# Lending Club Case Study

## SUBMISSION

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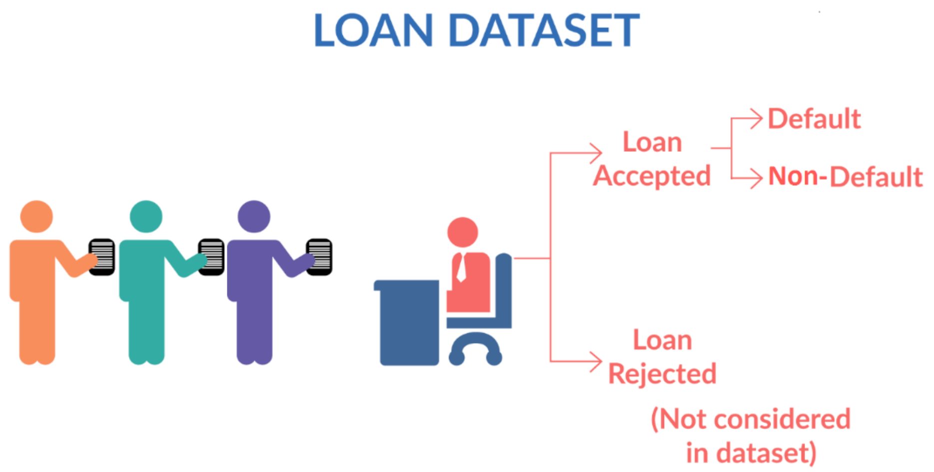
# Lending Club: Loan Risk Analysis

**Business Domain**:

1. Largest online loan marketplace, facilitating personal loans, business loans, and financing of medical procedures
2. Lends various types of loans to urban customers.
3. Loan applications are categorized based on
   - Customer Attributes
   - Loan Attributes

**Business Requirement** :

1. Identify driving factors for Loan Defaults.
2. Identify indicators for Loan Default
3. Decrease loan defaults to reduce business loss



# Analysis Approach

**Clean Data**
- Null Values Handling
- Converting & Formatting Data-types

**Univariate Analysis**
- Check Distribution of Numerical Values
- Check Distribution of Categorical Values

**Derived Metrics**
- Create Business Oriented Metrics
- Create Data & Type Metrics

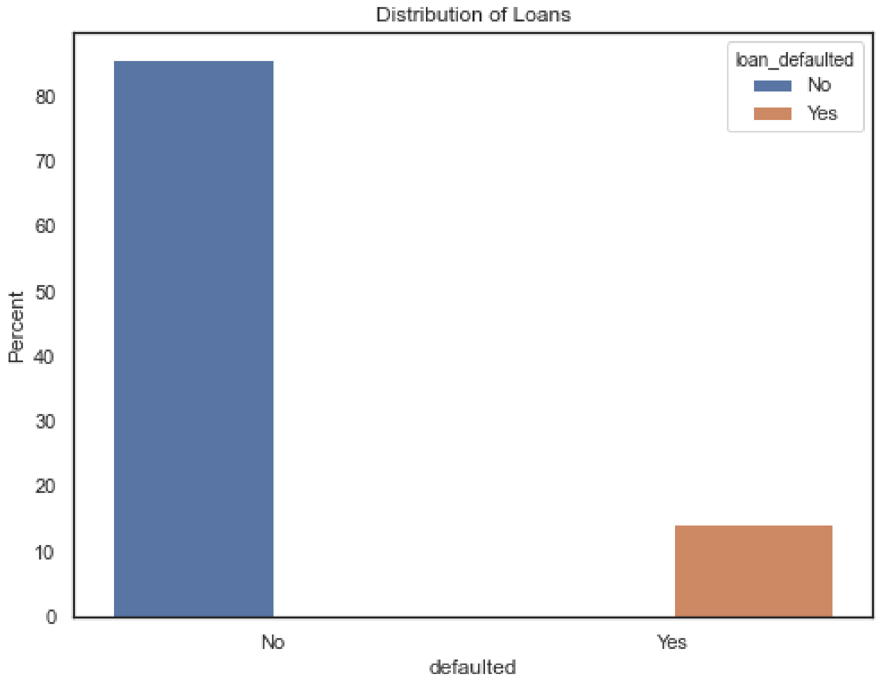
**Segmented Univariate Analysis**
- Check Distribution over various Segments

**Bivariate Analysis**
- Correlation Analysis
- Analyze Patterns b/w variables
- Explore joint Distribution

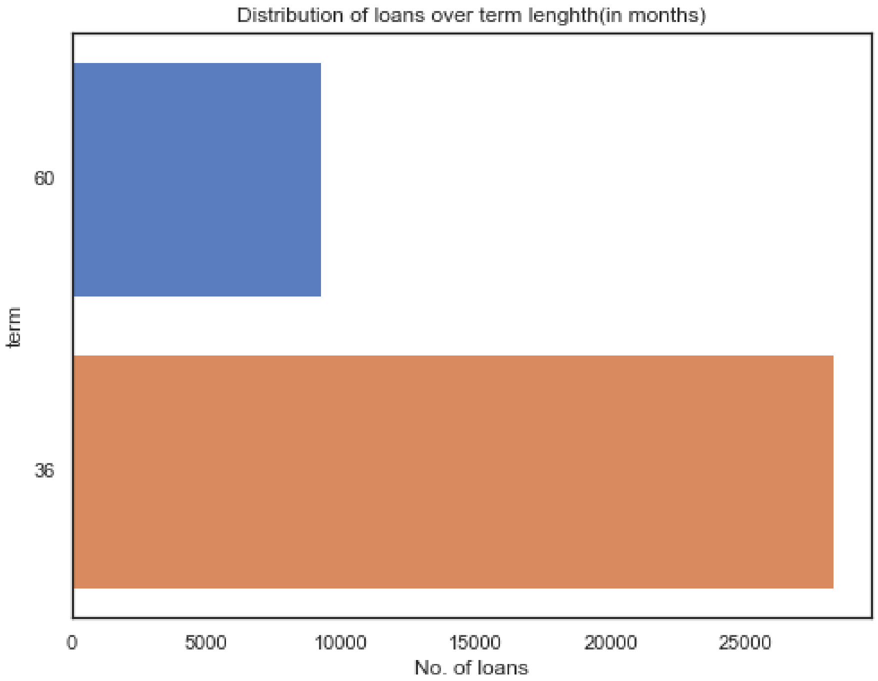
**Observations/ Recommendation**
- Suggestions based on Case-Study

# Understanding Loan Status

## Default Rate in issued Loans




## Term of Issued Loans

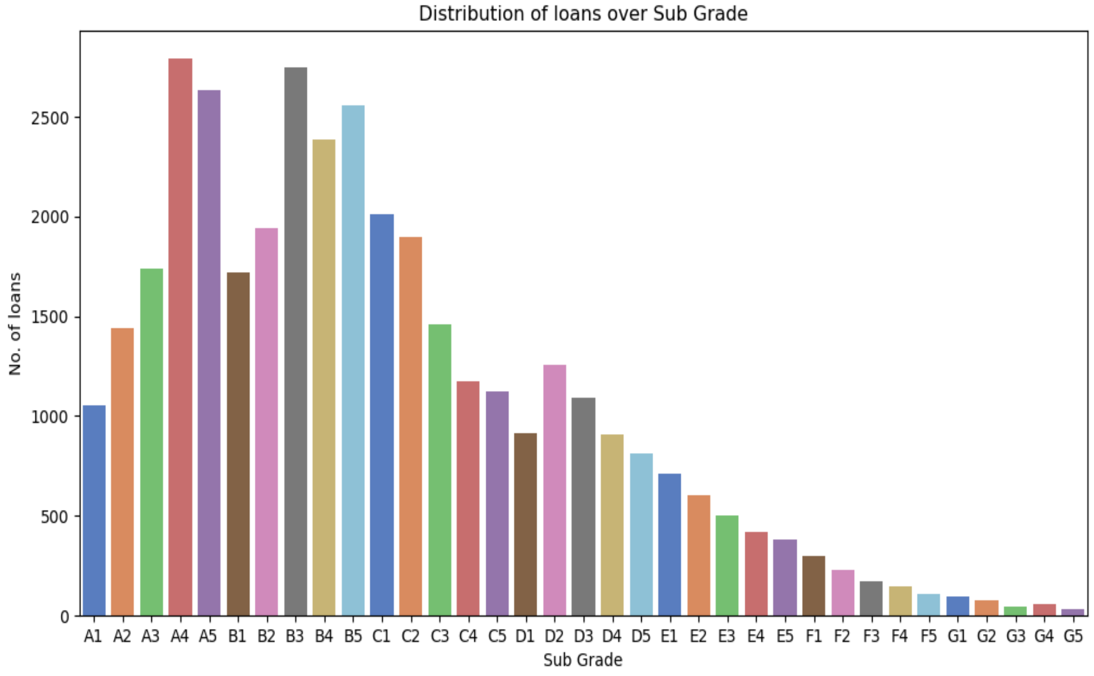



**Observations :**

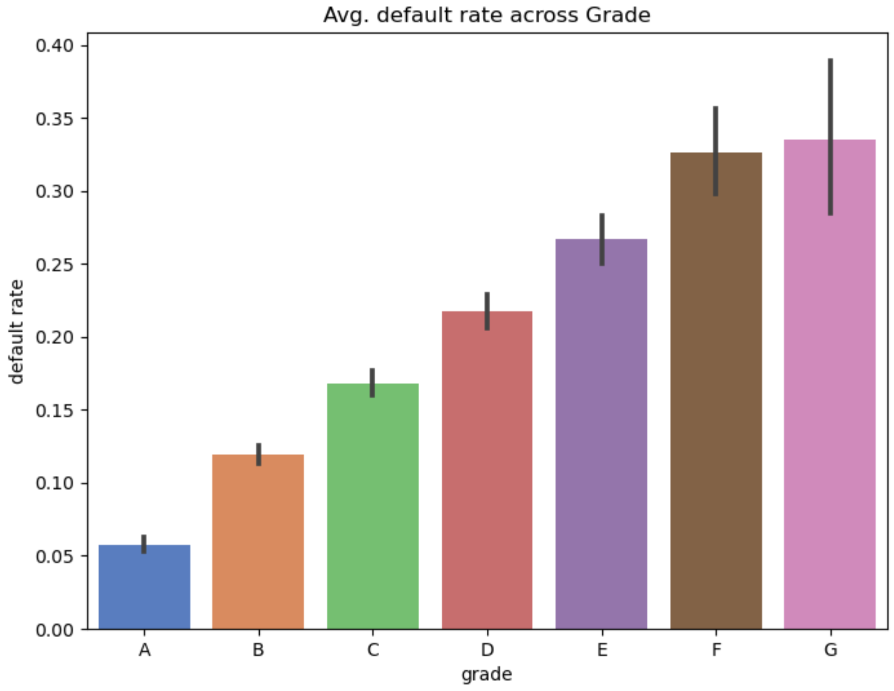
1. Lending Club(LC) as an organization sees ~14% Default over all the loan it issues.
2. Lending Club(LC) seems to prefer short term(3 years) loan as they are less risky.

# Understanding Loan Status

## Loans issued over various Grades




## Default Rate against Grade of Loan

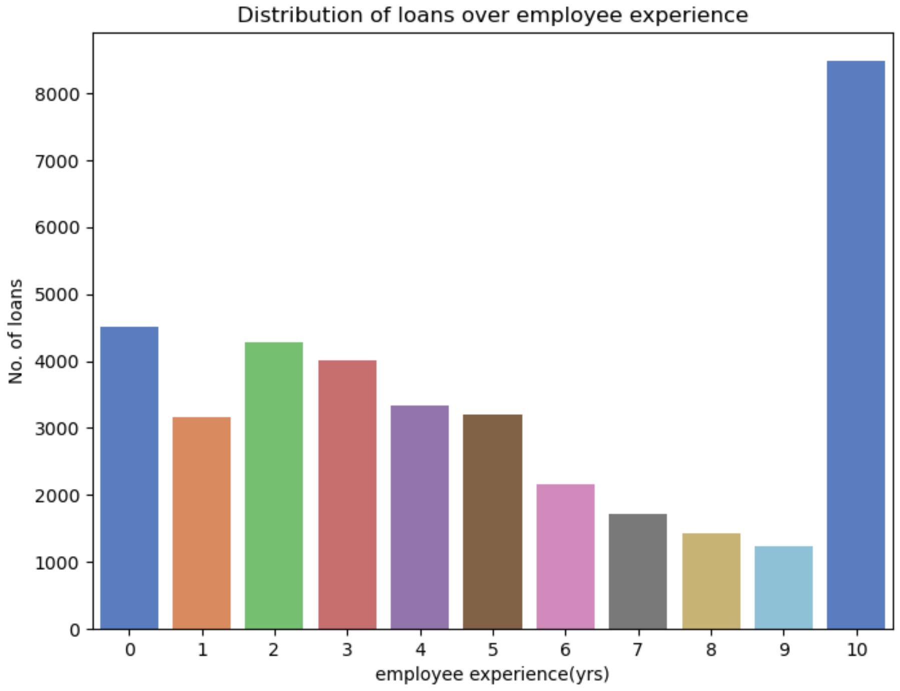



**Observations :**

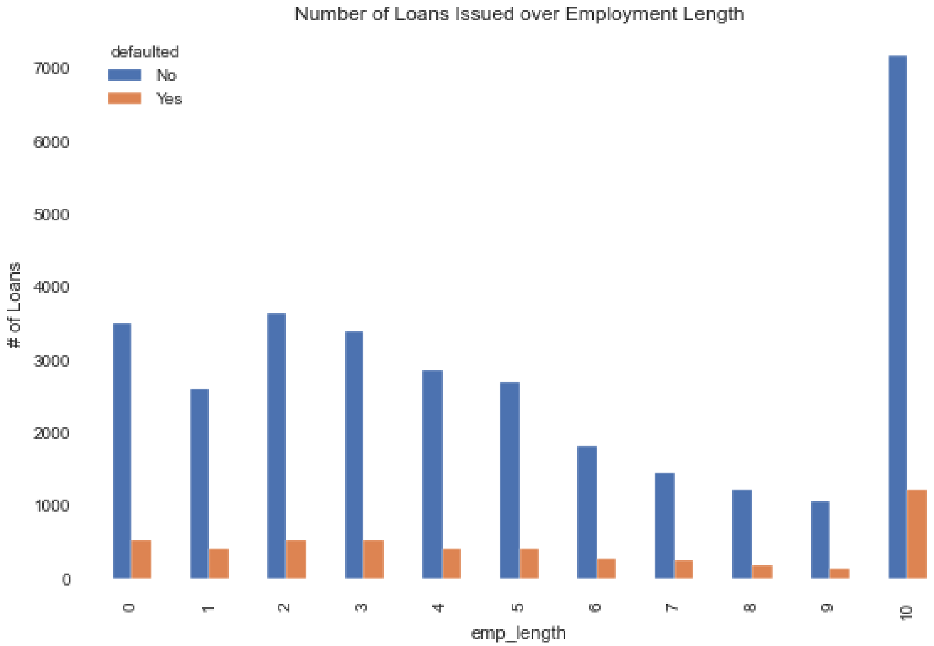
1. As the grade diminishes the number of loans also decreases.
2. But we should pay attention to, grade A and grade B, where the loans peak as we move from A to B, conveying that huge, majority get B loans and A grade loans are less.
3. Default Rate increases sharply as the Grade diminishes.

# Understanding Applicant Attribute

## Number of Loans over Employment Length




## Employment Length Against Default Rate

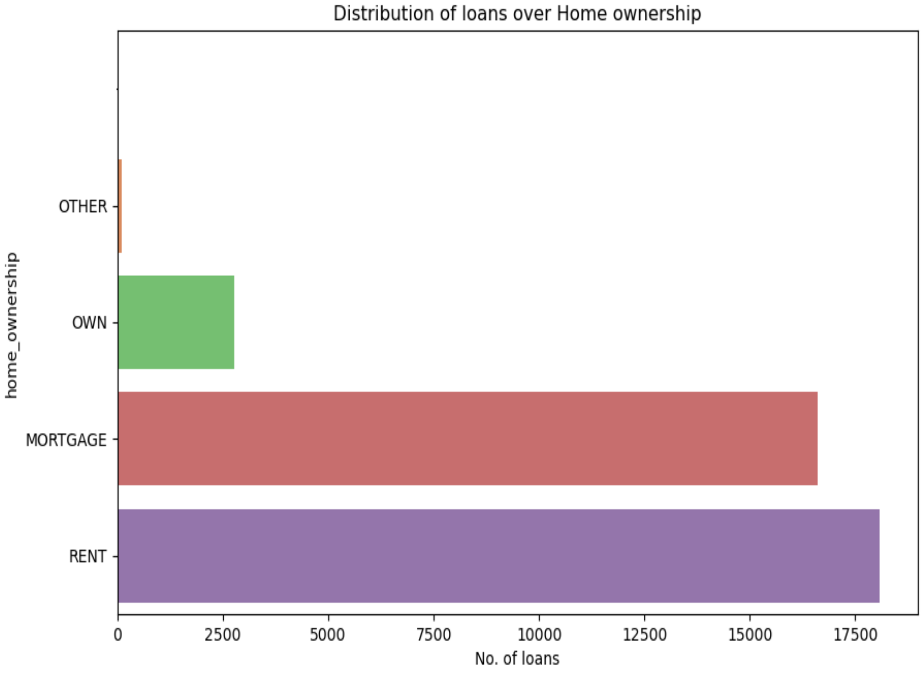



**Observations :**

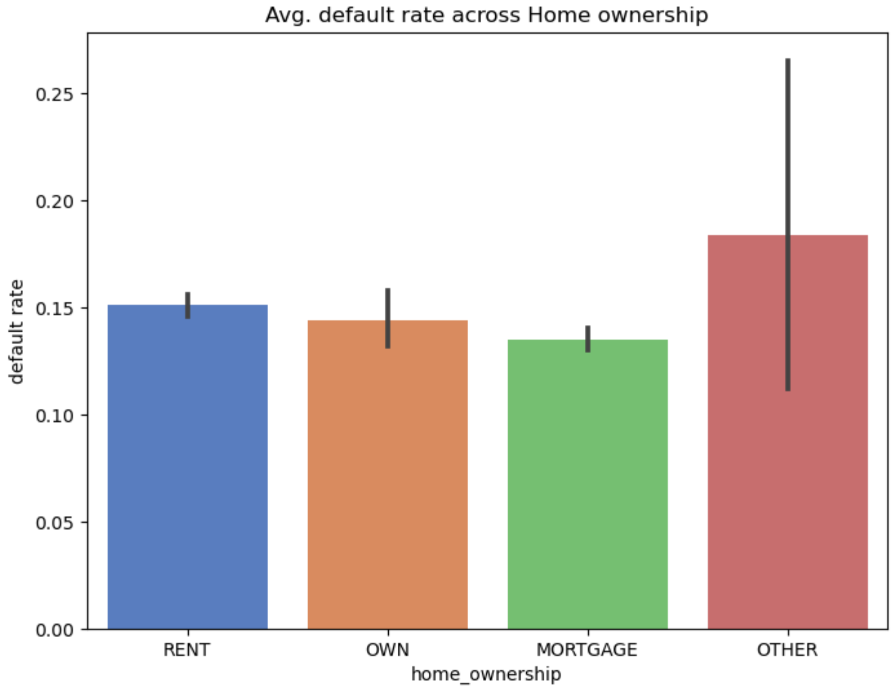
1. Most loans belong to employees with more than 10+ years of work experience, the reason is capping of work experience to 10
2. A diminishing trend can be seen for number of loans against employment length (0-9 years).
3. This may be indicative of growth in savings with long term employment.
4. It’s interesting to see that Default rate also decrease with increase in employment length(0-9 years). Given 10+ years is a huge bucket .

# Understanding Applicant Attribute

## Type of Home Ownership



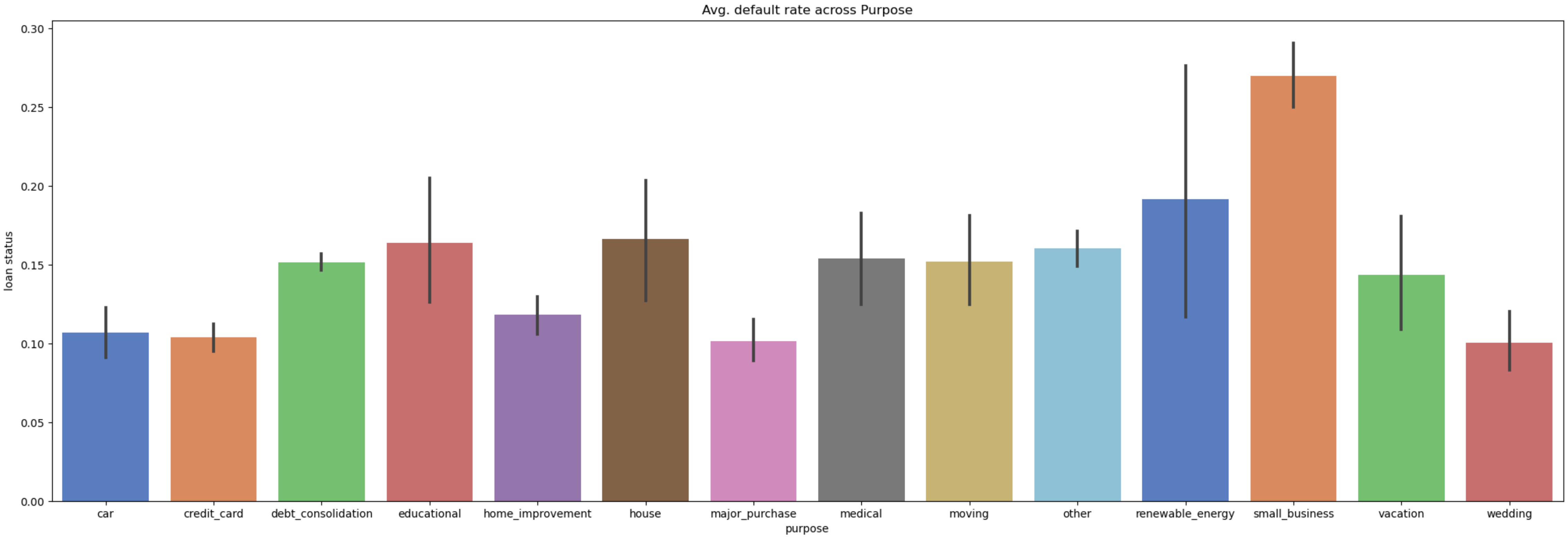

## Default Rate against Home Ownership




**Observations :**

1. Applicants applying to Lending Club(LC) generally have a Home on Rent or Mortgage.
2. Applicants with OTHER type of Home ownership have the Highest default rate, making these loans risky.
3. Rest all are pretty close to each other, with Mortgage having the least risk in the group.

# Loan Purpose

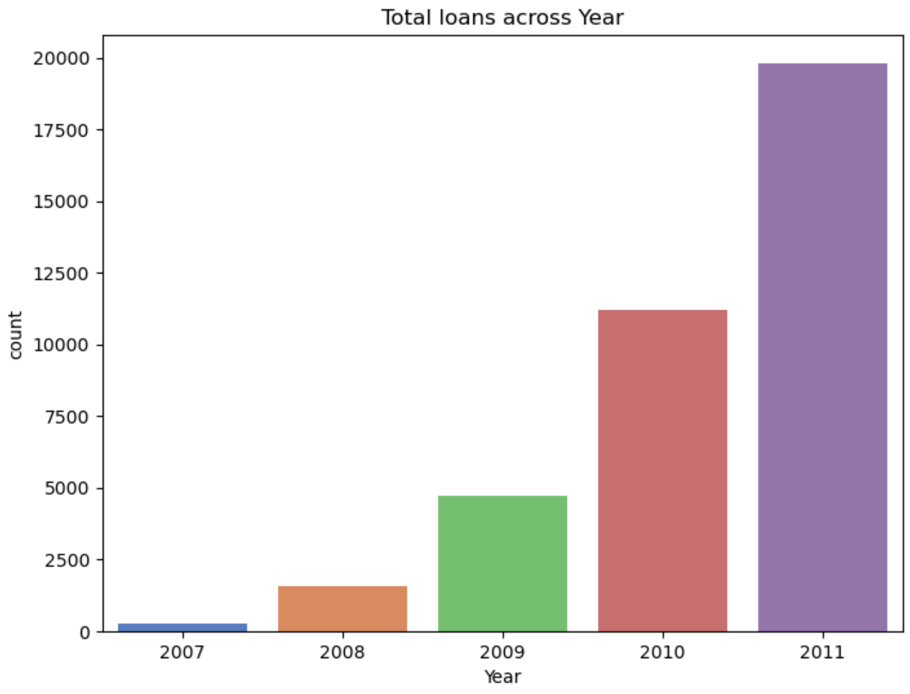



**Observations :**

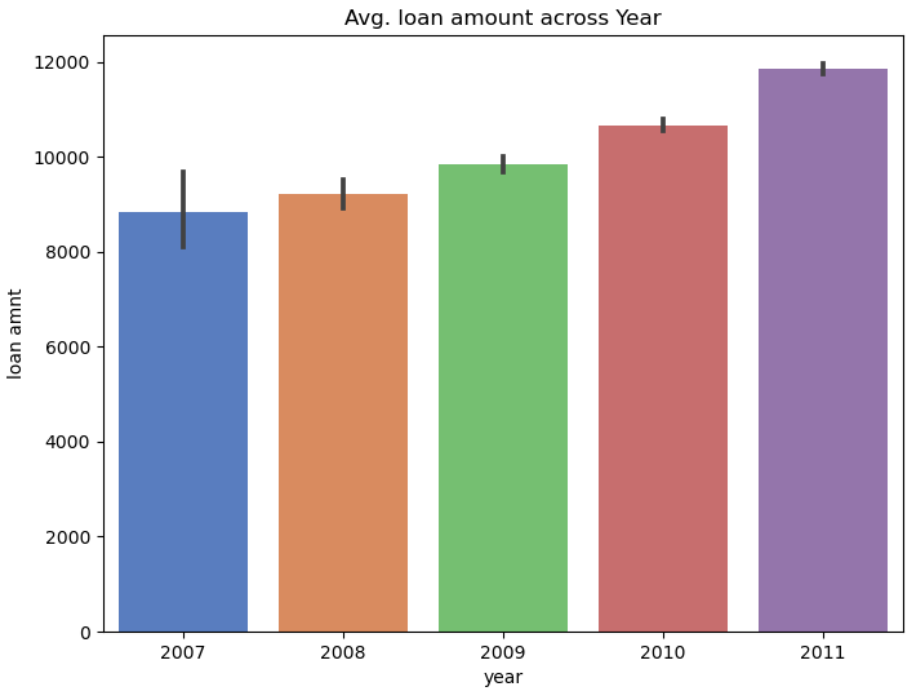
1. Small Businesses have the highest Default Rate, which has a natural intuition of the business failing.
2. Renewable Energy as a sector is growing globally but is still subject to high risk. This is evident from the Default Rate & high variance
3. Loans taken for Wedding have the least Default Rate.
4. Debt Consolidation though is the most popular reason for loan, has a comparatively medium risk level.

# Loan Pattern over Time

## Year application




## Year Loan amount

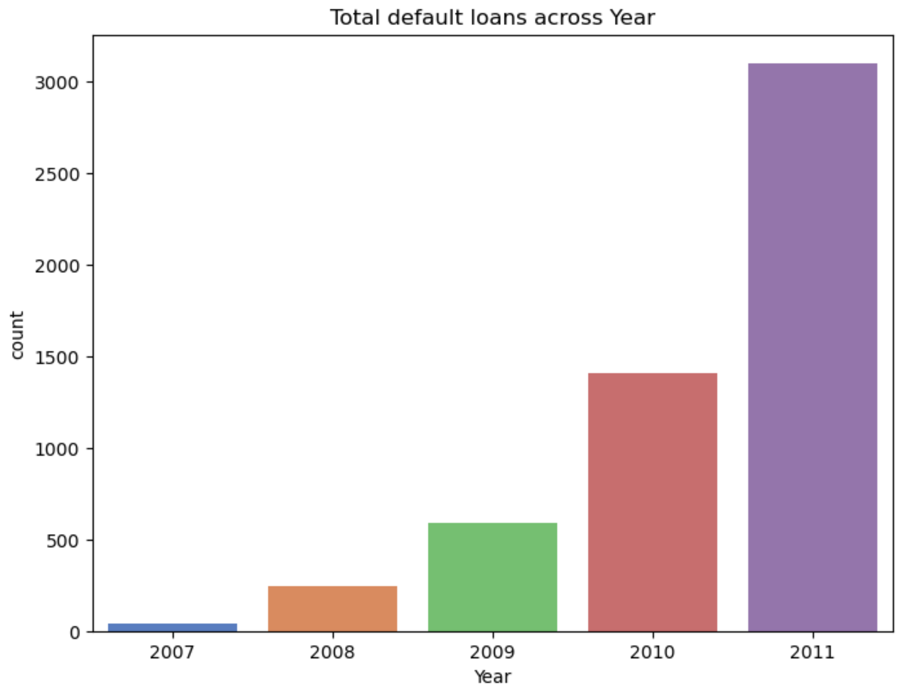



**Observations :**

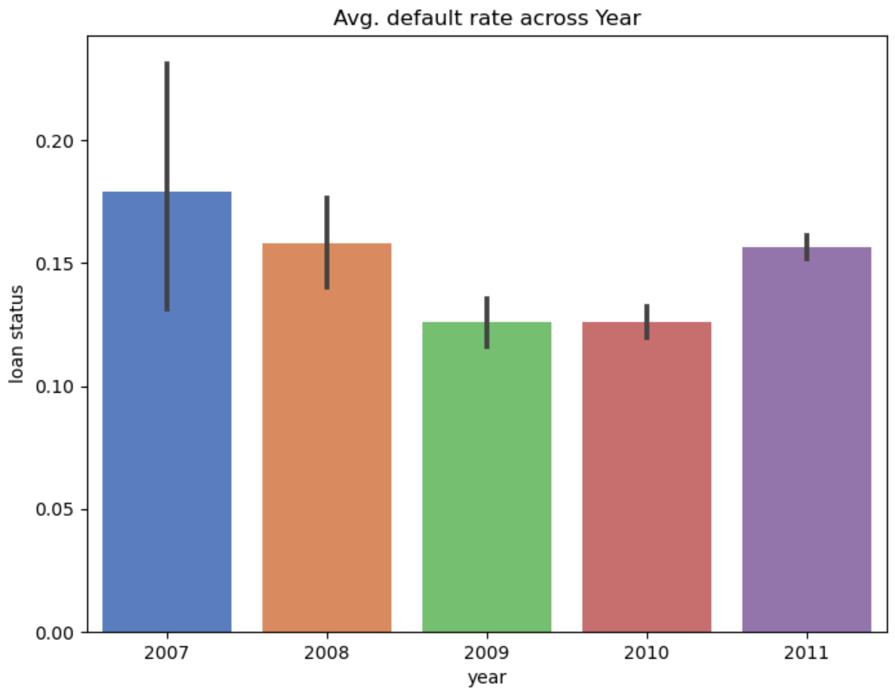
1. The number of Loans issued exponentially increases over time.
2. Strikingly, the average Loan Amount issued increased very gradually.

# Loan Pattern over Time

## Year application




## Year Default



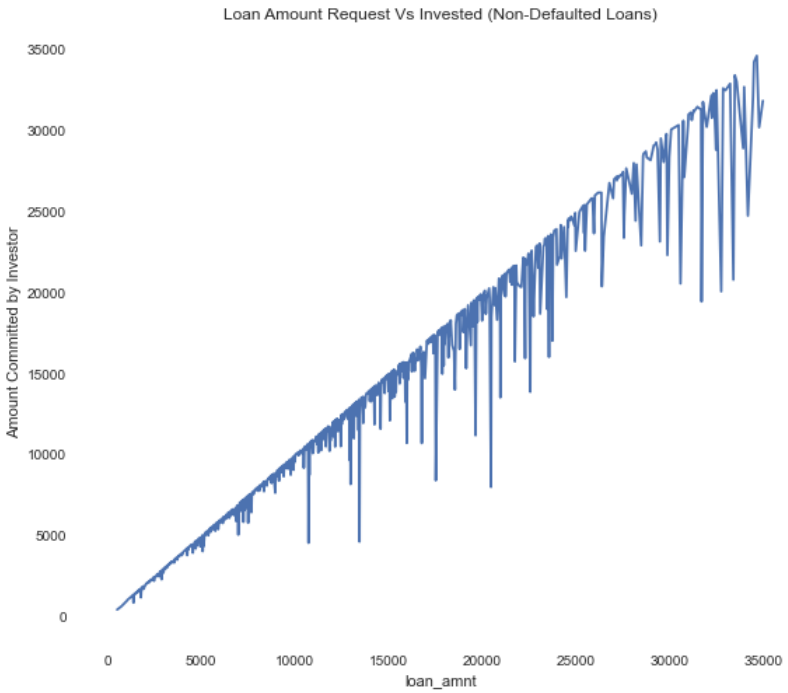

**Observations :**

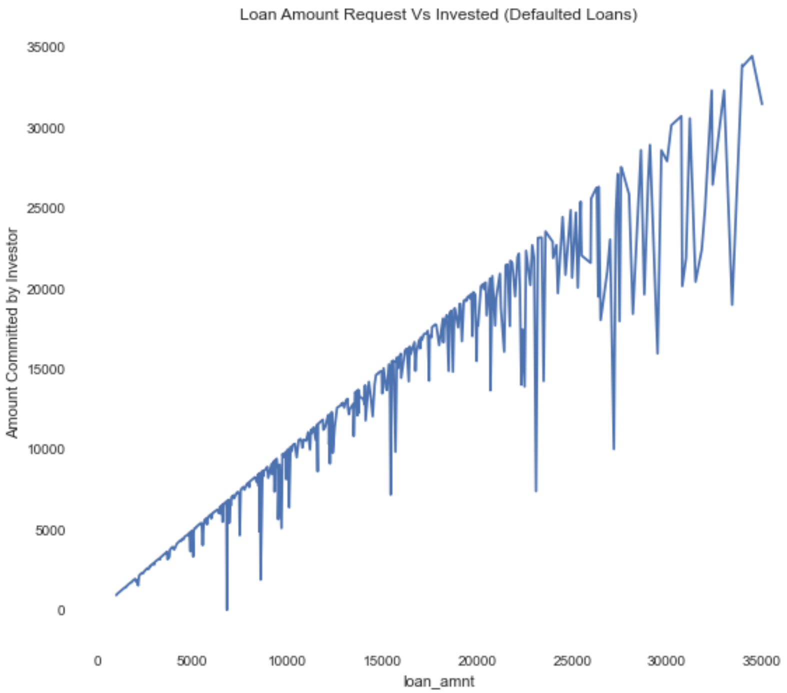
1. As the total number of Loans increased, similar pattern in Default is visible
2. Strikingly, average default rate came down from 2007-2009 which can be attributed to the Economic Crisis.
3. Post the crisis, it seems the default rate is on the rise again, which needs to taken care of.

# Understanding Relationships

In the next section we explore how Loan Amount is related to other parameters for Defaulted & Non-Defaulted Loans.

# Loan Amount with Funded Amount Investor

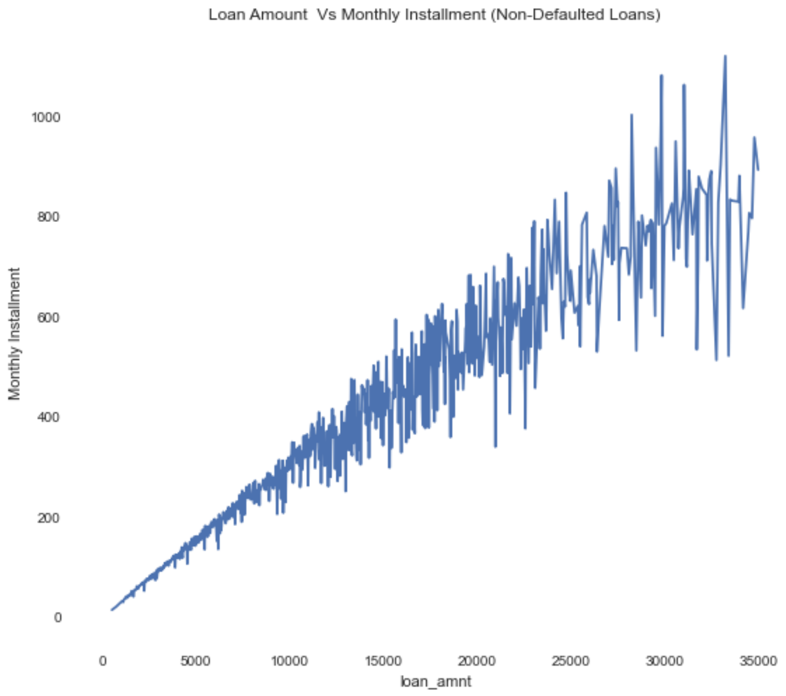


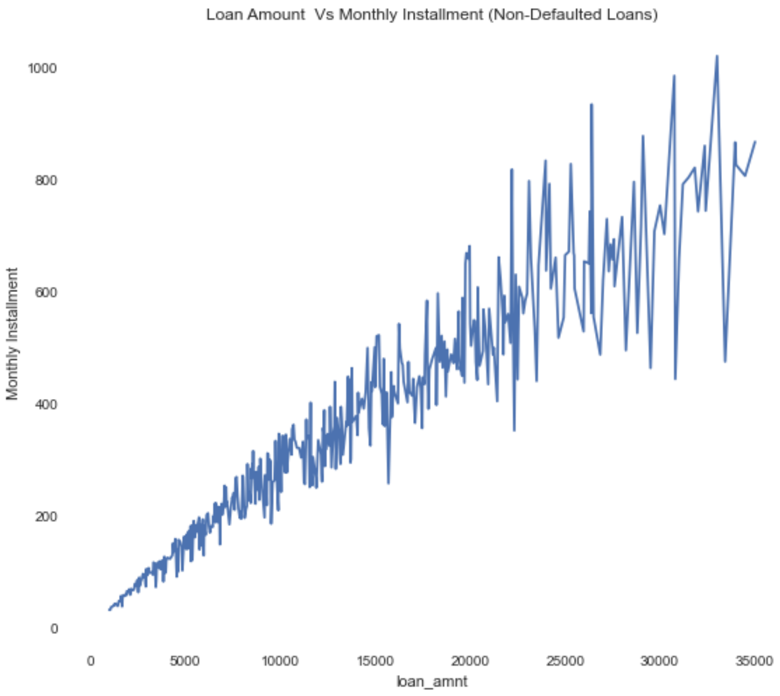




**Observations :**

1. Intuition holds true, as Loan Amount requested increases, Funded Amount by investor increases.
2. Notice the noise(dropping lines) showing that certain loans grants differ massively from the requested amount.
3. **NO** loan was funded more than the requested amount. This proves the correctness of the data.
4. Non-Defaulted Loans have a higher positive slope than Defaulted Loans.
5. Defaulted Loans see a wider gap between approved amount and the requested amount.

# Loan Amount with Monthly Instalment



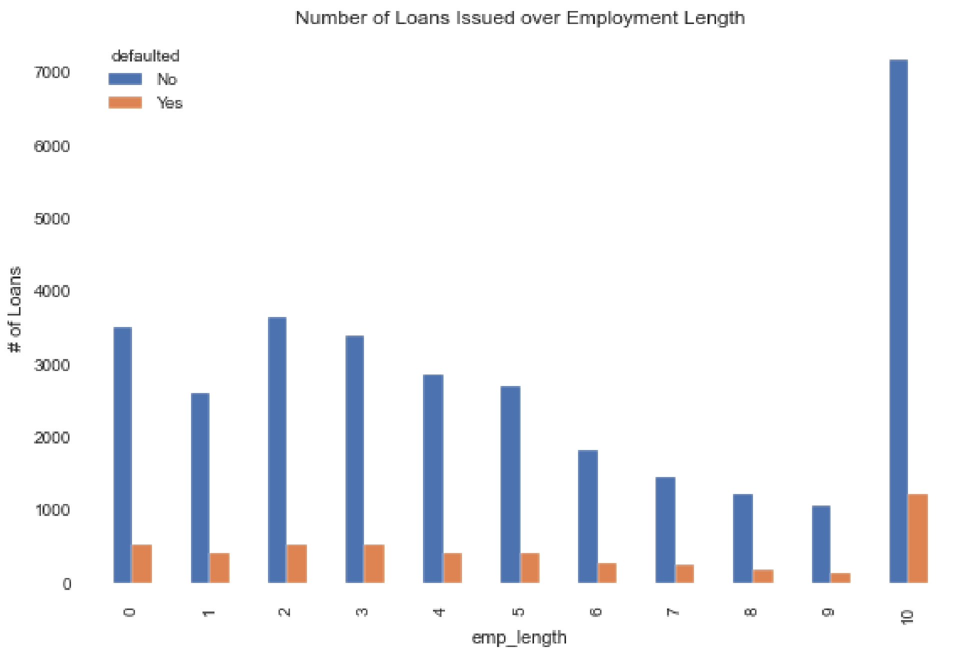




**Observations :**

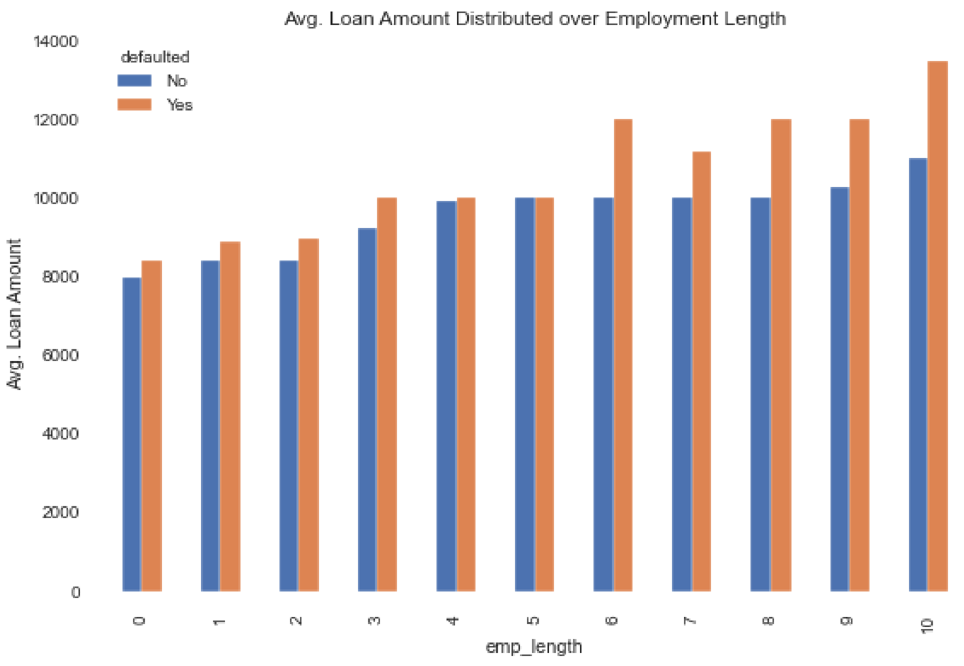
1. A near linear relation between Loan Amount & Monthly Installment.
2. The deviation from the general trend diverges more as the Loan Amount increases.
3. The slope of the linear trend is lower for Defaulted Loans as compared to Non-Defaulted loans.
4. The magnitude of diversion from the linear trend is more for Defaulted Loans.
5. This makes a strong point on dependence of Loan amount on interest rate & period of loan. This dependence is seen more for high amount & defaulted loans.

# Employment Length v/s Loan Amount

## Loans issued over Employment Length



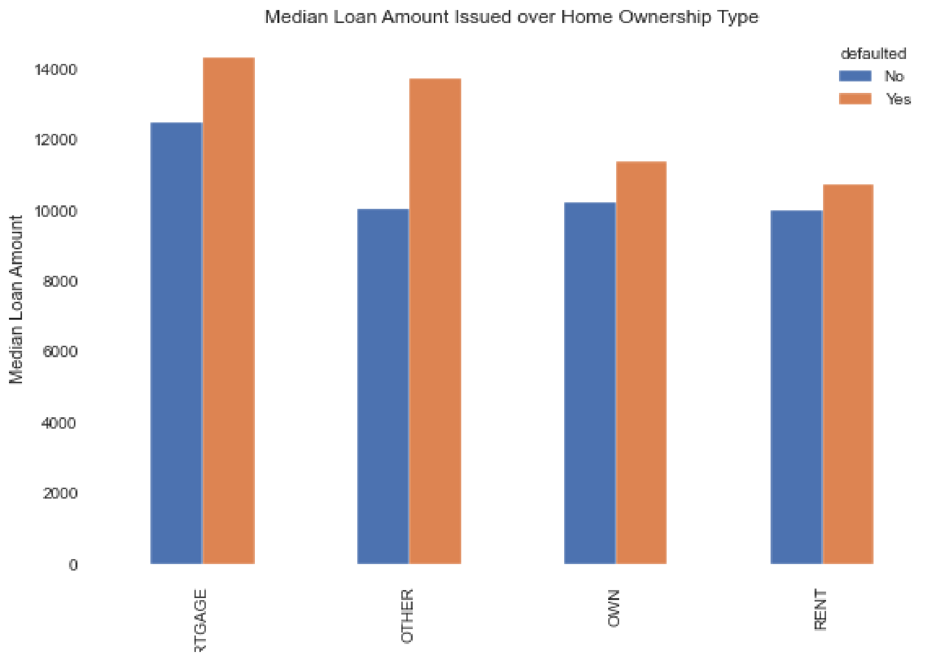

## Loan Amount Defaulted over Employment Length




**Observations :**

1. Applicants with mid-range employment have low default rate & high average loan amount.
2. Average Loan amount gradually increases with increase in employment years.
3. Amount of Defaulted Loan(in orange) is generally higher in most of the cases compared to the Non-Defaulted Loan Amount.

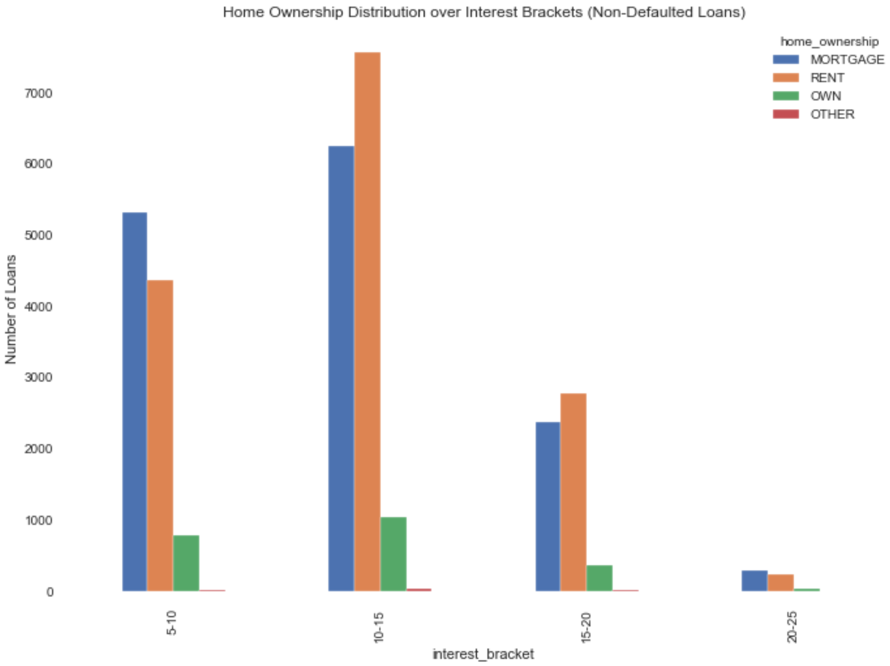
# Home Ownership v/s Loan Amount

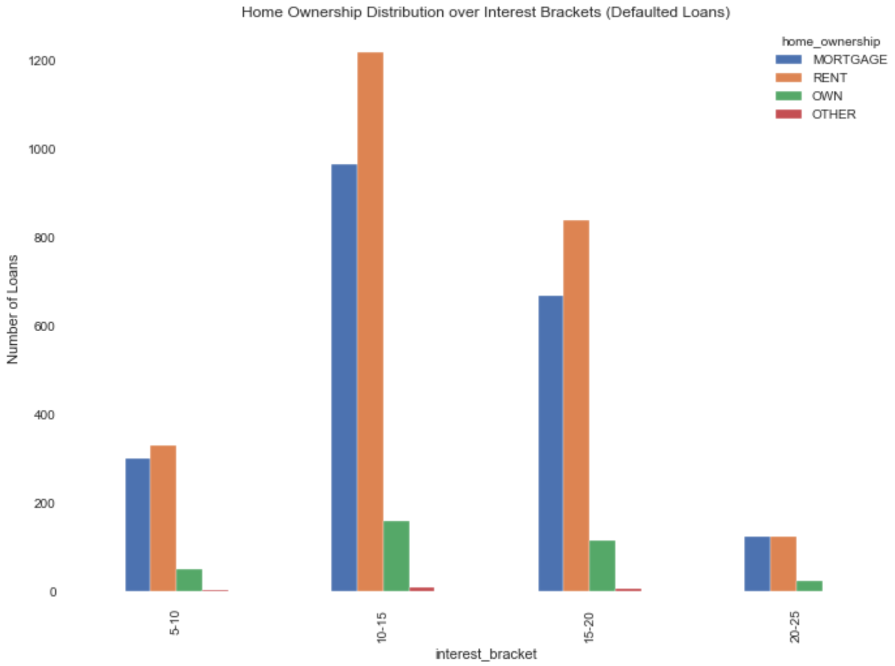




**Observations :**

1. The avg./median for applicant's with Home Ownership as Mortgage & Other is the highest in the 4 categories.
2. The difference between the Defaulted & Non-Defaulted Loan Amount is also maximum for Other & Mortgage home owner applicant's

# Interest Rate v/s Home Ownership




**Observations :**

1. For Non-defaulted Loans, we can see majorly loans in 5-10 & 10-15 percent interest bracket.
2. For Defaulted Loans, we can see majorly loans in 10-15 & 15-20 percent interest bracket.
3. The striking fact is that for Defaulted loans, 5-10 percent interest bracket has less number of loans. This can be attributed to these being more risky loans.

# Recommendations

1. **Action** : Stop issuing Loans below E grade.
2. **Action** : Stop issuing Loans to applicant whose Home Ownership is OTHER type.
3. **Precaution** : Loans for the purpose of Small Business is highly risky.
4. **Suggestion** : Applicants with mid-term employment(5-9) years should be given preference.
5. **Insight** : Based on Employment Length of an applicant,we can suggest thresholds above which loans have high chance of defaulting.
6. **Insight** : Based on the Home Ownership of an applicant, we suggest thresholds above which loans have high chance of defaulting.
7. **Suggestion** : We suggest increasing interest rate for loans(>10) to maximize profit for applicants with Rented house.
8. **Suggestion** : For Loan Amount > 25000$ , investors need to reduce loan sanctions or amount.