Lending Club Case Study

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BUSINESS UNDERSTANDING

- **Aim:**

  Improve loan approval decisions to minimize financial loss and missed opportunities.

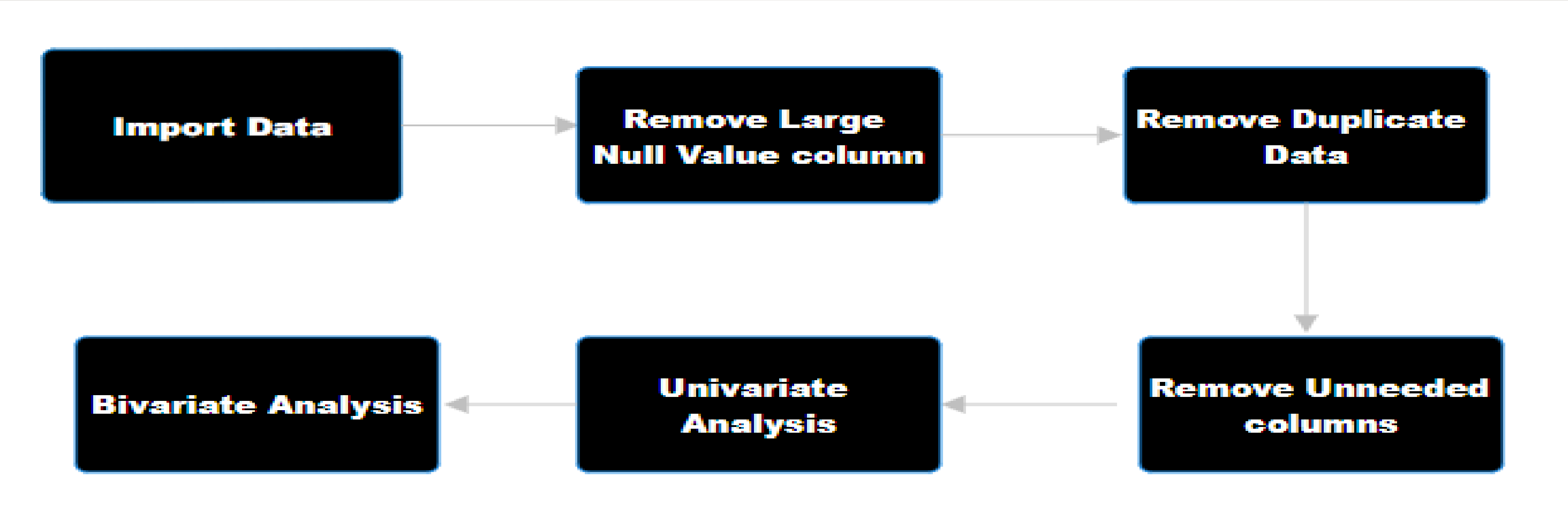
- **Analysis :**

  The dataset contains information on past approved loan applicants, including whether they fully repaid, are currently repaying, or defaulted (charged-off). Rejected loan applications are not included.

- **Loan Risk Analysis:**

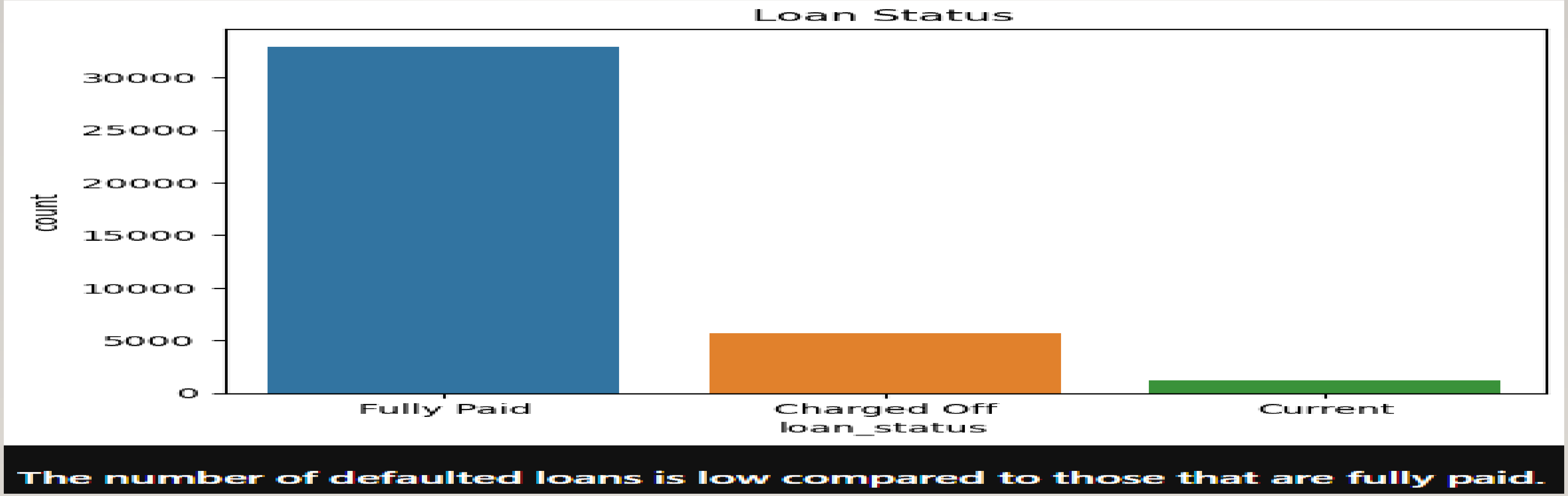
  Balancing Business Growth and Financial Risk

DATA PREPROCESSING AND ANALYSIS FLOW



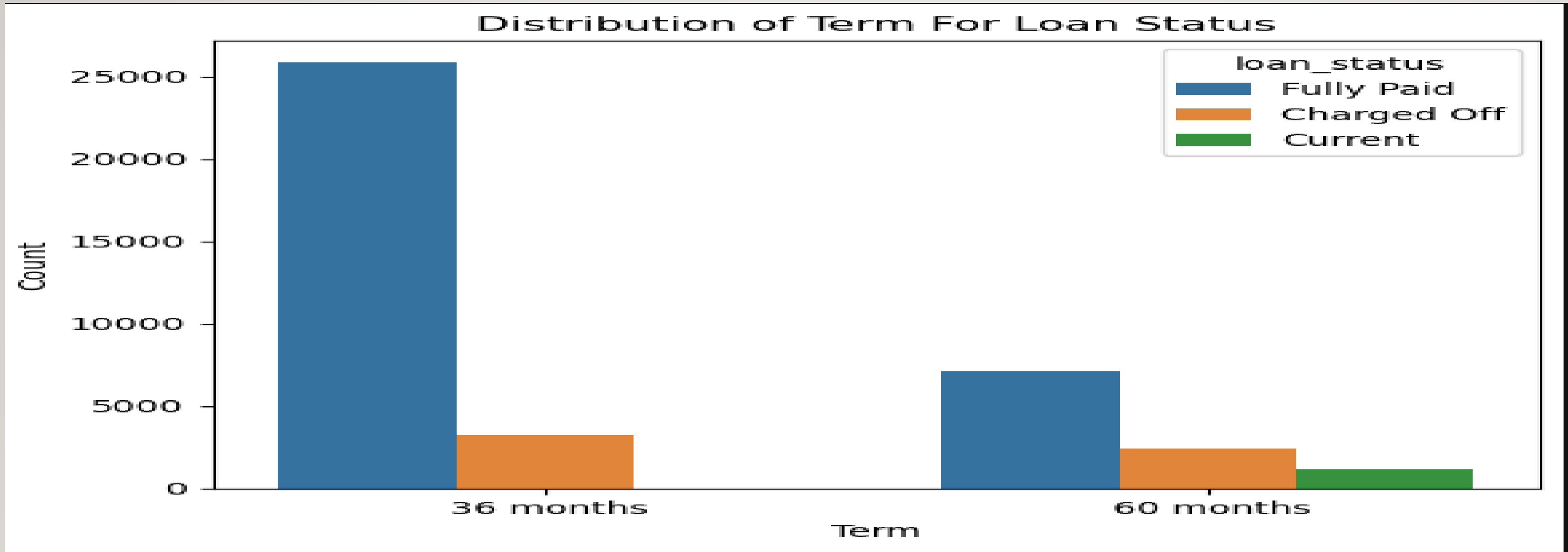
UNIVARIATE ANALYSIS

DISTRIBUTION OF LOAN STATUS



- The number of charged off loan is much smaller(14.5%) compared to total count.

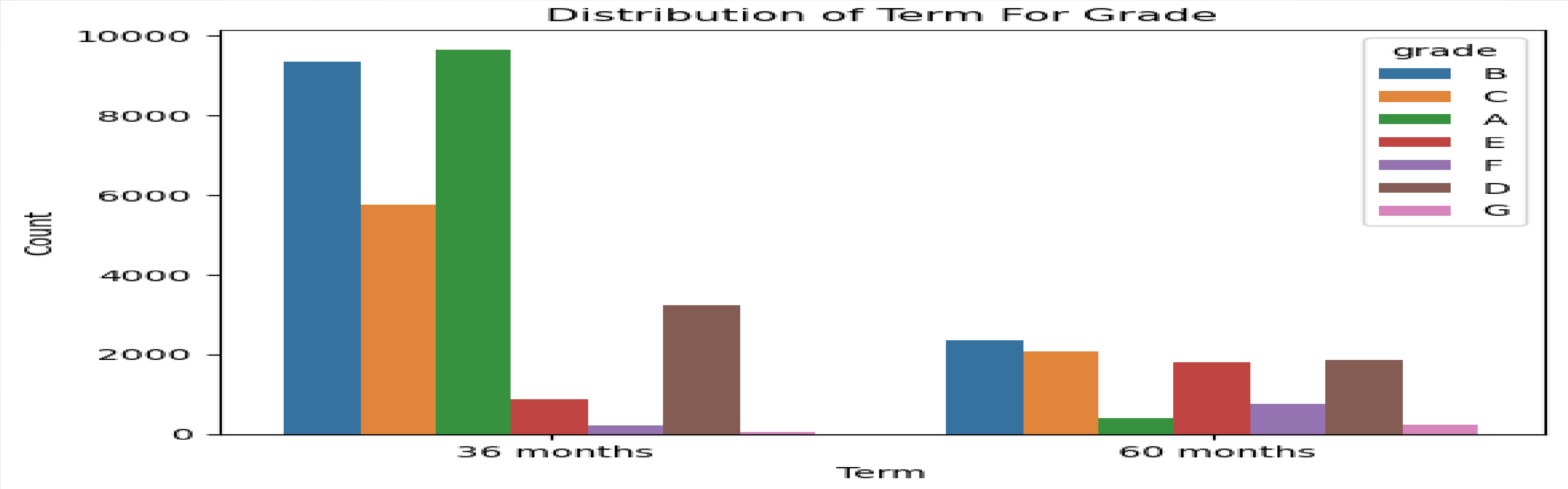
DISTRIBUTION OF TERM FOR LOAN STATUS



Over half of the loans taken have a term of 36 months, in contrast to those with a 60-month term.

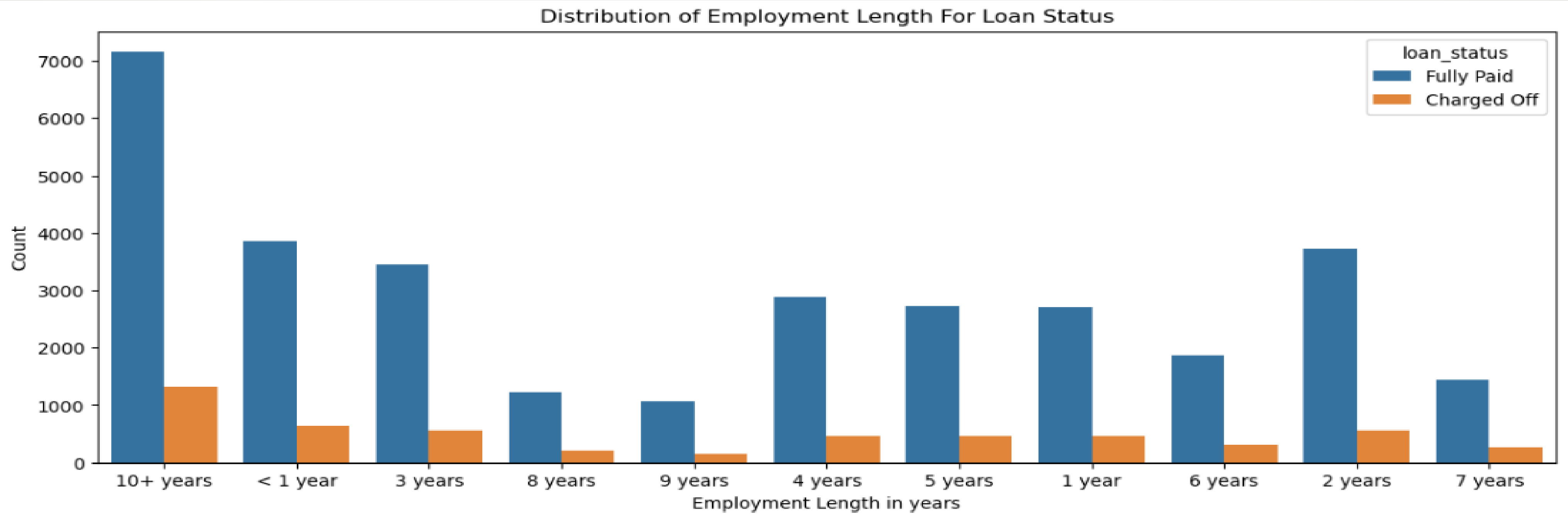
- Loan amounts increase with interest rates up to 17.5%, then decline, suggesting higher rates deter borrowing

DISTRIBUTION OF TERM FOR GRADE



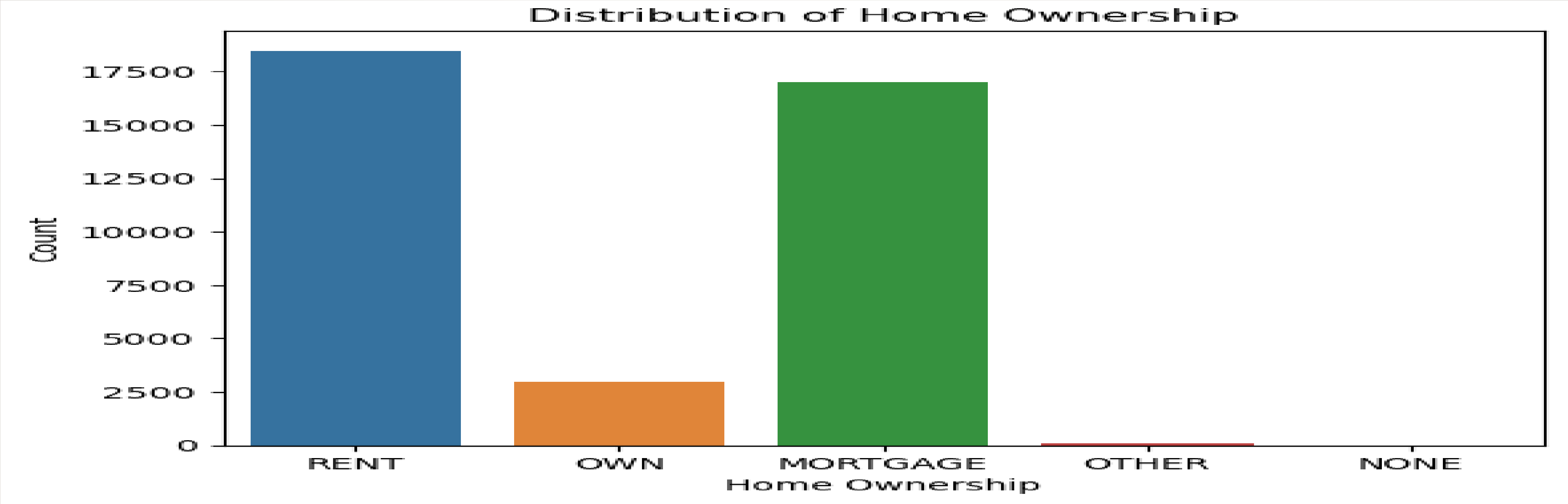
- Loans with a 36-month term are primarily composed of grade A and B loans, while loans with a 60-month term mostly consist of grade B, C, and D loans.

DISTRIBUTION OF EMPLOYMENT LENGTH



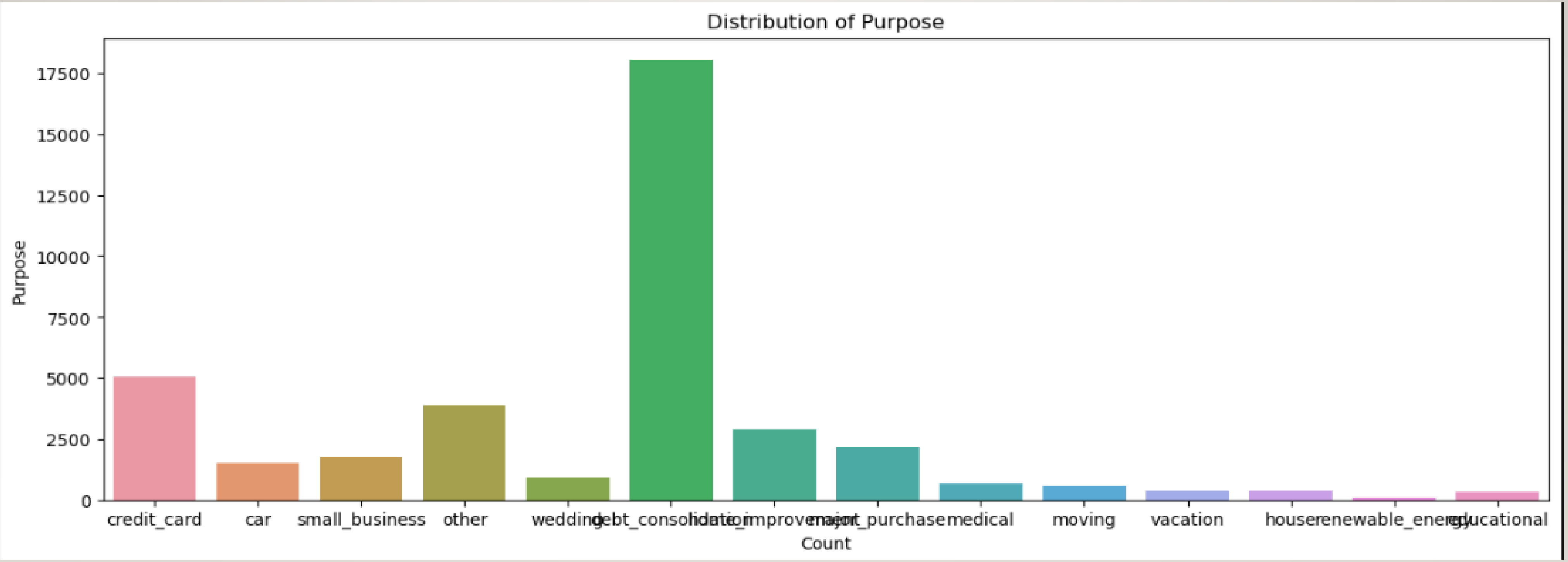
- Employees with over 10 years of experience are more likely to either default or fully repay their loans.

DISTRIBUTION OF HOME OWNERSHIP



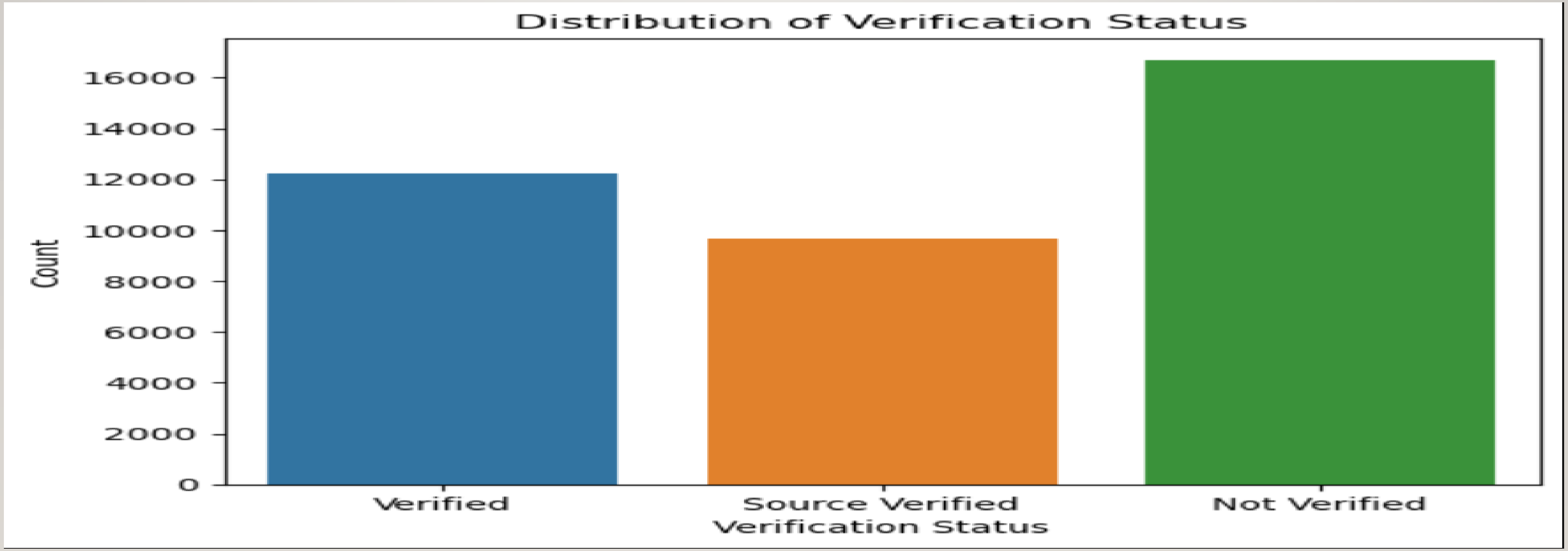
- [ ] The majority of borrowers do not own property and are either on a mortgage or renting.

DISTRIBUTION OF PURPOSE



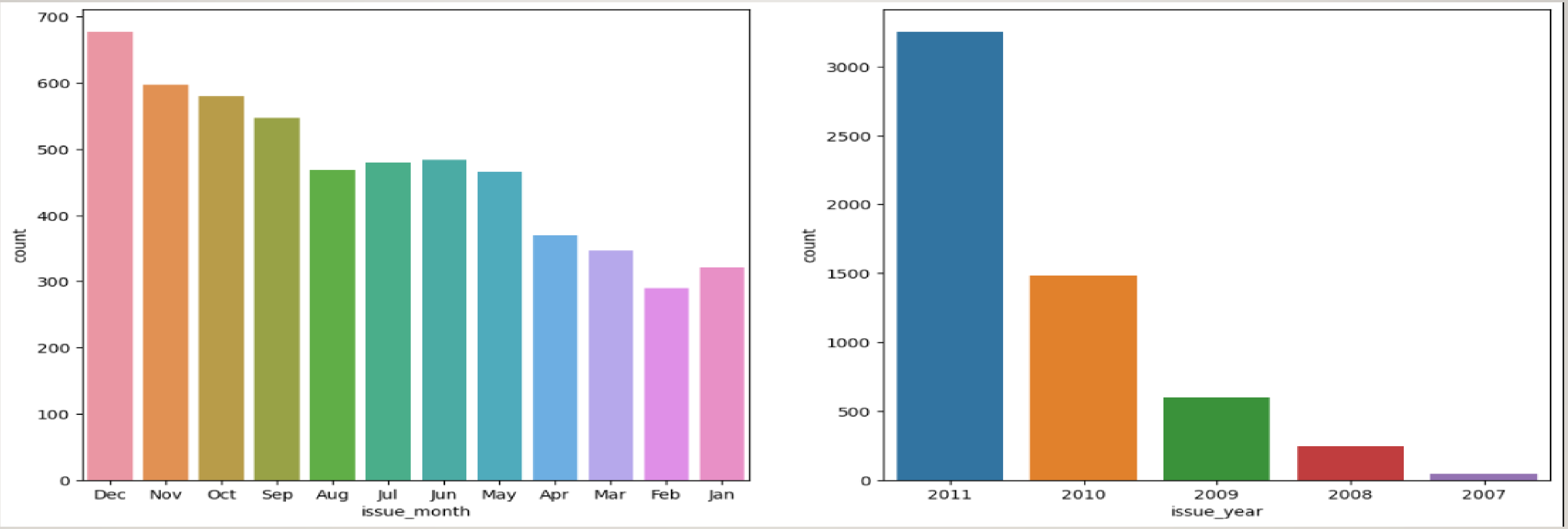
- A significant portion of loans are taken for debt consolidation, followed by credit card repayment.

DISTRIBUTION OF VERIFICATION STATUS



- Approximately 50% of the borrowers are either company-verified or have their income source verified.

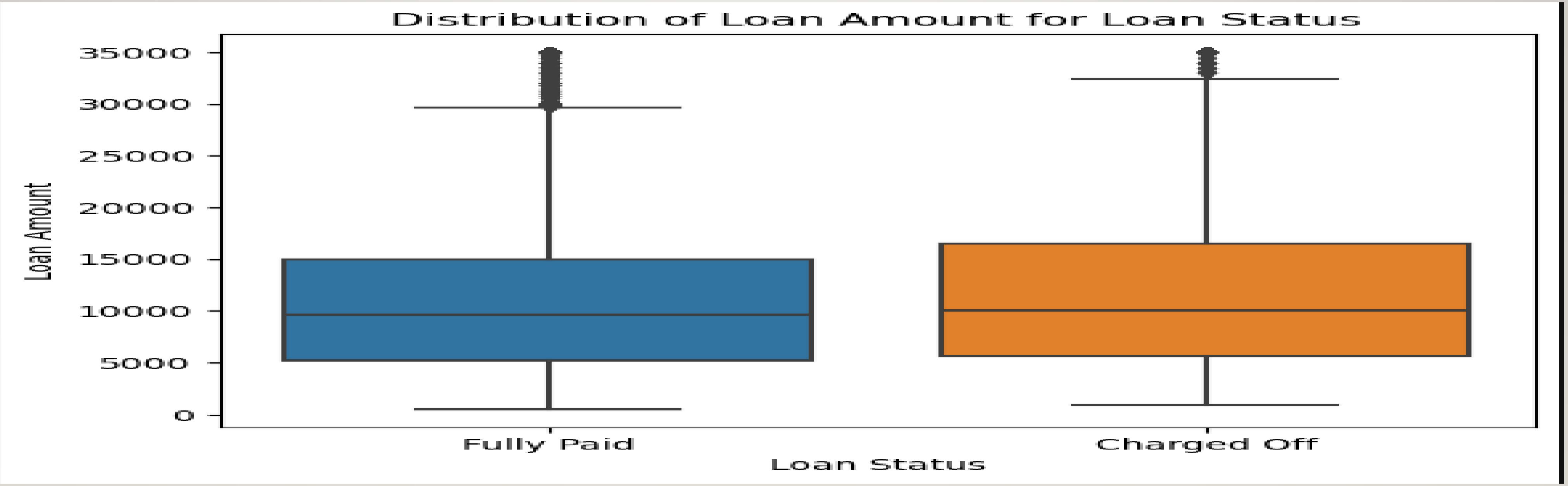
DISTRIBUTION OF ISSUED MONTH AND YEAR



- The highest number of defaults occurred when loans were issued in December. Additionally, loans issued in 2011 saw a higher default rate compared to other years.

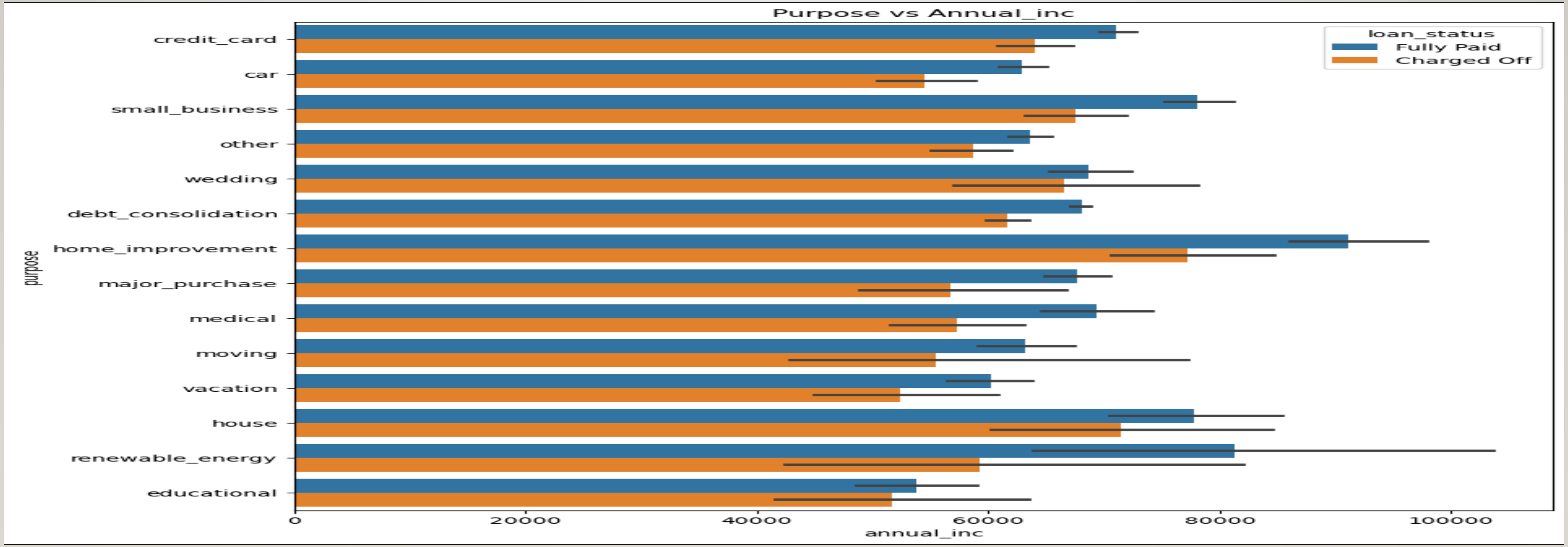
BIVARIATE ANALYSIS

LOAN AMOUNT VS LOAN STATUS



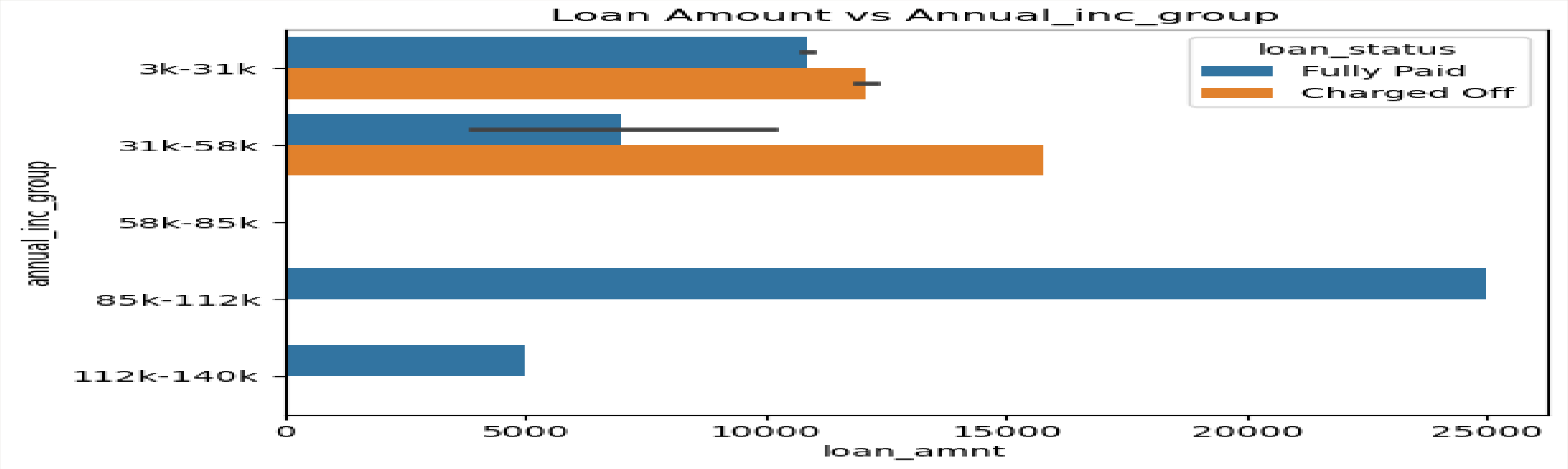
- The total fully paid amount, at 358,049,725, is significantly larger compared to the charged-off amount, indicating a higher proportion of successfully repaid loans.

ANNUAL INCOME VS LOAN PURPOSE



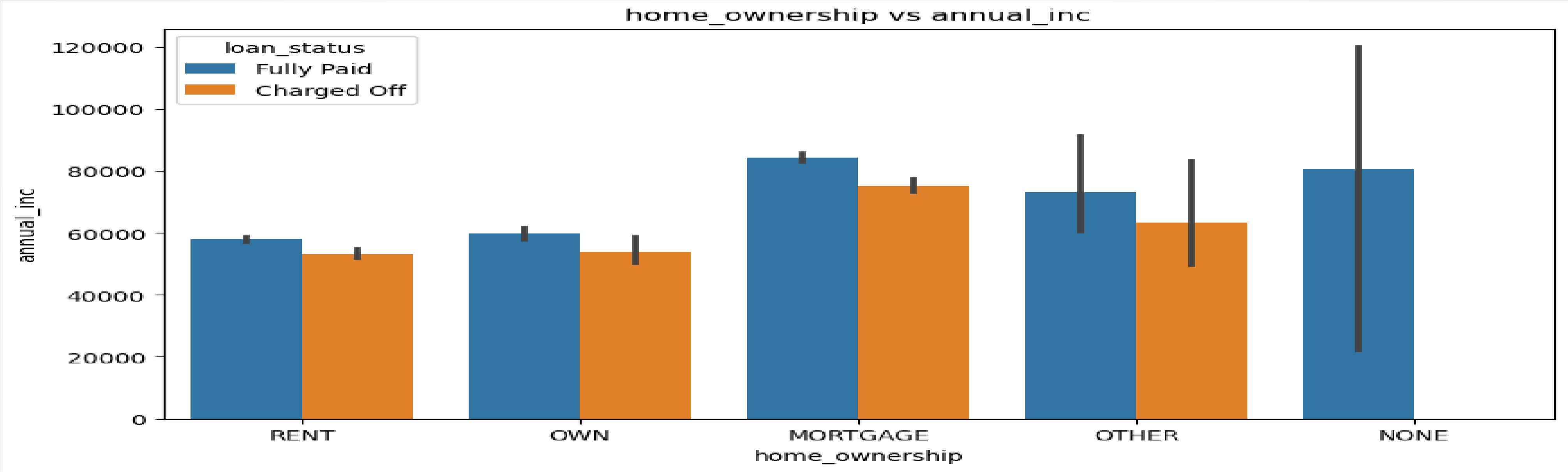
- Applicants with higher salaries predominantly applied for loans related to 'home improvement' 'house' and 'renewable energy'.

ANNUAL INCOME VS LOAN AMOUNT



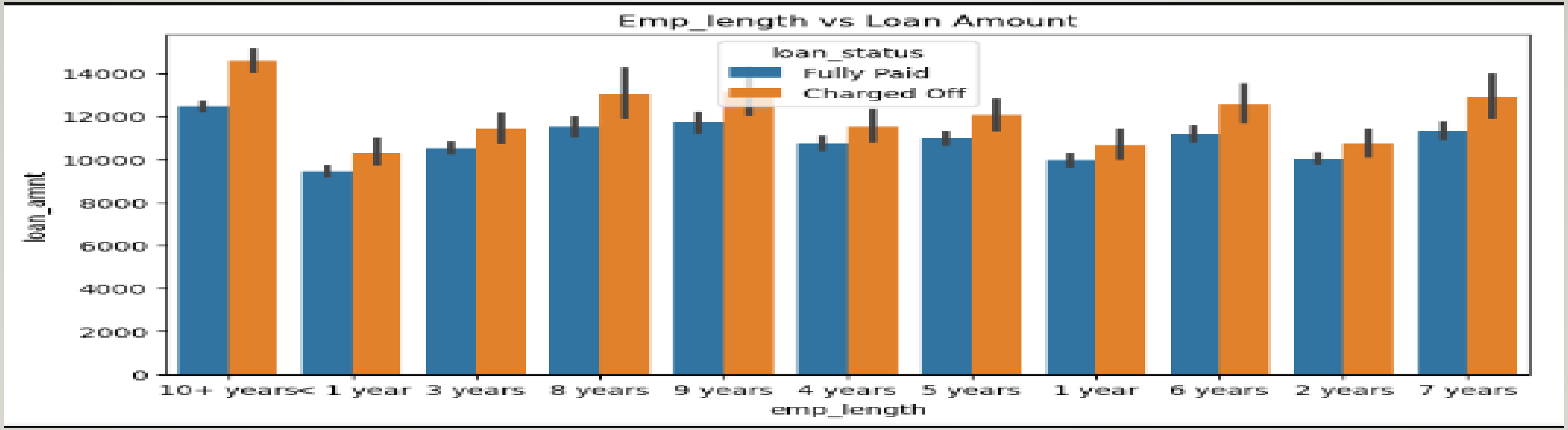
- ❑ Borrowers in the $85k to $112k annual income bracket have the largest loan amounts.

ANNUAL INCOME VS HOME OWNERSHIP



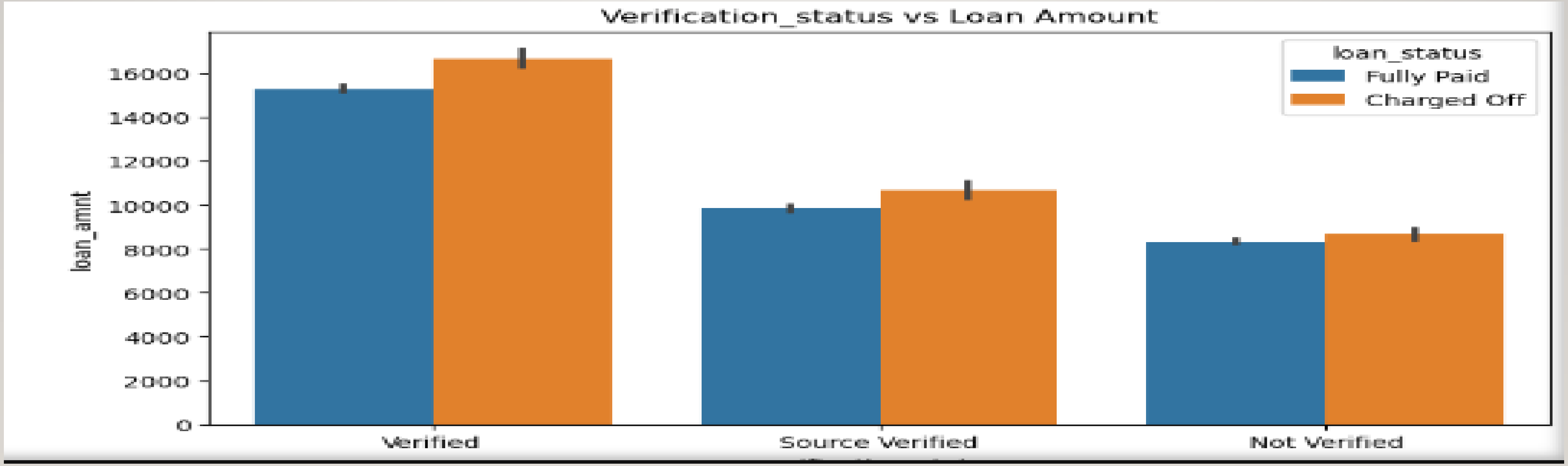
- ❑ Borrowers with a mortgage tend to have the highest annual income compared to other home ownership types

LOAN AMOUNT VS EMPLOYEE LENGTH



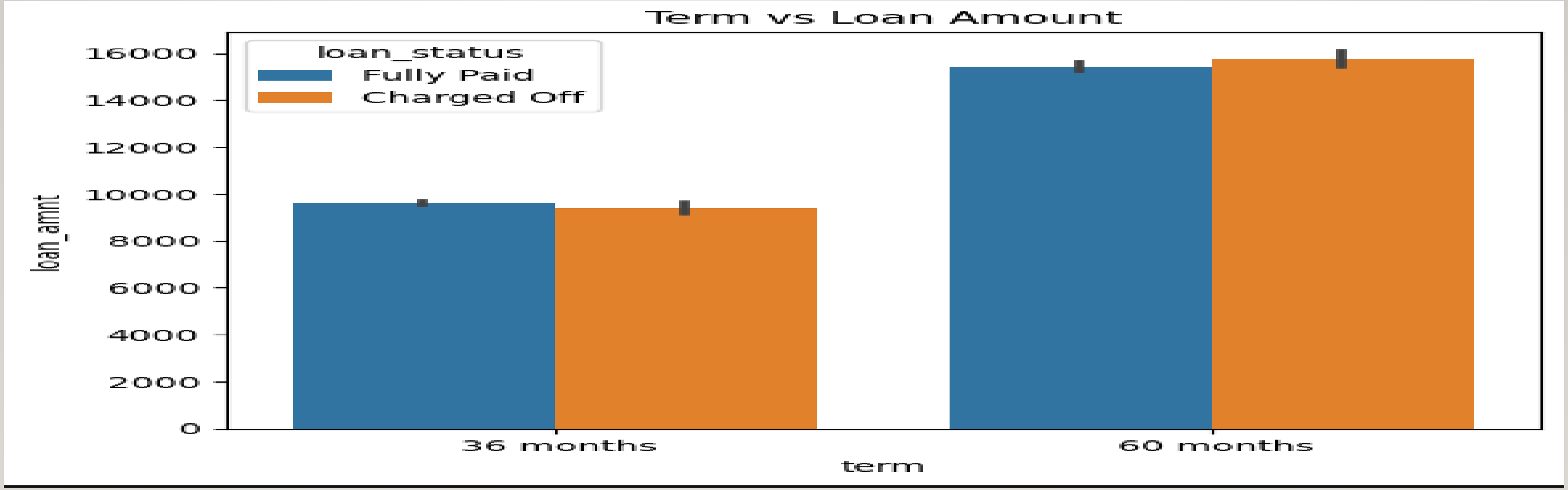
- Employees with longer working history got the loan approved for a higher amount.

LOAN AMOUNT VS VERIFICATION STATUS



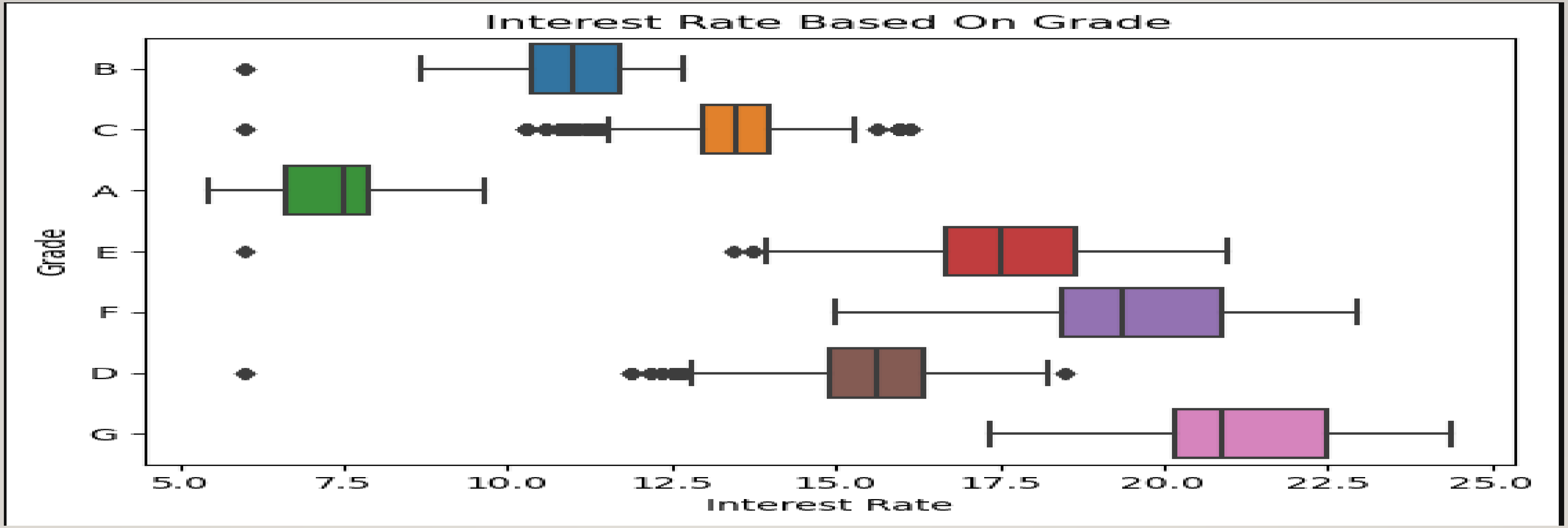
- The verification status indicates that there are more verified loans, with a total amount of 189,663,350, compared to other statuses.

TERM VS LOAN AMOUNT



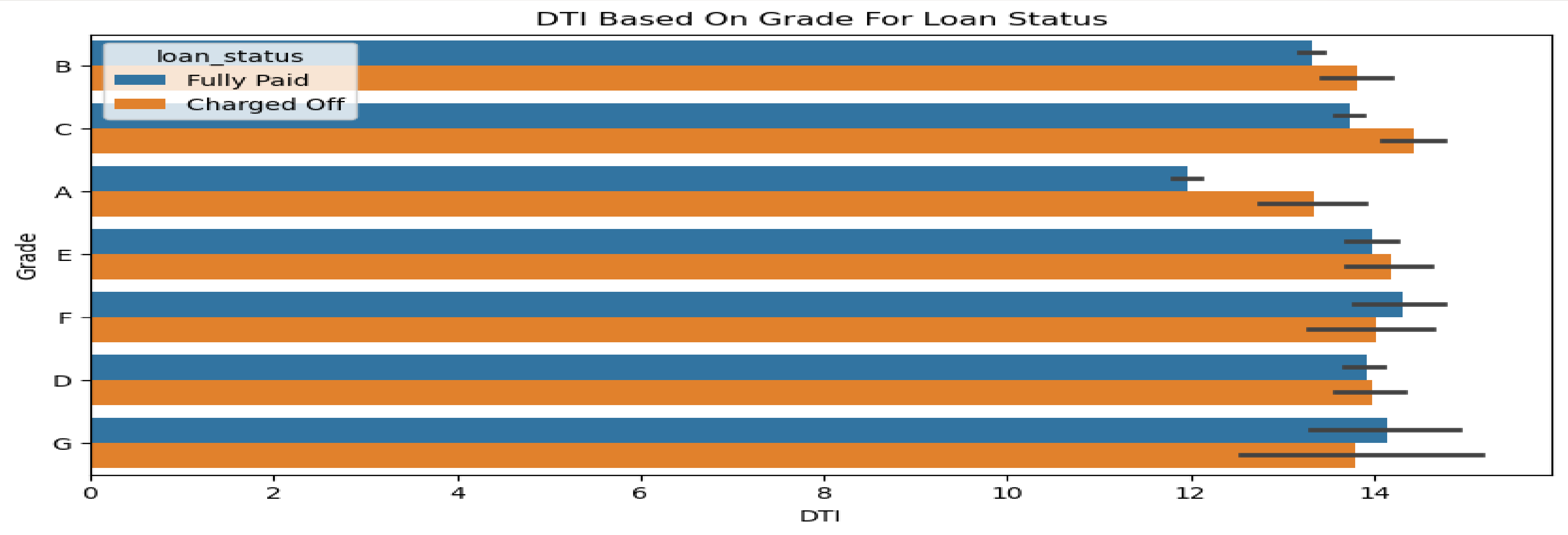
- The majority of loan amounts are associated with a 36-month term, in comparison to a 60-month term.

COMPARISON OF INTEREST RATE BASED ON GRADE



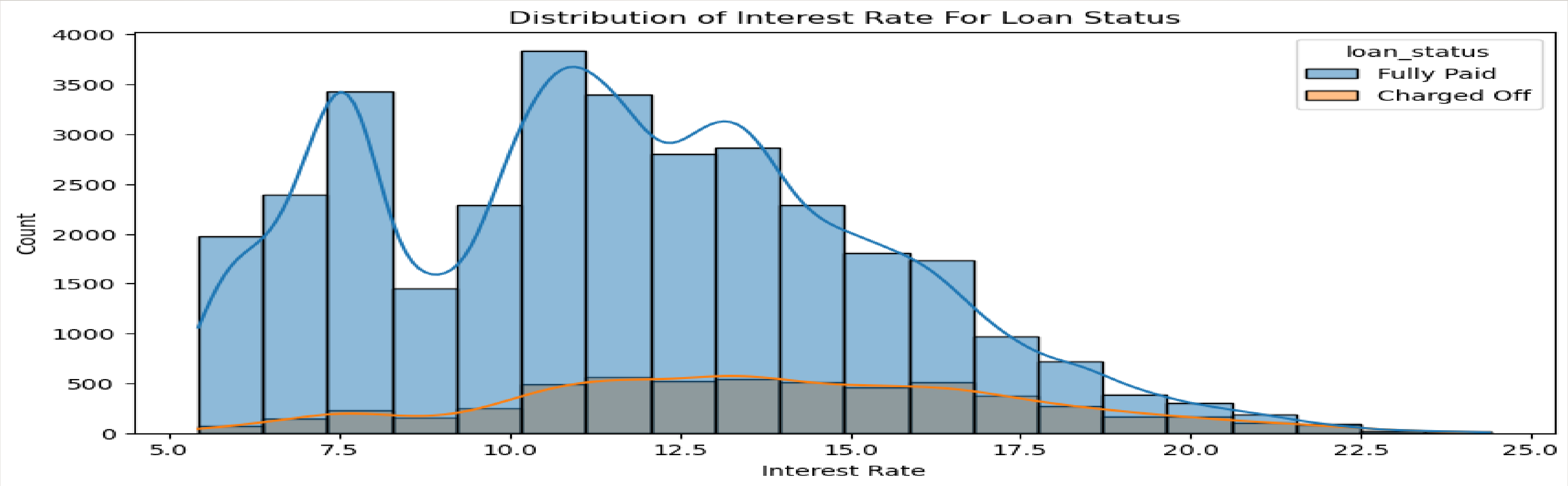
- The B grade loans, with an amount of 128,515.86, carry higher interest rates compared to other grades

COMPARISON OF DTI OVER GRADE FOR LOAN STATUS



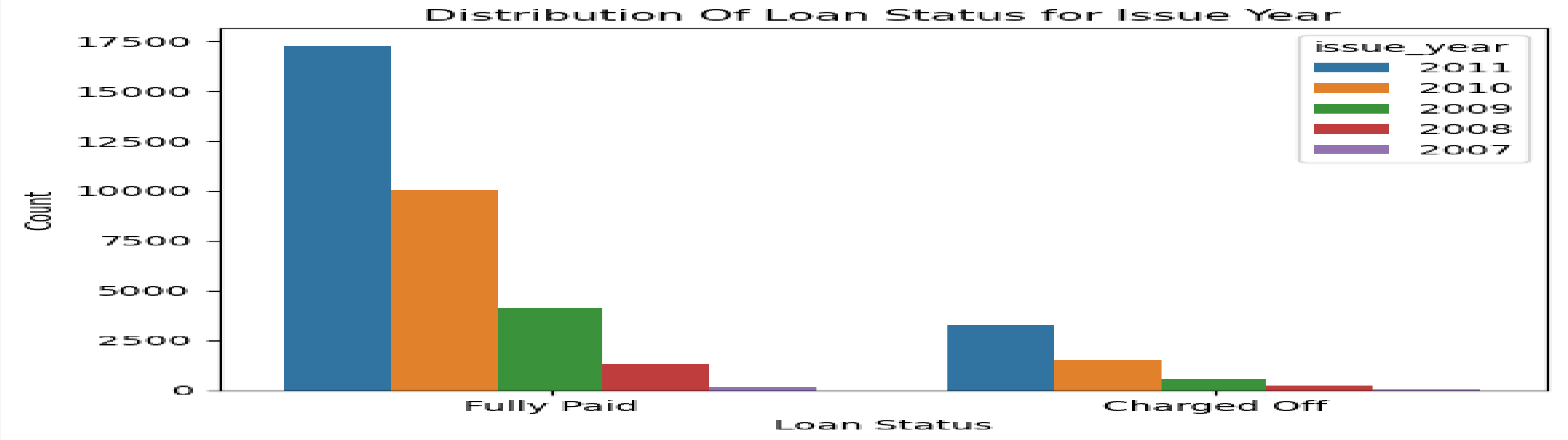
- ❑ The B grade loans, with a DTI of 156,264.41, have a higher debt-to-income ratio compared to other grades.

DISTRIBUTION OF INTEREST RATE BASED ON LOAN STATUS



- ❑ Loan amounts increase with interest rates up to 17.5%, then decline, suggesting higher rates deter borrowing

DISTRIBUTION OF LOAN STATUS FOR ISSUE YEAR



- ❑ The exponential increase in loans over the years suggests a significant rise in the debt-to-income (DTI) ratio, while the rate of loan defaults is decreasing

UNIVARIATE ANALYSIS

- The number of fully paid loans is significantly higher compared to loans that are either charged-off or still current.
- Over half of the loans taken have a term of 36 months, in contrast to those with a 60-month term.
- The interest rates are predominantly concentrated in the 5-10 and 10-15 ranges, with a noticeable dip around the 10% mark.
- Most borrowers have more than 10 years of work experience.
- Employees with over 10 years of experience are more likely to either default or fully repay their loans.

UNIVARIATE ANALYSIS

- Annual income exhibits a left-skewed distribution, indicating that the majority of borrowers have relatively low incomes compared to the rest.
- A significant portion of loans are taken for debt consolidation, followed by credit card repayment.
- The highest number of defaults occurred when loans were issued in December. Additionally, loans issued in 2011 saw a higher default rate compared to other years.
- Loans with a 36-month term are primarily composed of grade A and B loans, while loans with a 60-month term mostly consist of grade B, C, and D loans
- The majority of borrowers do not own property and are either on a mortgage or renting. Approximately 50% of the borrowers are either company-verified or have their income source verified.

BIVARIATE ANALYSIS

- Applicants with higher salaries predominantly applied for loans related to 'home improvement' 'house' and 'renewable energy’.
- Borrowers in the $85k to $112k annual income bracket have the largest loan amounts.
- Borrowers with a mortgage tend to have the highest annual income compared to other home ownership types
- Employees with longer working history got the loan approved for a higher amount.
- The verification status indicates that there are more verified loans, with a total amount of 189,663,350, compared to other statuses.
- The majority of loan amounts are associated with a 36-month term, in comparison to a 60-month term.

BIVARIATE ANALYSIS

- The total fully paid amount, at 358,049,725, is significantly larger compared to the charged-off amount, indicating a higher proportion of successfully repaid loans.
- The B grade loans, with an amount of 128,515.86, carry higher interest rates compared to other grades .
- The B grade loans, with a DTI of 156,264.41, have a higher debt-to-income ratio compared to other grades
- Loan amounts increase with interest rates up to 17.5%, then decline, suggesting higher rates deter borrowing
- The exponential increase in loans over the years suggests a significant rise in the debt-to-income (DTI) ratio, while the rate of loan defaults is decreasing.

CONCLUSION

- **Loan Tenure and Default Risk:**

 * Loans with a 60-month term appear to be riskier compared to 36-month loans, as they include more B, C, and D grade loans, which are generally associated with higher interest rates and debt-to-income (DTI) ratios.

- **Income and Loan Behavior:**

 * Borrowers with higher annual incomes tend to take out larger loans, especially for home-related improvements and renewable energy projects.

 * Despite higher incomes, the propensity to default seems higher in certain income brackets, such as the $85k to $112k range. Income alone isn't a perfect indicator of repayment capacity.

- **Employment and Risk:**

 * Applicants with more than 10 years of work experience make up a large portion of both fully paid and defaulted loans, suggesting that work experience alone isn't a decisive factor in loan approval.

 * However, those with longer employment histories tend to be approved for larger loans, potentially leading to increased default risk due to higher financial burdens.

- **Interest Rate Impact:**

 * Loans with interest rates up to 17.5% are more common, but beyond this threshold, the number of loans decreases, implying higher rates may deter borrowers. However, these higher interest loans are riskier, as they are more likely to lead to default.

CONCLUSION

- **Debt-to-Income Ratio (DTI):**

  * Higher DTI ratios, particularly in B grade loans, are correlated with increased loan amounts and default rates. This indicates that borrowers taking on larger loans relative to their income are at greater risk of default.

- **Homeownership and Borrower Risk:**

  * Borrowers with mortgages tend to have higher incomes, but homeownership status (especially renting or mortgages) doesn't offer strong protection against default.

  * Non-homeowners and those renting may face additional financial pressures, making them more prone to default.

- **Verification Status and Loan Performance:**

  * Verified loans have higher total amounts, and a large number of fully paid loans fall into this category. This suggests that income verification might correlate with better repayment outcomes.

- **Purpose and Default**:

  * Loans taken out for debt consolidation and credit card repayment make up a significant portion of both fully paid and defaulted loans. These loans may represent higher-risk borrowers attempting to manage existing debt, increasing their default likelihood.

CONCLUSION

- **Seasonal and Temporal Trends:**

  * Loans issued in December have a higher default rate, potentially indicating seasonal financial strain or year-end budgetary issues for borrowers.

  * The year 2011 showed higher default rates, which could be reflective of macroeconomic conditions or specific changes in lending policies.

- **Increasing Loan Demand vs. Declining Default Rates:**

  * Over time, the number of loans has increased, but default rates have declined, indicating possible improvements in lending practices or risk assessment strategies. However, the increase in the DTI ratio suggests rising financial pressure on borrowers.

OVERALL STRATEGIC IMPLICATIONS

- Lending strategies should be adjusted to account for the increased risk in 60-month loans, higher DTI ratios, and loans issued at the end of the year

- While income is an important factor, it cannot be the sole determinant in assessing borrower risk. A combination of variables, including DTI, loan term, and verification status, should be used to make more accurate risk assessments.

- Additional precautions (e.g., higher interest rates or smaller loan amounts) should be taken when lending to borrowers taking out loans for debt consolidation or credit card repayment, as these tend to be high-risk categories.