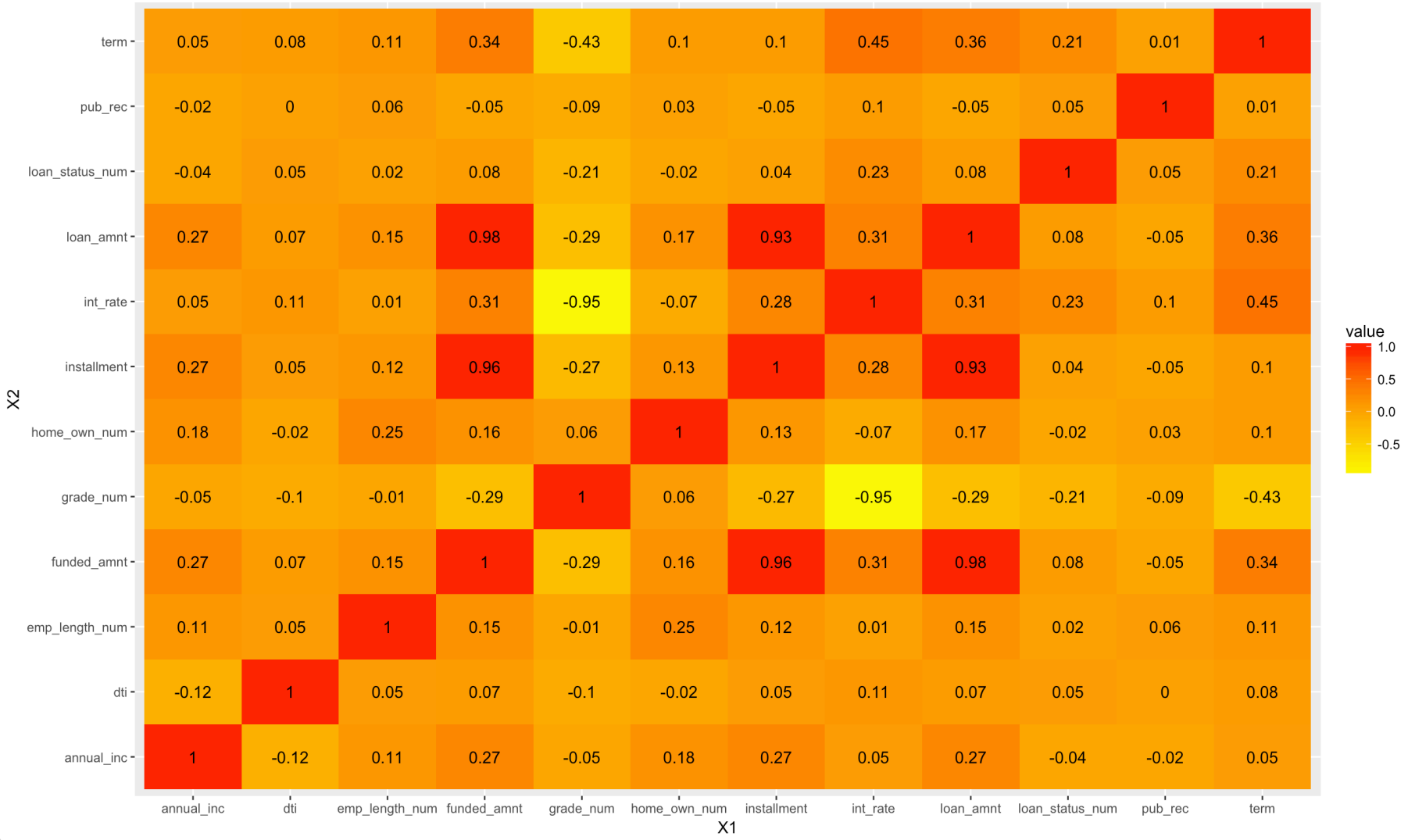


Bivariate Analysis – Emp Length vis-à-vis Status

- Employee length was below 5 years for 50% of loans
- 22% of loans were taken by customers who had over 10 years of experience
- There is a higher tendency to default on the loans when employees length of work is less than 5 years



Multi-Variate Analysis – Heat Map



Key Observations From Heat Map

- Risk of default increases when Interest Rate on the loan increases
- Tendency to default on a loan increases when the loan Term increases
- When loan Grade decreases then the potential to default on the loan increases
- Higher loan amounts are riskier and increase the chances of default
- Customers with a higher Debt To Income percentage are more riskier
- Customers with derogatory Public Records are more riskier
- Customers with a low or very low Annual Income have a higher tendency to default
- Customers who own their Home have a lesser tendency to default compared to living on Rent or paying Mortgage
- Customers with a low employment length have a higher tendency to default

Significant Customer Attributes

Analysis of Consumer attributes from the data has highlighted the following attributes that are key drivers for default.

Key Customer attributes for Loan Default are:

	Relationship with Loan Default	Effect of variable on Loan Status
Debt To Income	+0.05	Higher the DTI more riskier the customer becomes
Public Record	+0.05	A customer with derogatory public record has a higher chance of defaulting
Annual Income	-0.04	Customer with a high annual income tends to be less riskier
Employee Length	+0.02	Customer with a low employee length tends to be more riskier
Home Ownership	-0.02	Home owners are less riskier then living on rent or paying mortgage

Significant Loan Attributes

Analysis of Loan attributes from the data has highlighted the following attributes that are significant drivers for default.

Key Loan attributes for Loan Default are:

	Relationship with Loan Default	Effect of variable on Loan Status
Interest Rate	+0.23	Higher interest rates increases the chances of default
Term	+0.21	Longer the term higher the chances are of default
Grade	-0.21	Lower grade loans have a higher chance of default
Loan Amount	+0.08	Higher the loan amount higher the chances of default
Installment	+0.04	Higher the installment amount higher the chances of default

Conclusions

Analysis of consumer and loan attributes that influence the tendency to default was carried out. Top 5 variables which are strong indicators of default were identified.

Following conclusions have been reached,

- Key **Loan** attributes are **Interest Rate, Term and Grade**
- Key **Customer** attributes are **Public Record, DTI and Annual Income**

Key driver attributes for Loan Default are:

1. Interest Rate
2. Term
3. Grade
4. Public Record
5. Annual Income

Recommendations

Company will benefit from considering the following strategy when approving a loan application. The proposed strategy is based on the most important customer and loan attributes that have a significant influence on loan default.

Recommended Strategy

A loan has a **higher rate of default** when the following conditions are met.

- Interest rate is greater that 10 and
- Term is greater than 36 months and
- Grade is lower than B and
- When customer has a derogatory Public Record and
- Annual Income of the customer is lesser than $10000 and
- DTI is greater than 10