LOAN DEFAULT

FINTECH CAPESTONE

Understanding of risk analytics in Banking and Financial services

By

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AGENDA

- About the Project
- Introduction to the Project
- Insights and Recommendations based on the Analysis
- Insights and recommendations based on Hypothesis testing

ABOUT THE PROJECT

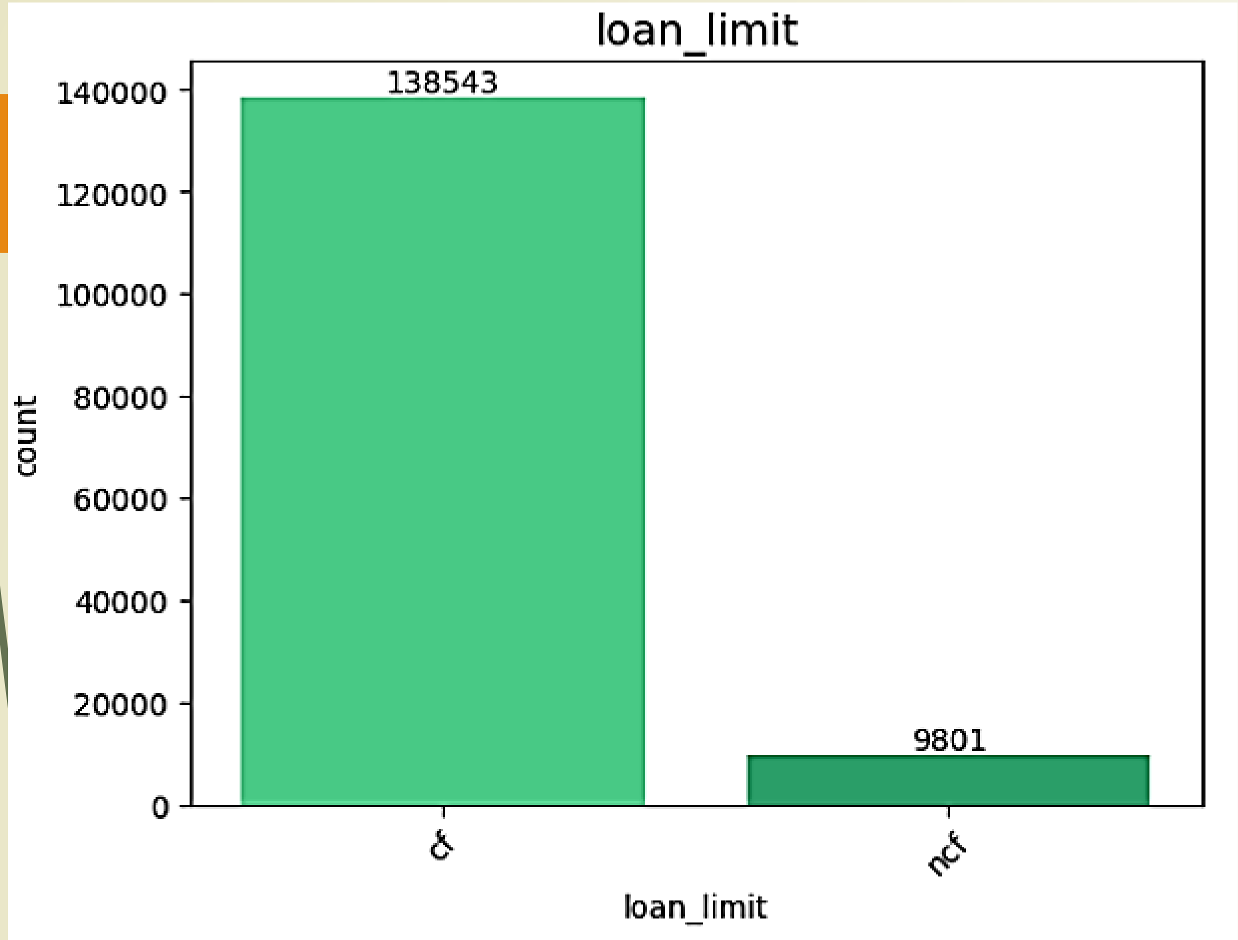
This project focuses on **risk analytics within the banking sector**, aiming to identify **key factors that contribute to loan defaults**. By analyzing variables such as loan amounts, LTV (Loan-to-Value) ratios, property values, and borrower demographics, **we uncover insights that can help predict and mitigate default risks**. Our analysis utilizes statistical techniques, including Chi-Square and Mann-Whitney U tests, to highlight relationships between these factors and loan status. **The goal** is to provide **actionable insights for improving risk assessment strategies and making more informed lending decisions to minimize defaults.**

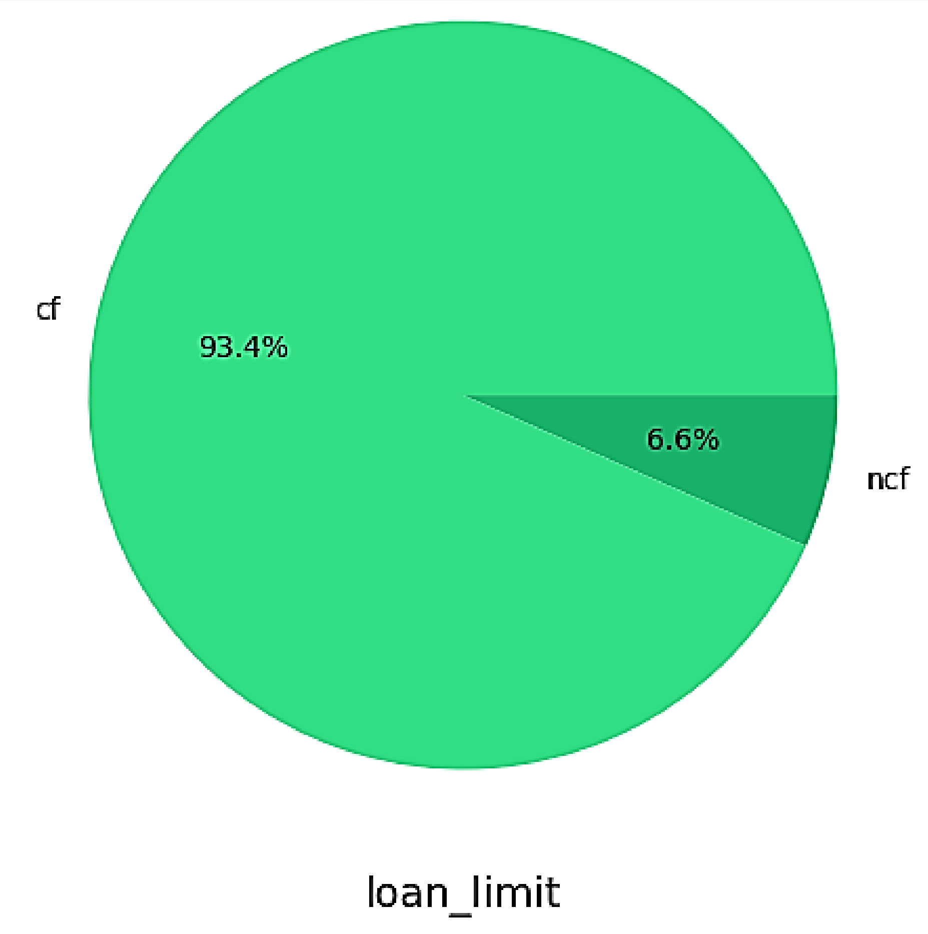
INTRODUCTION TO THE PROJECT

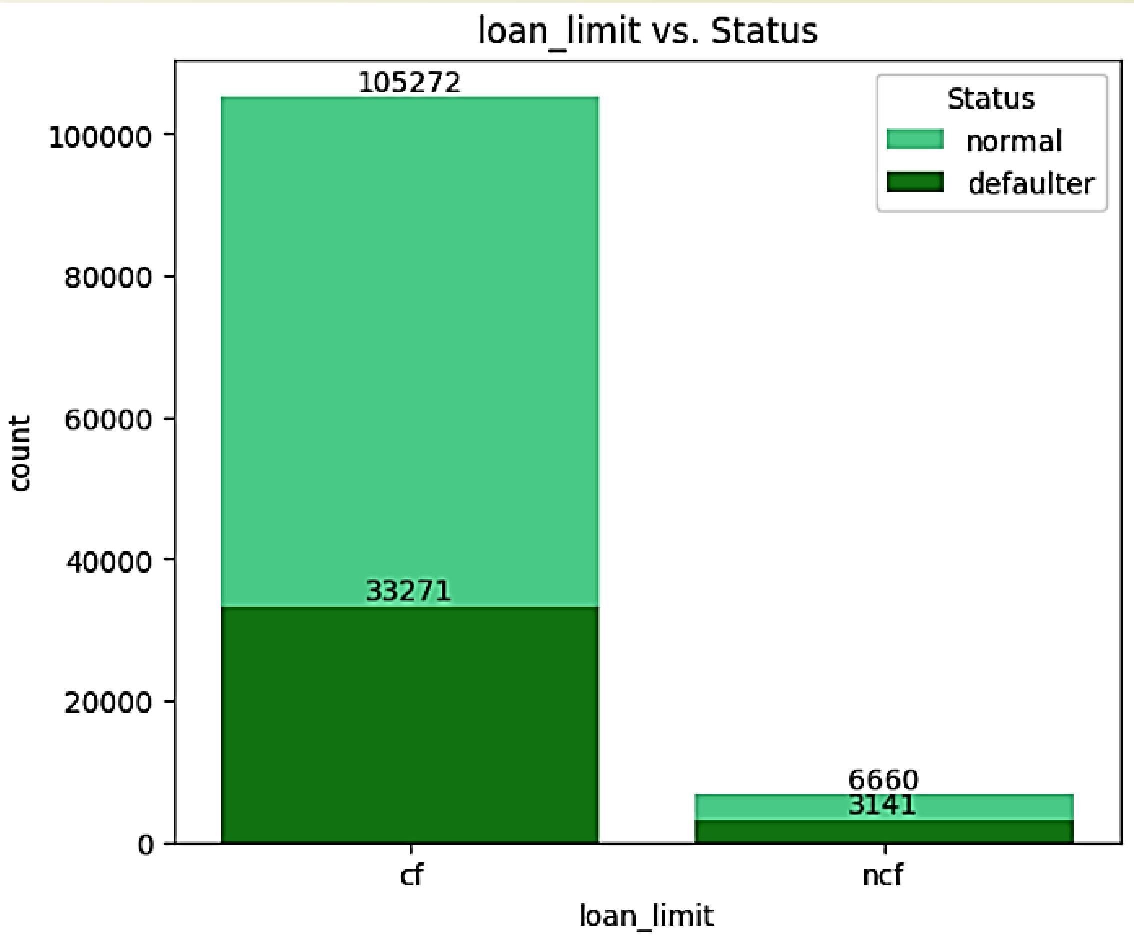
- **Objective:** Identify **key factors influencing loan defaults** and provide actionable insights to reduce the risk.

- **Dataset Overview:** Analyzed **148,670 records** with key variables such as loan amount, property value, LTV, and credit score.

- **Methods Used:** **E**xploratory **D**ata **A**nalysis, Hypothesis Testing and descriptive statistics.





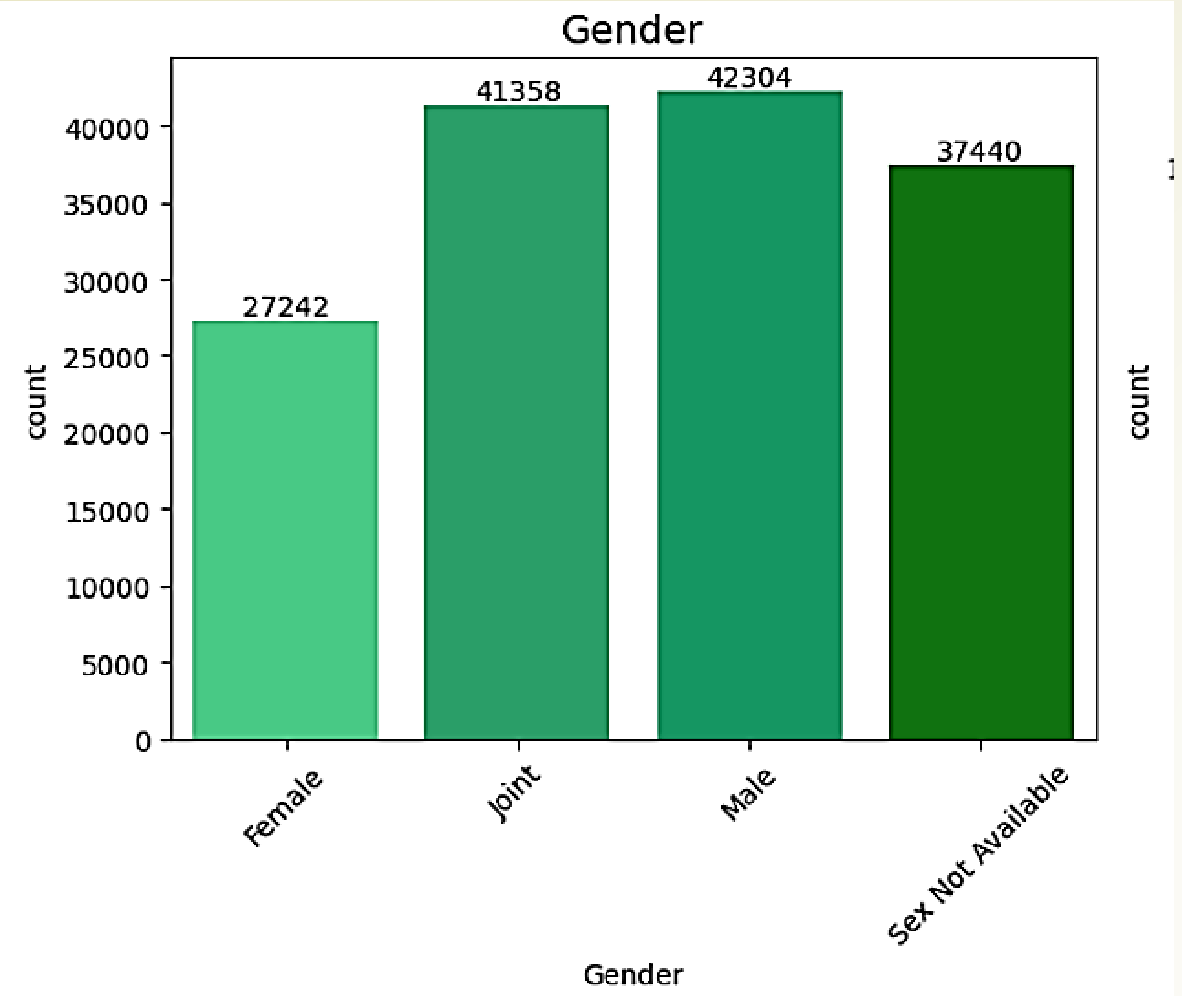


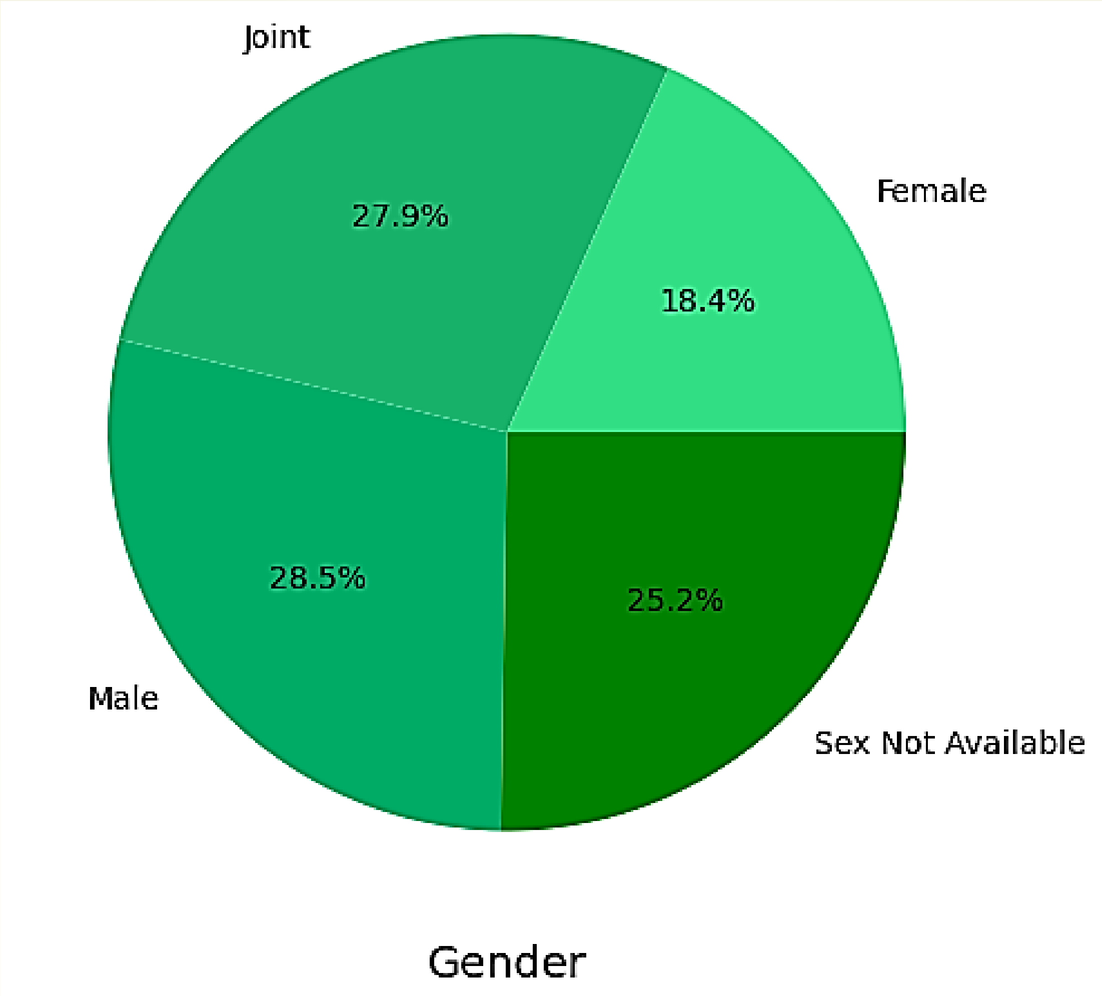
LOAN LIMIT ANALYSIS

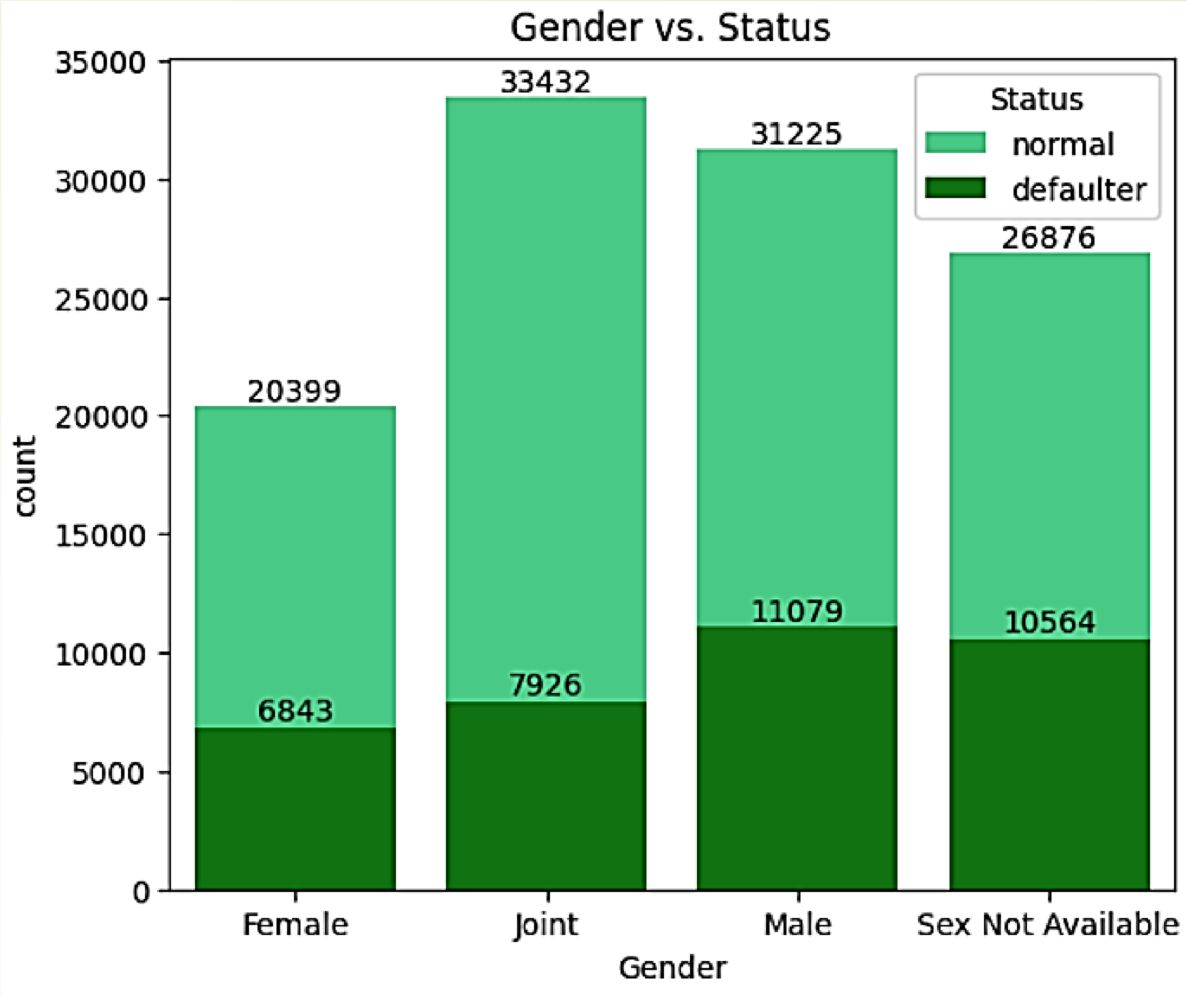
- **Majority** of loans fall under the **conforming category**, indicating a preference or higher eligibility for loans that meet standard criteria.
- **Higher Stability** in **Confirmed Loan Limits**.
- **Increased Risk** in **Non-Confirmed Loan Limits**

Recommendation:

The significant number of defaults among non-confirmed borrowers highlights an opportunity for lenders to **improve their assessment procedures** and support mechanisms for these clients.





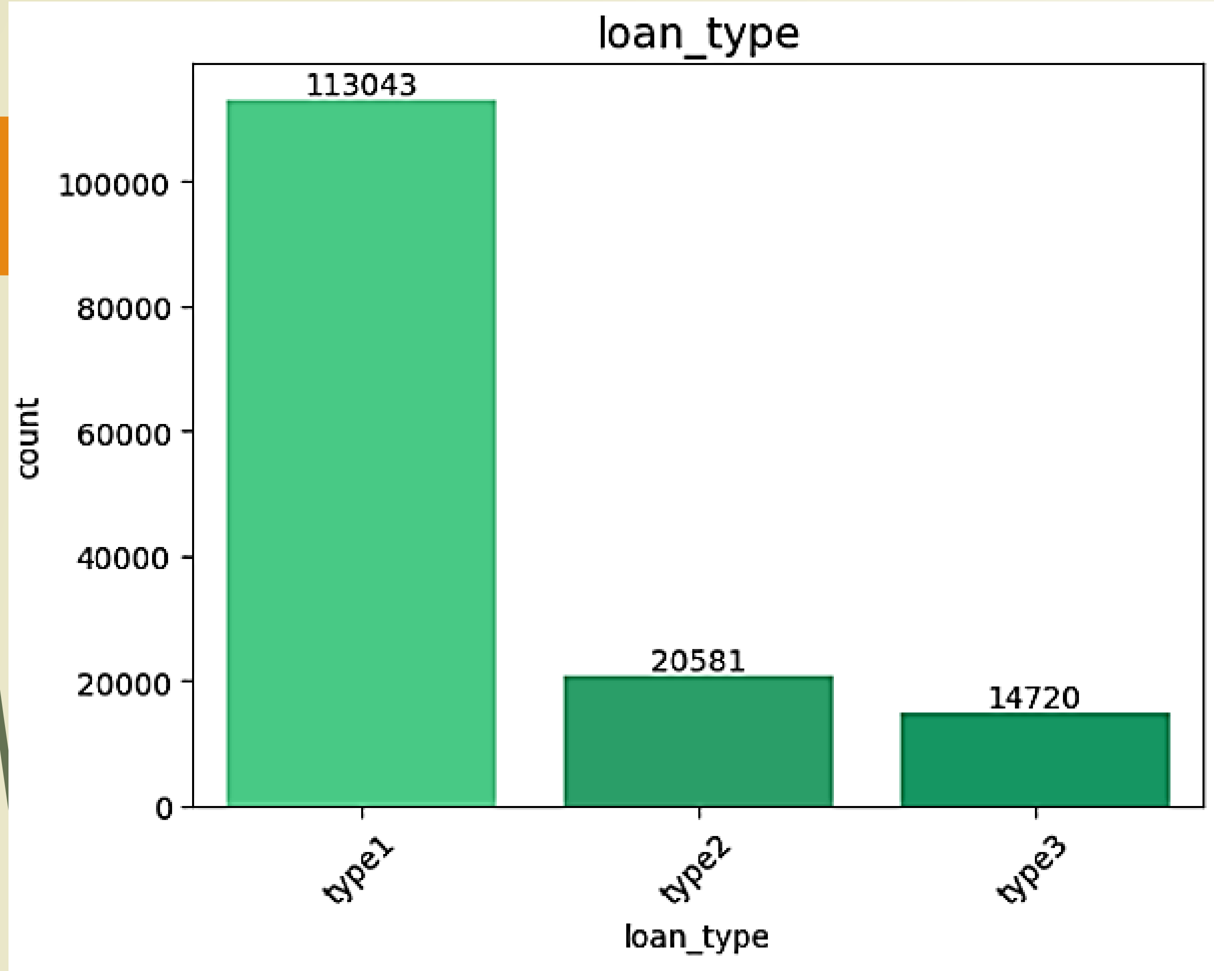


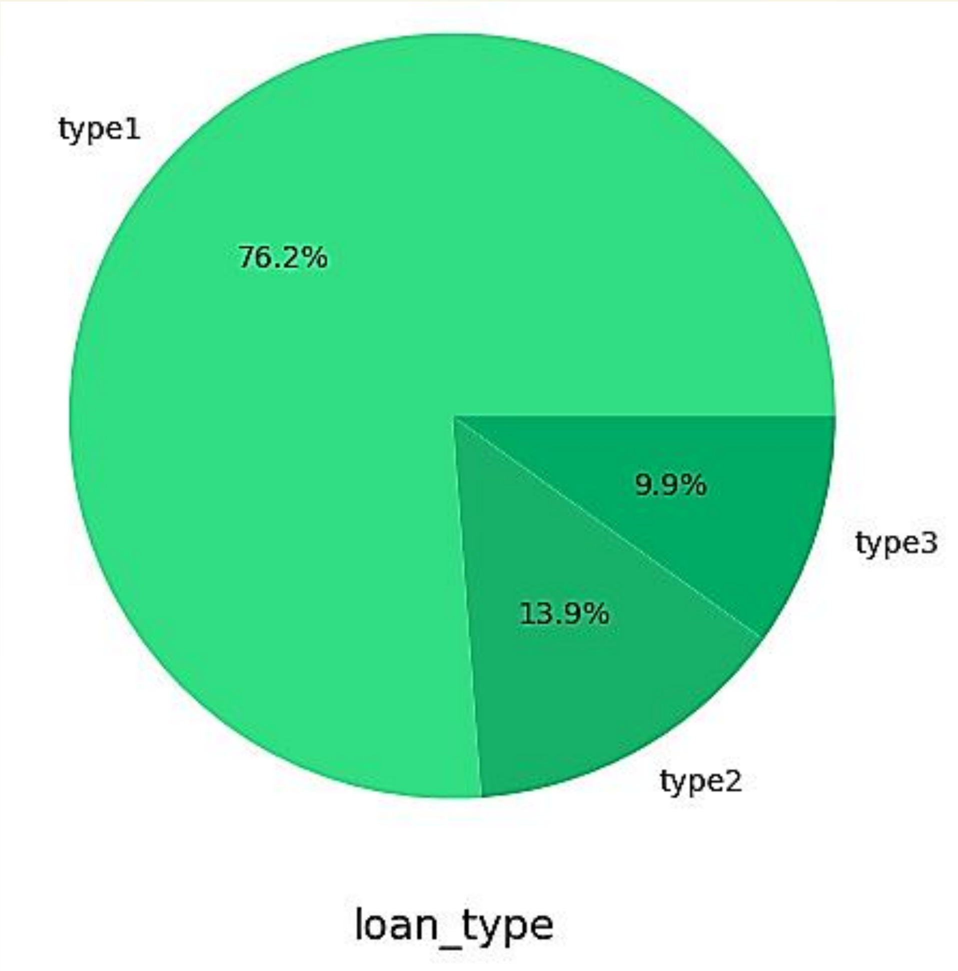
GENDER ANALYSIS

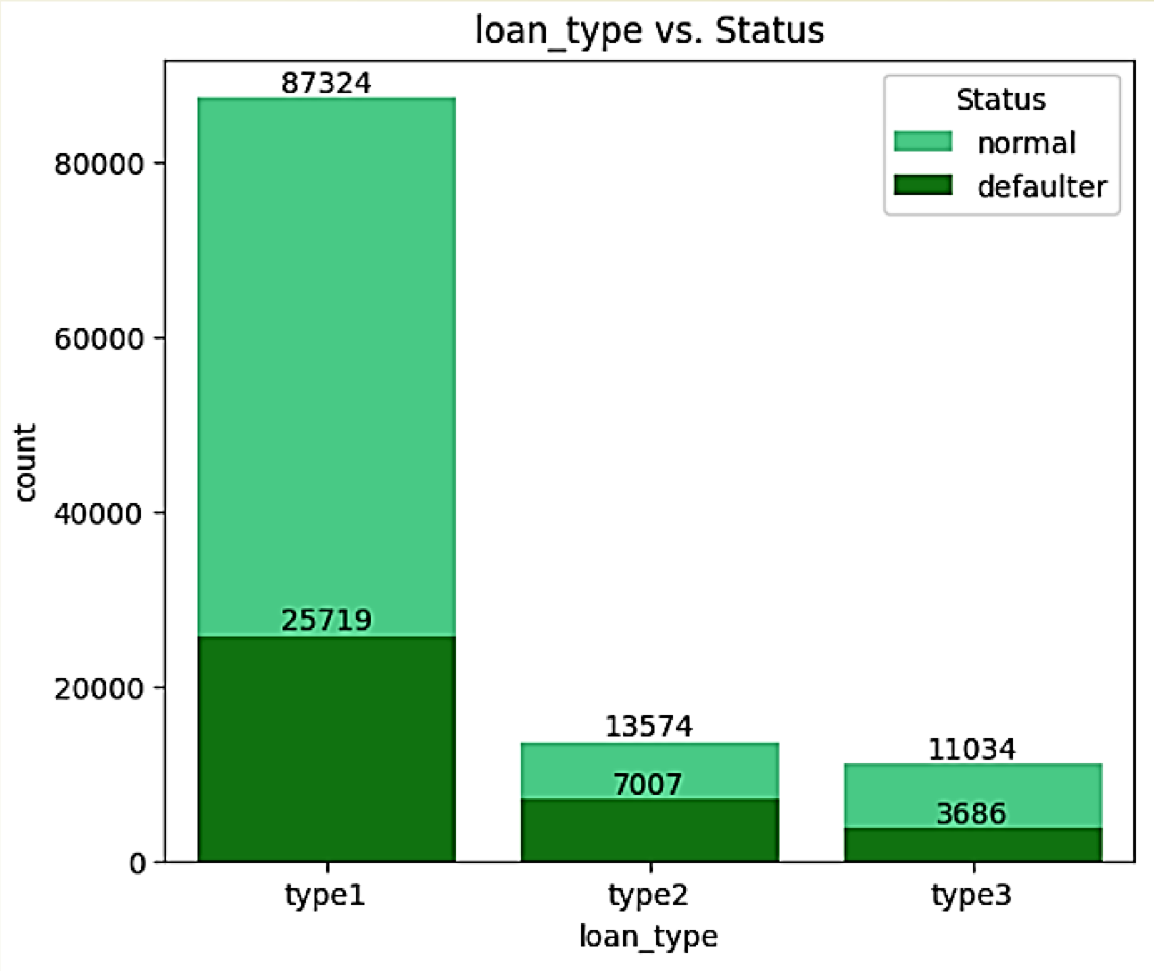
- There is a **near-even split** between **male and joint applications**, with a **relatively high number of cases** where **gender information is unavailable**. Female applicants represent the smallest group.
- **Joint borrowers** show a relatively **lower default rate**.
- Borrowers with **unspecified gender** also exhibit a **high default rate**.

Recommendation:

The significant number of defaults among non-confirmed borrowers highlights an opportunity for lenders to **improve their assessment procedures** and support mechanisms for these clients.





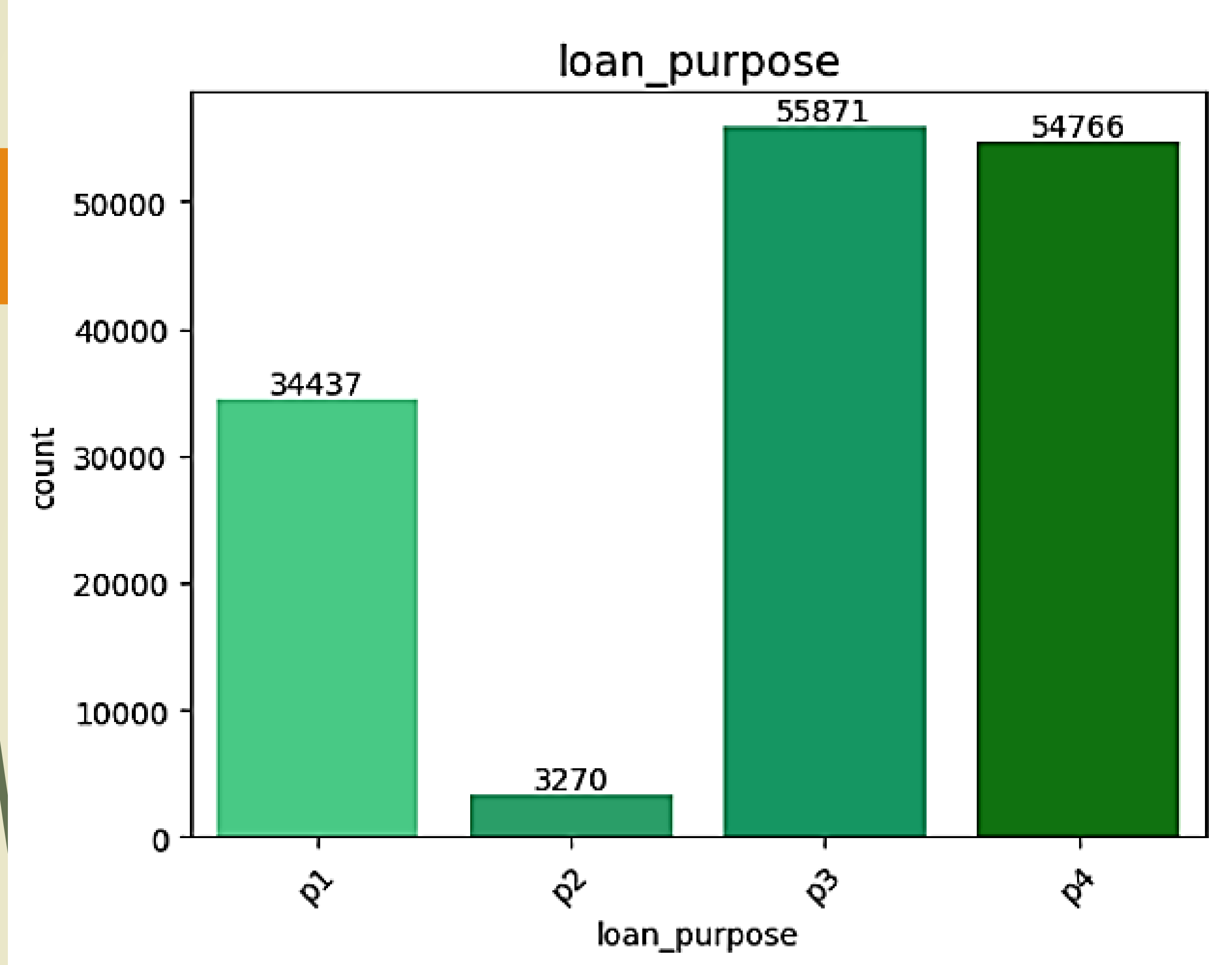


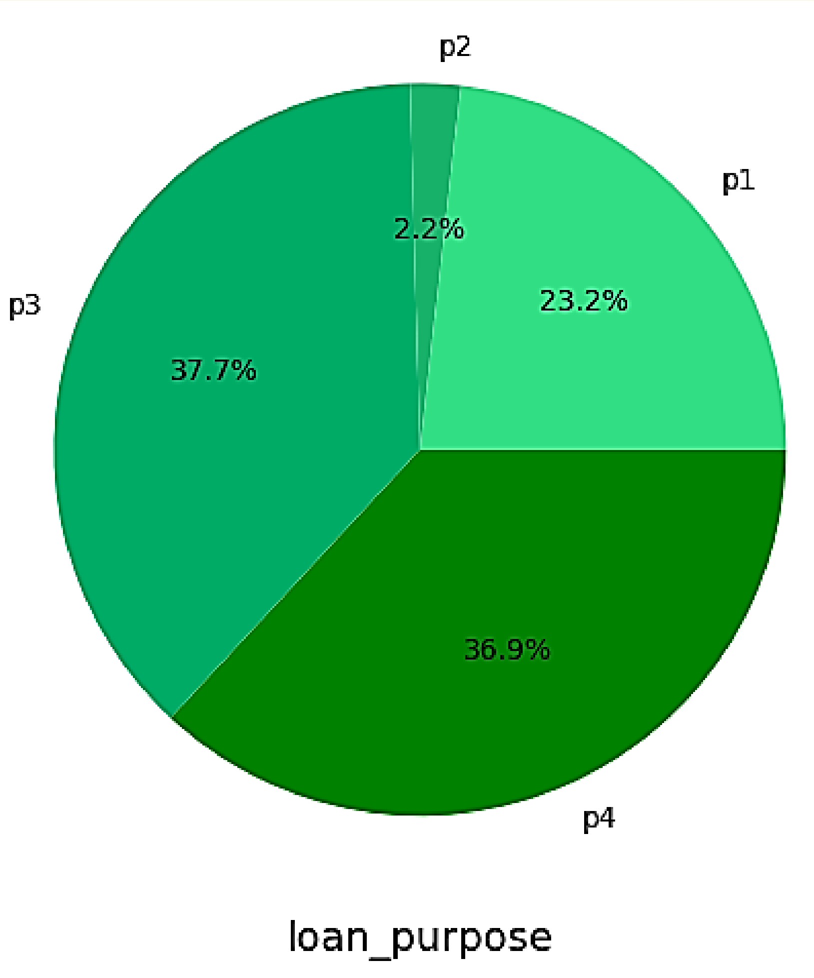
LOAN TYPE ANALYSIS

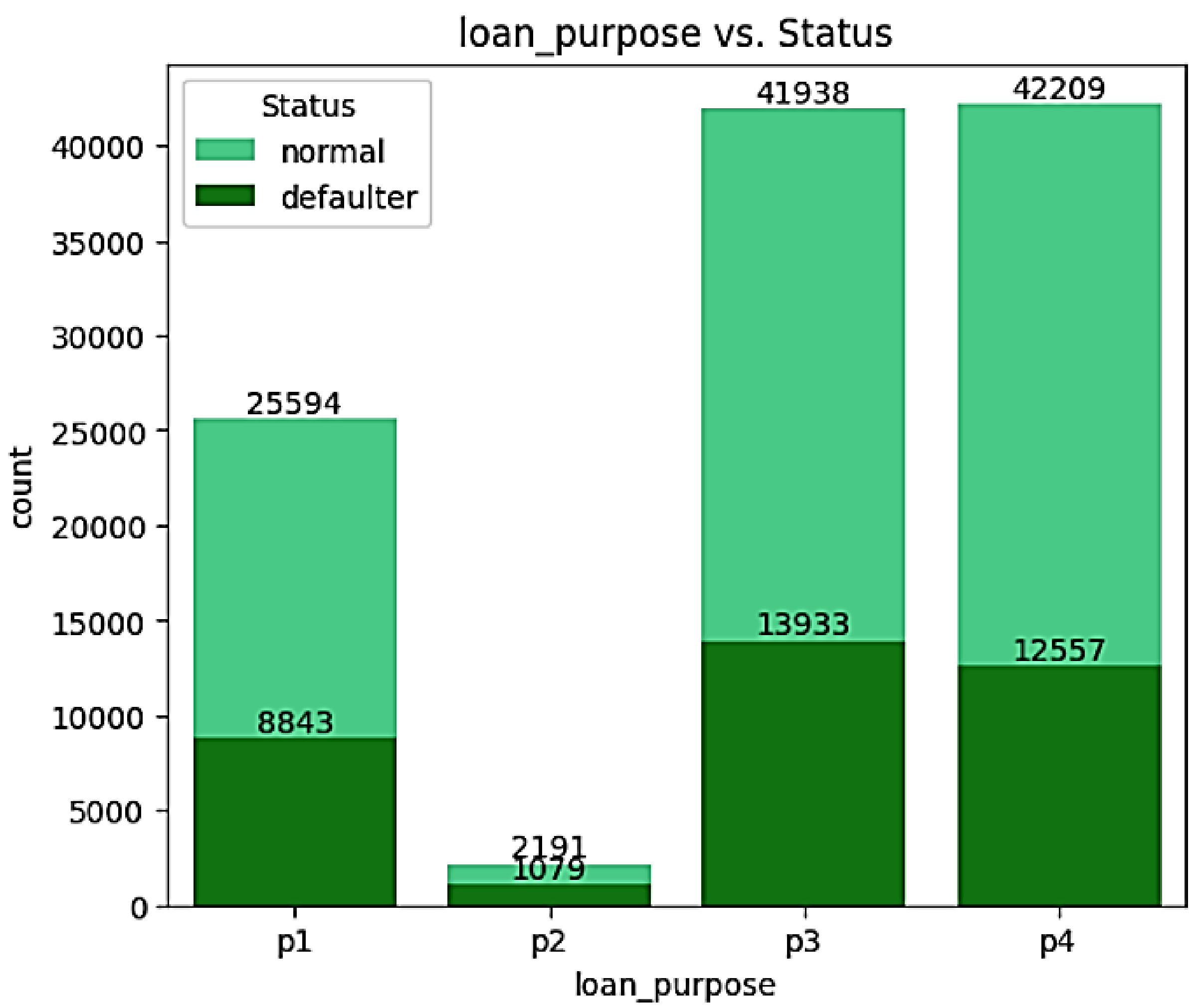
- **Vast majority** of loans belong to loan **type 1**, showing a strong concentration in this category.
- Loan **Type 1** stands out as the most favorable in terms of **low defaults**
- Loan **Type 2** presents **significant risks** with a **high default rate**.

Recommendation:

Revise the lending criteria and **conduct a thorough review** of the terms and borrower profiles for **Loan Type 2**, as it shows a **significantly higher default rate compared to other loan types**, to mitigate risk and improve overall loan performance.





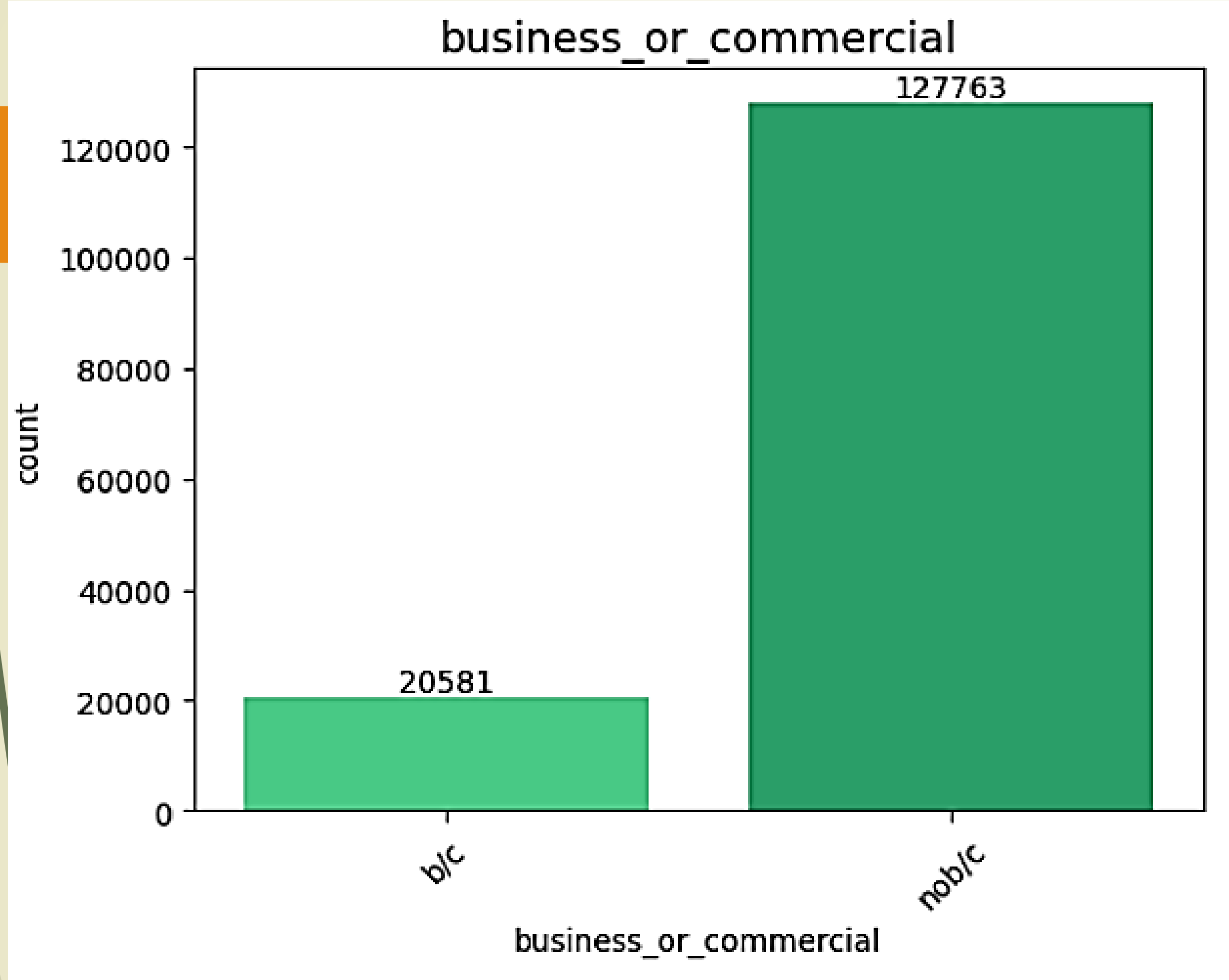


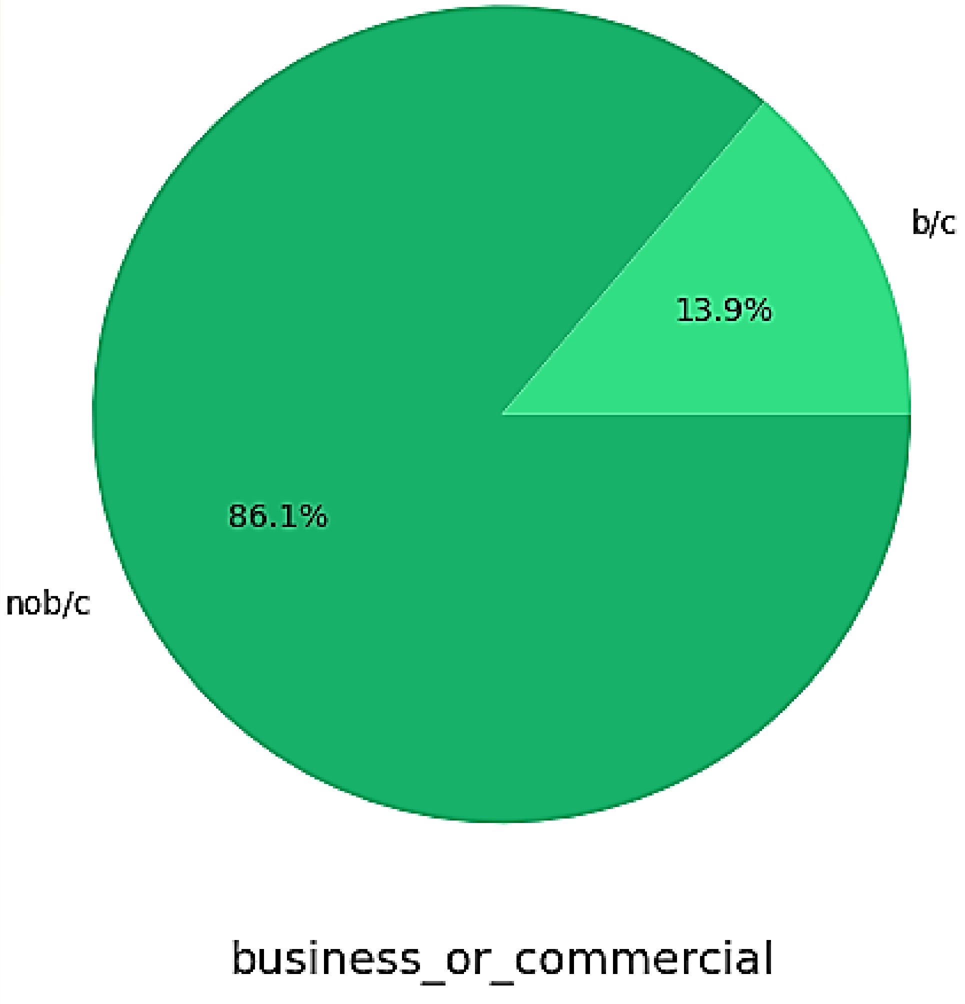
LOAN PURPOSE ANALYSIS

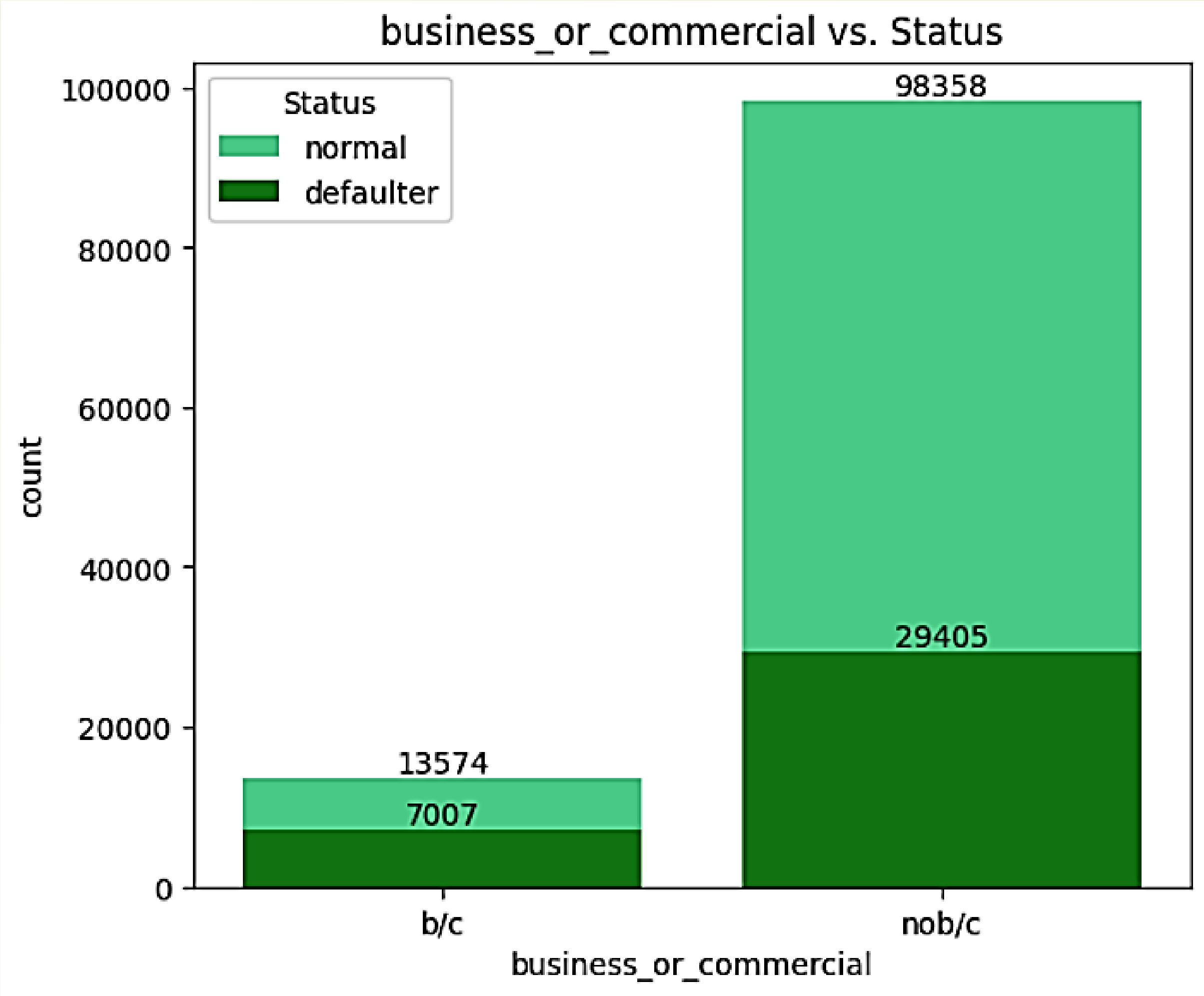
- **Majority of loans** are associated with **purposes p3 and p4**, indicating a focus on certain use cases for loans.
- Loan **Purposes P1 and P2** show **high default rates**.
- Loan **Purpose P4** has the best performance with the **lowest default rate**.

Recommendation:

Conduct a detailed analysis of Loan **Purpose P1 and Loan Purpose P2**, as they exhibit high default rates, to **identify underlying risk factors** and develop targeted strategies to mitigate risks associated with these loan purposes.





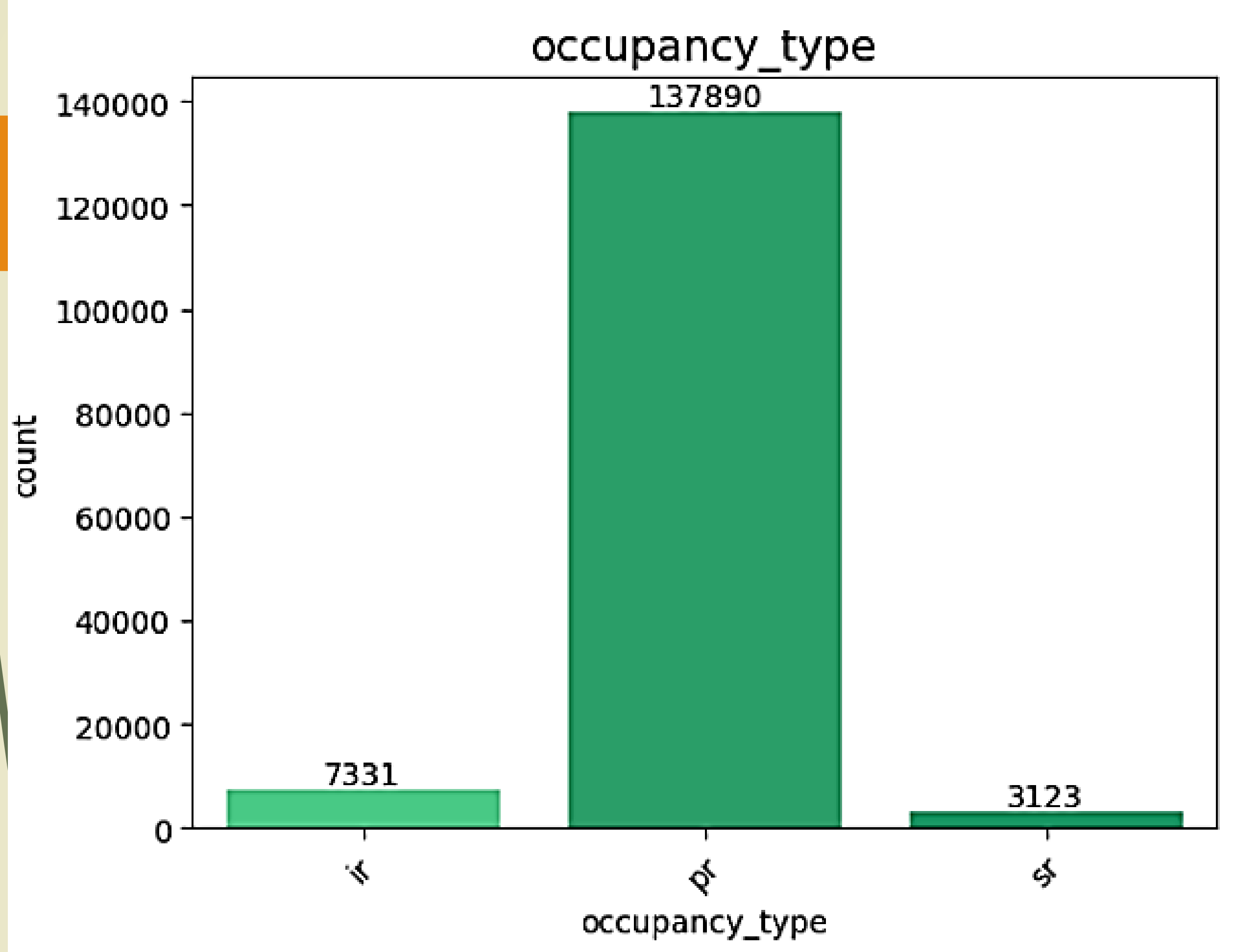


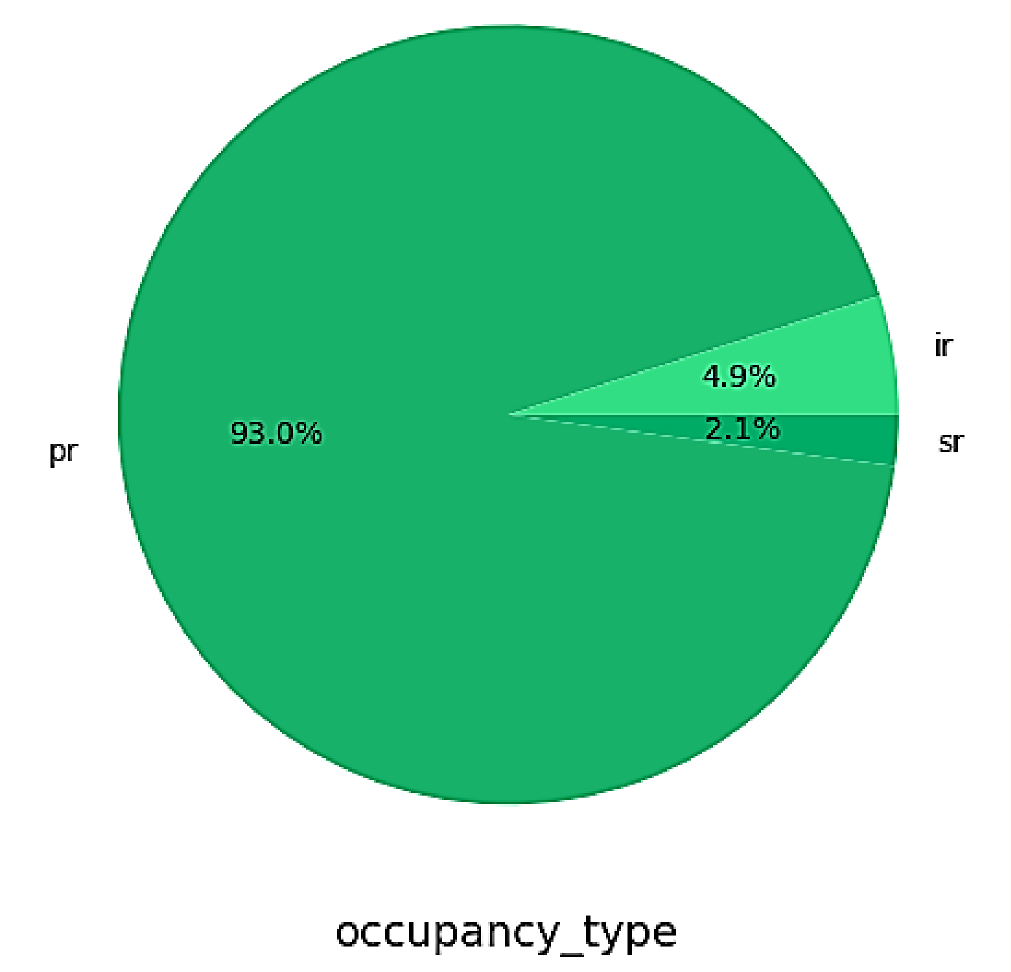
BUSINESS (OR) COMMERCIAL LOAN ANALYSIS

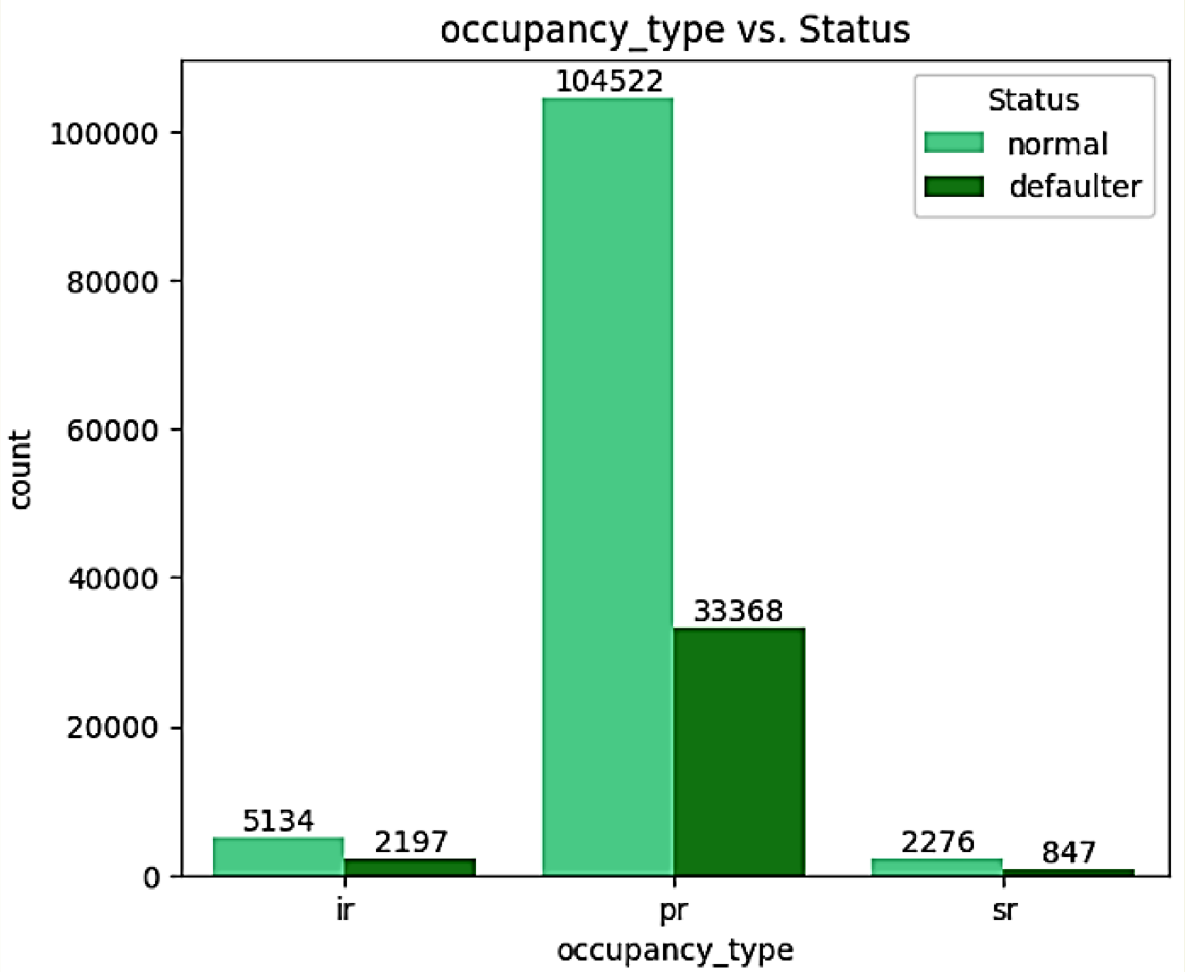
- The **most loans are for personal or non-business purposes**, with a small proportion allocated for commercial needs.
- Loans given to **business/commercial establishments (b/c)** exhibit a **higher default rate**.
- **Non-commercial or personal loans (nob/c)** demonstrate stronger performance, with a higher proportion of normal loans and a **lower default rate**.

Recommendation:

Enhance risk assessment protocols for business/commercial loans due to their higher default rate, and consider implementing more stringent lending criteria or providing additional support to borrowers in this category to reduce default risks.





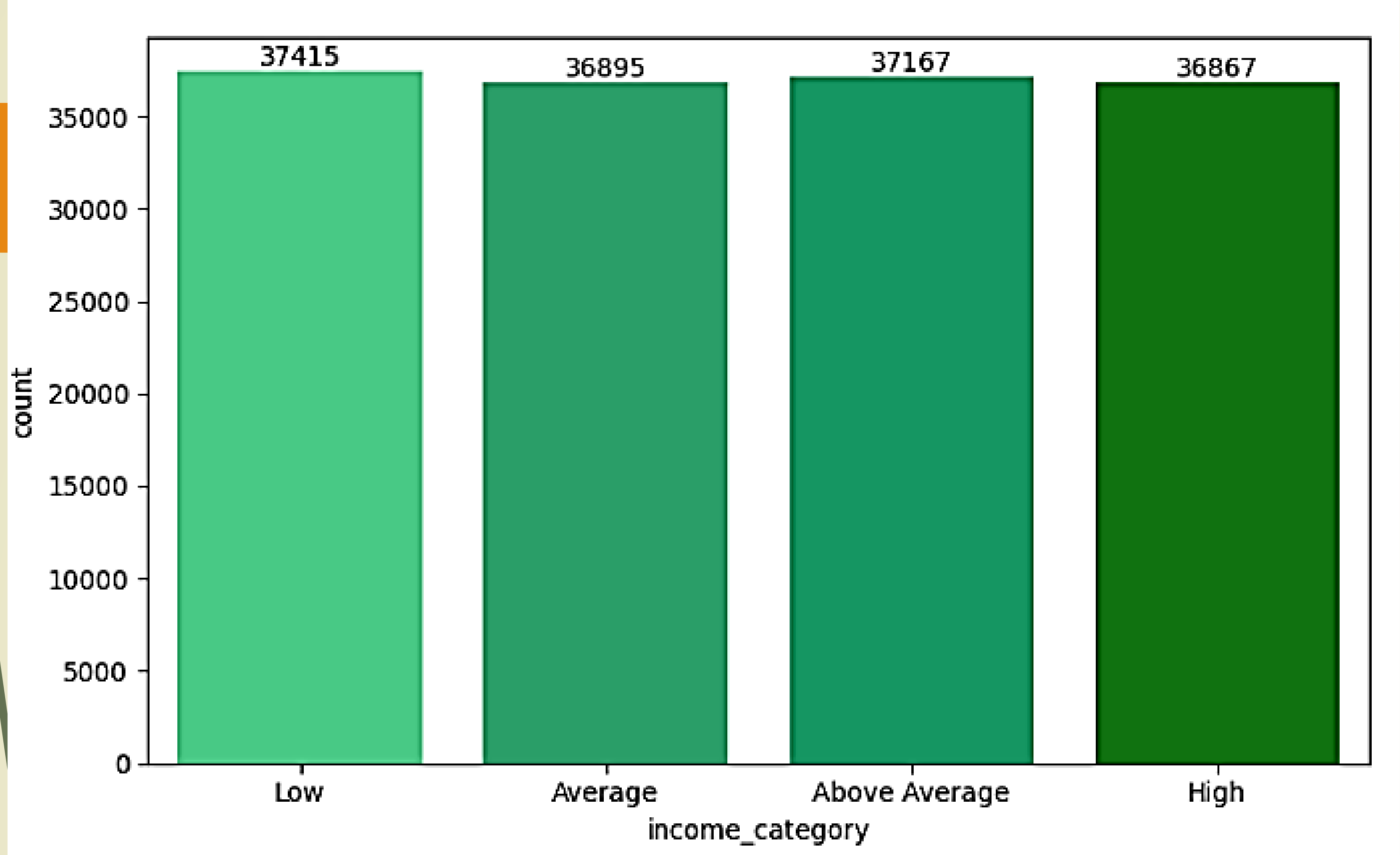


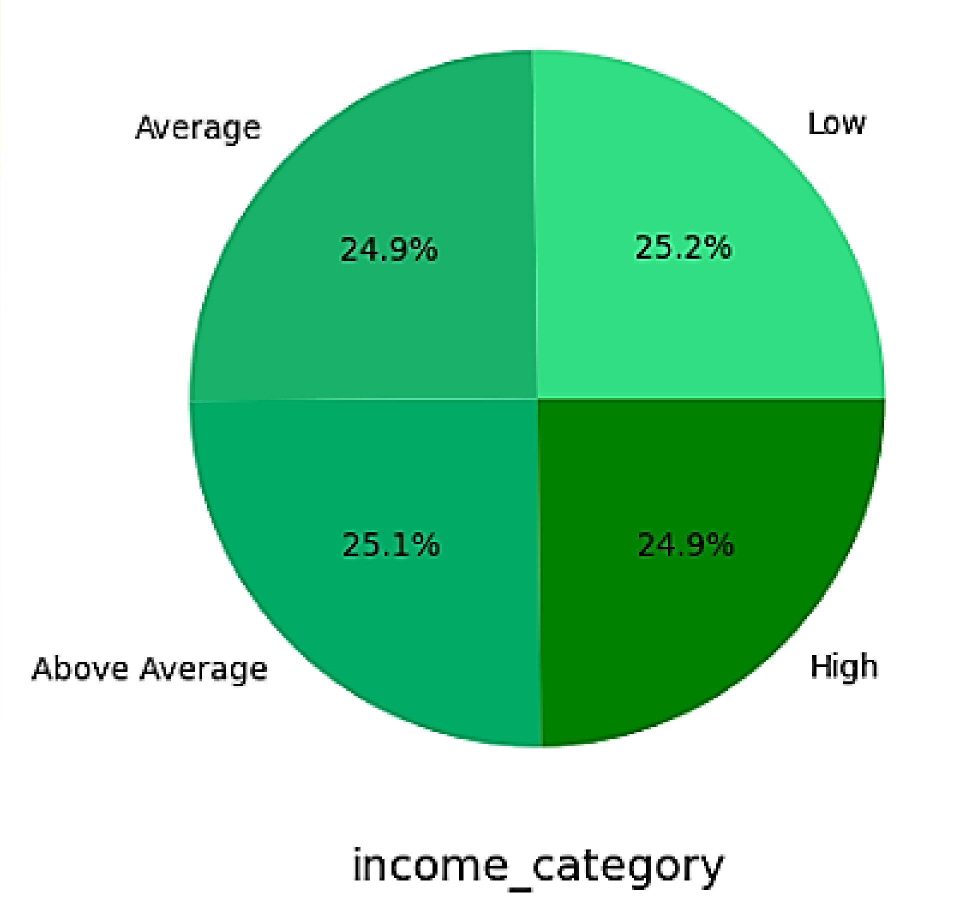
OCCUPANCY TYPE ANALYSIS

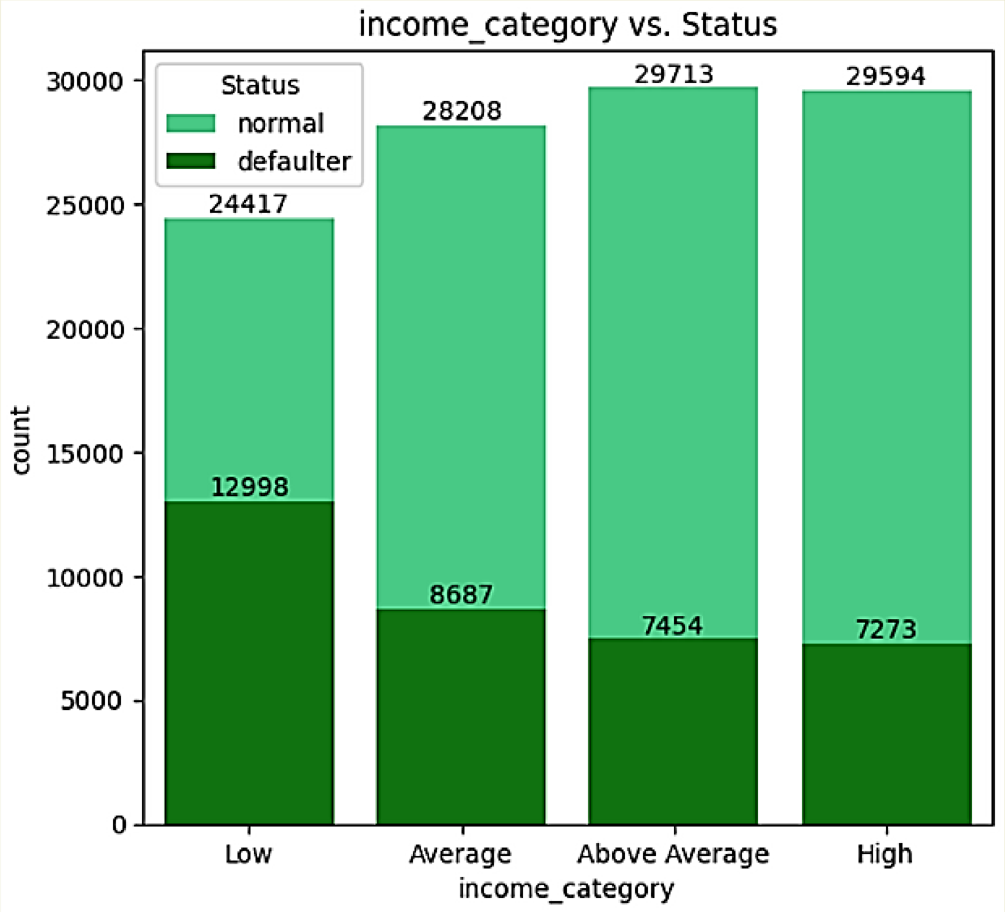
- **Vast majority of loans** are tied to **primary residences**, with investment and secondary residences making up only a small fraction.
- **Higher Default** Rates for **Investment Residences**.
- Stability in Secondary Residences

Recommendation:

Implement stricter credit assessments and risk management strategies for **investment residences** (occupancy type 'ir') to mitigate the high default rates, while maintaining supportive measures for primary and secondary residence borrowers to ensure overall portfolio stability.





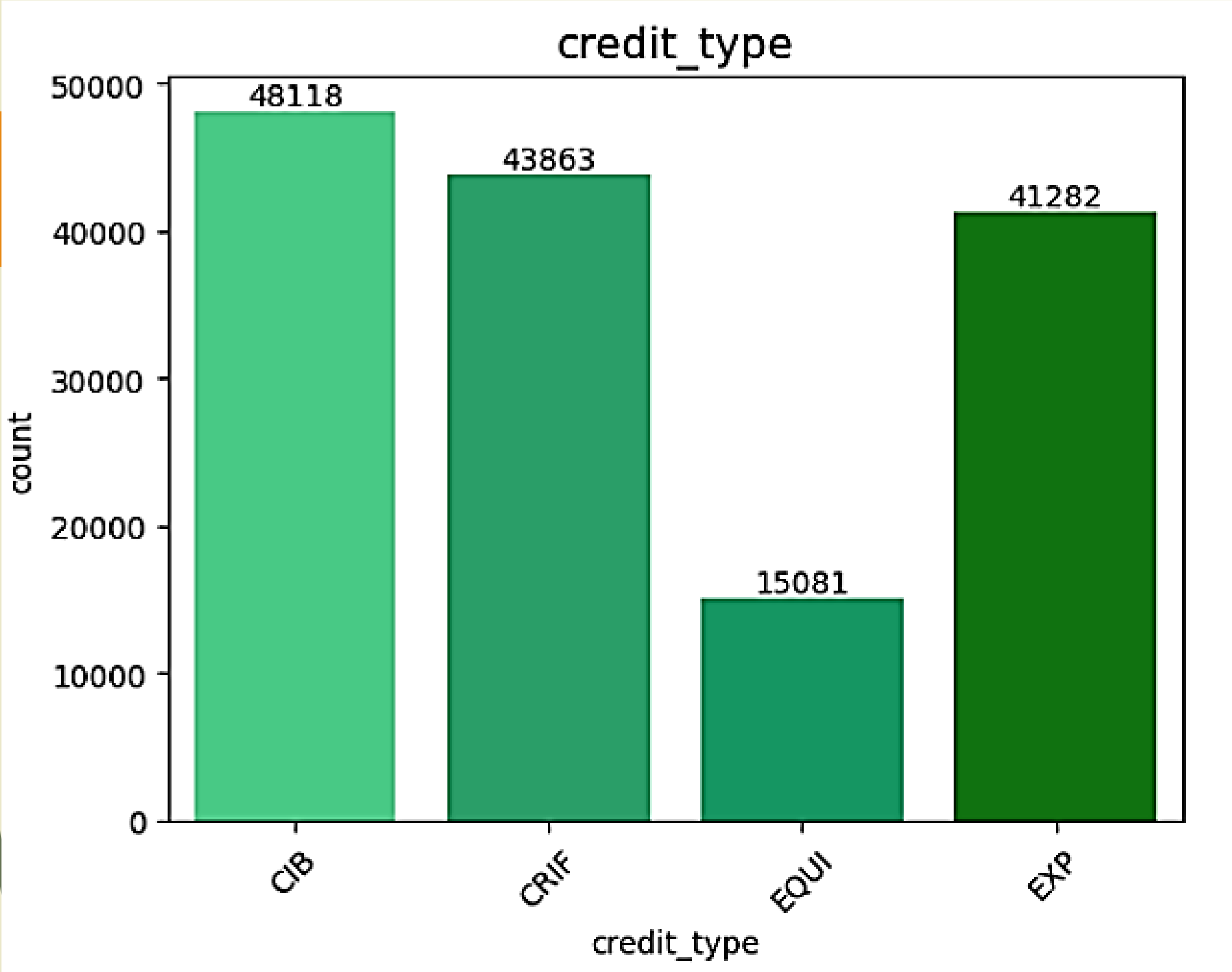


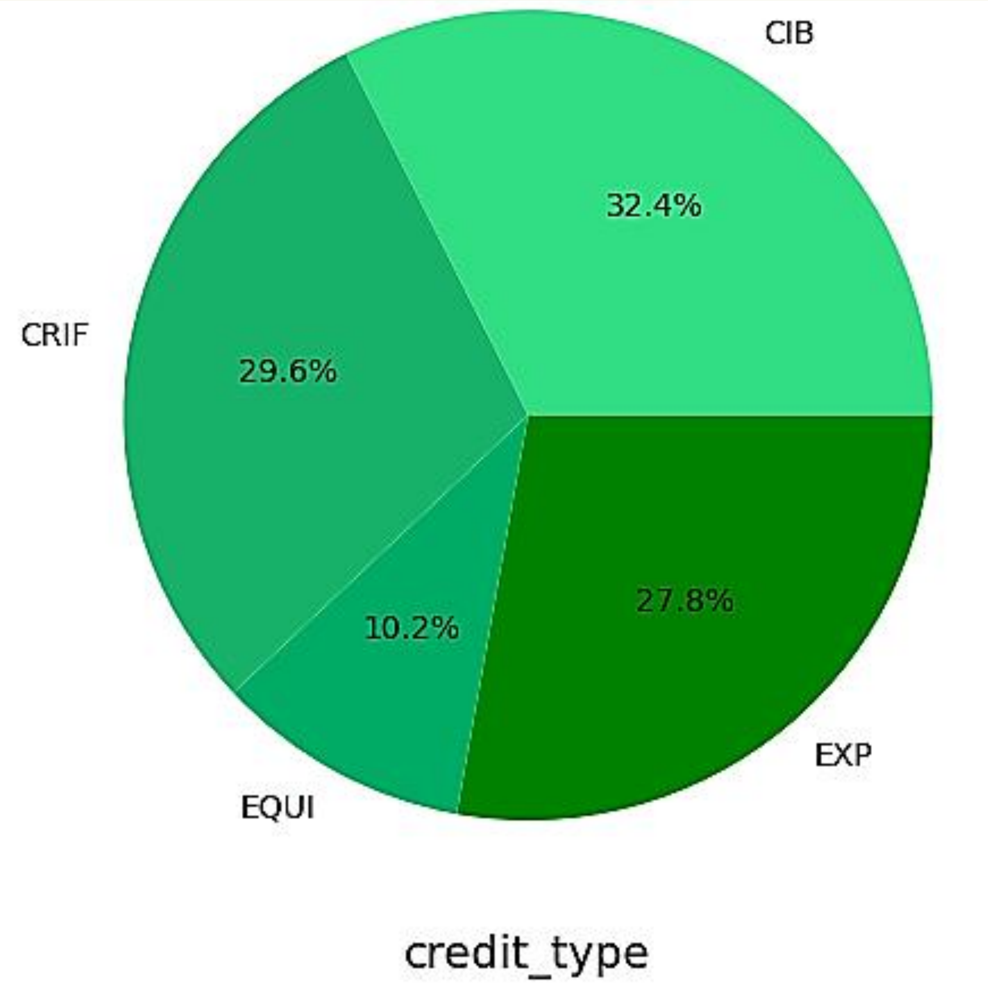
INCOME CATEGORY ANALYSIS

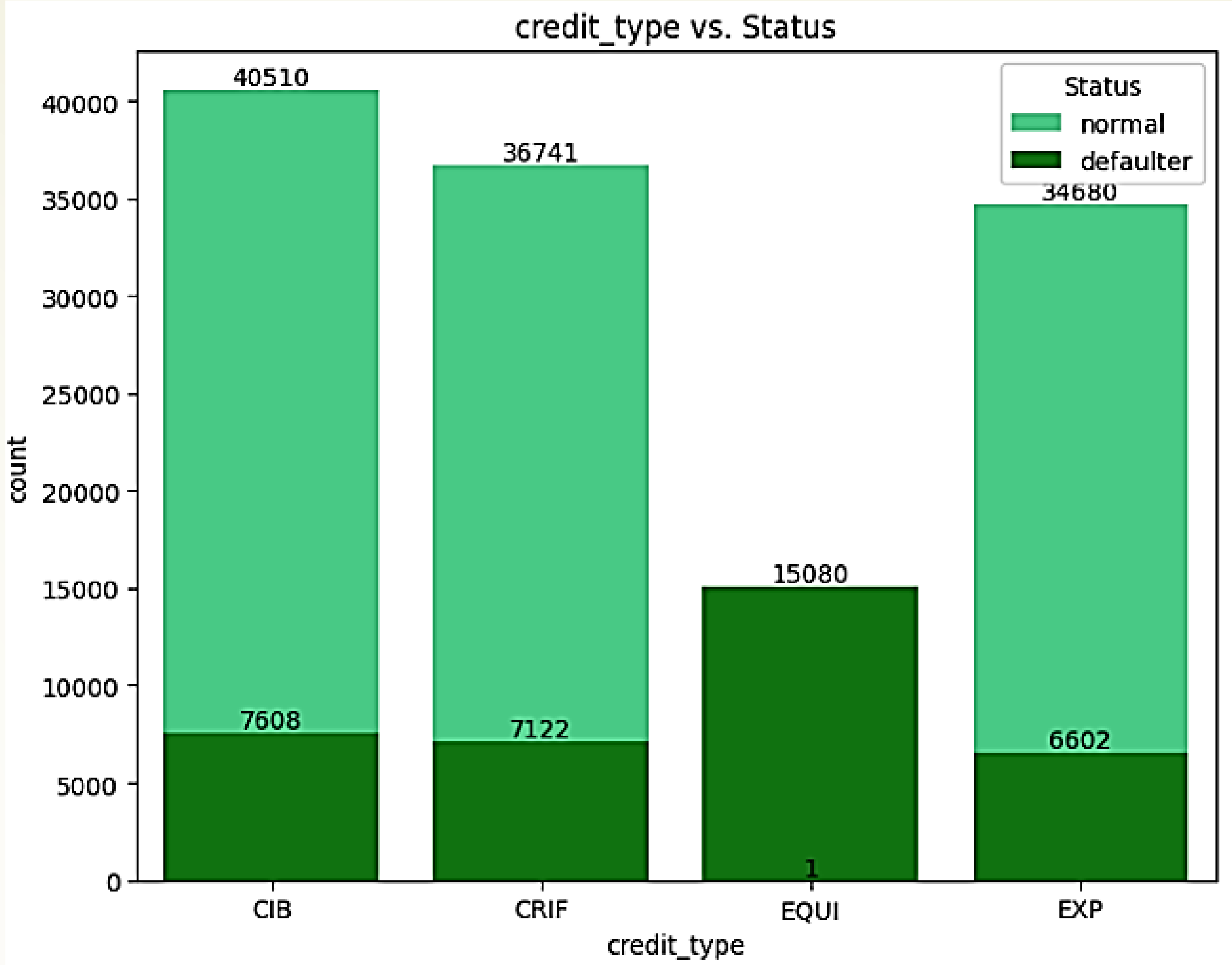
- The **counts of borrowers** are relatively **balanced across the four income categories**
- **Low-income category** having the **highest number of borrowers (37,415)**, followed closely by Above Average (37,167), Average (36,895), and High (36,867)
- As **income increases from Low to High, the number of defaulters decreases**. The ratio of normal to defaulter improves, showing that **higher income groups tend to default less frequently**.

Recommendation:

Implement targeted financial assistance and risk management strategies for **low-income borrowers**, as they exhibit a slightly higher default rate compared to higher-income groups





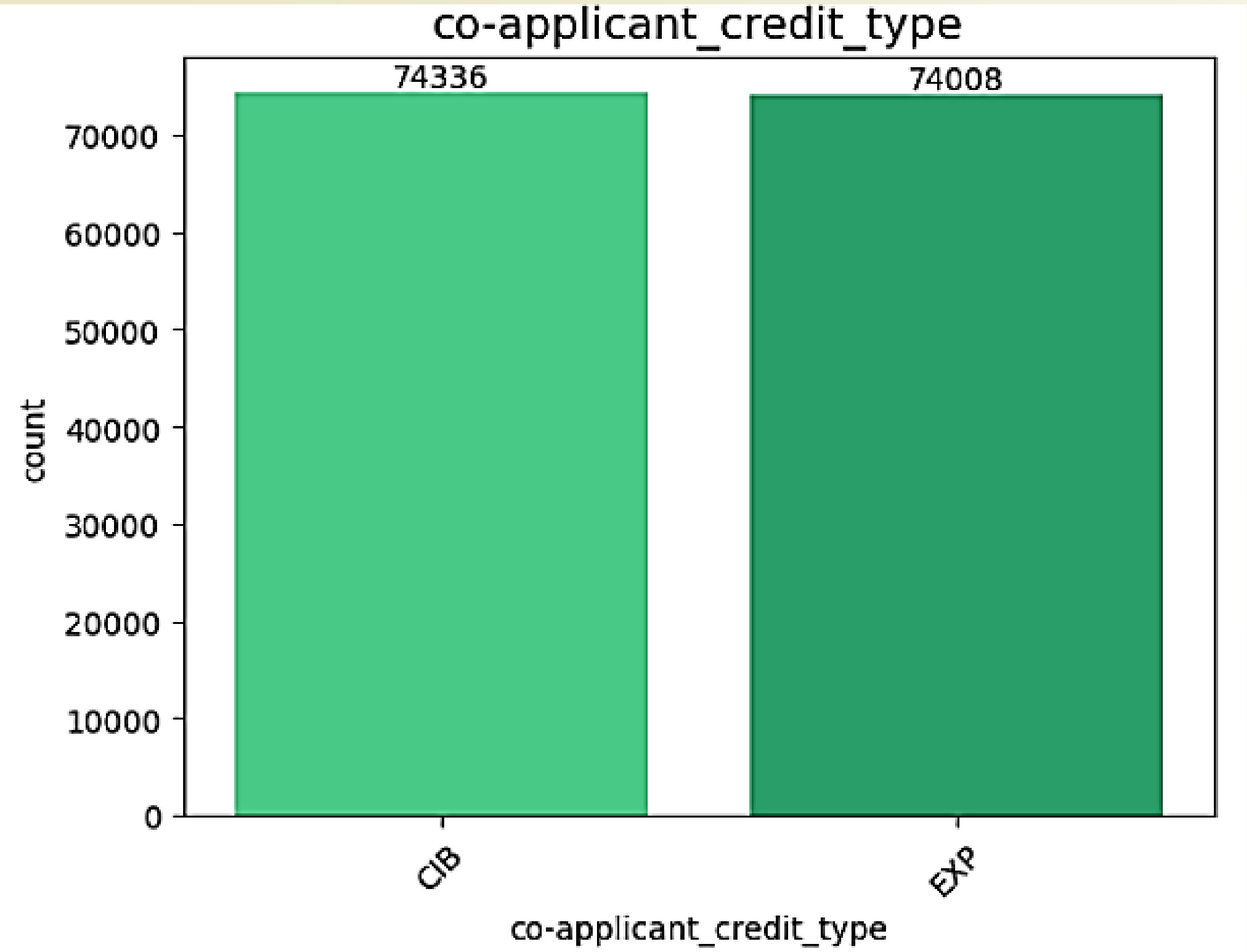


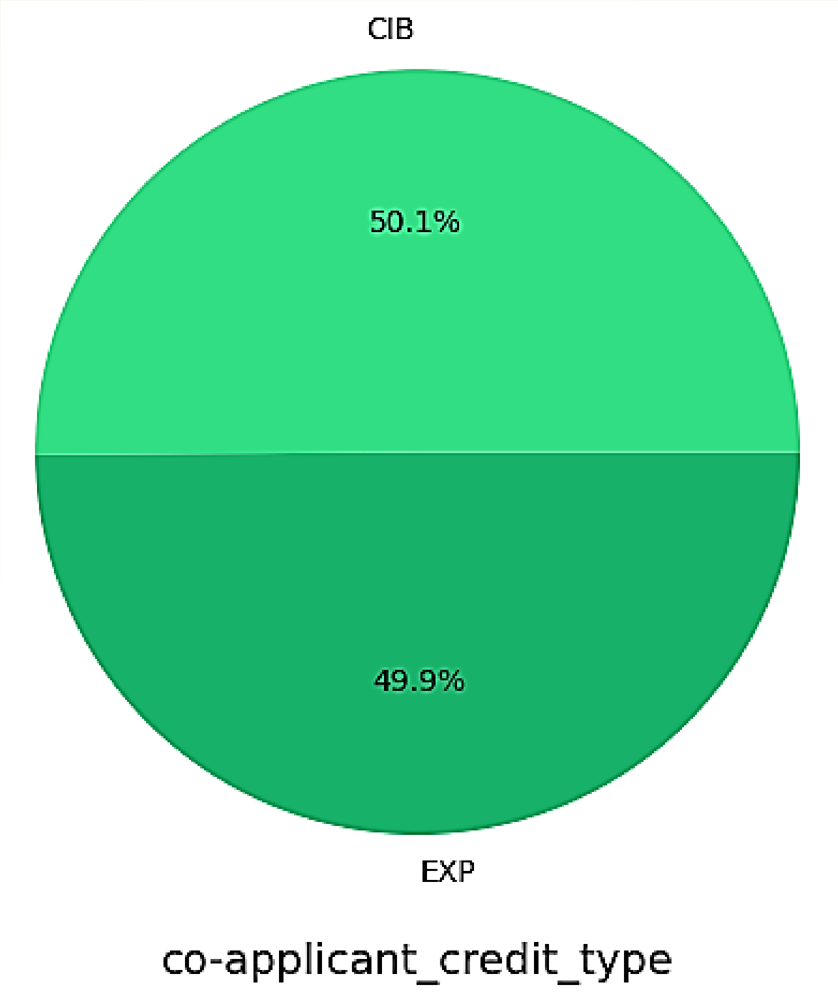
CREDIT TYPE ANALYSIS

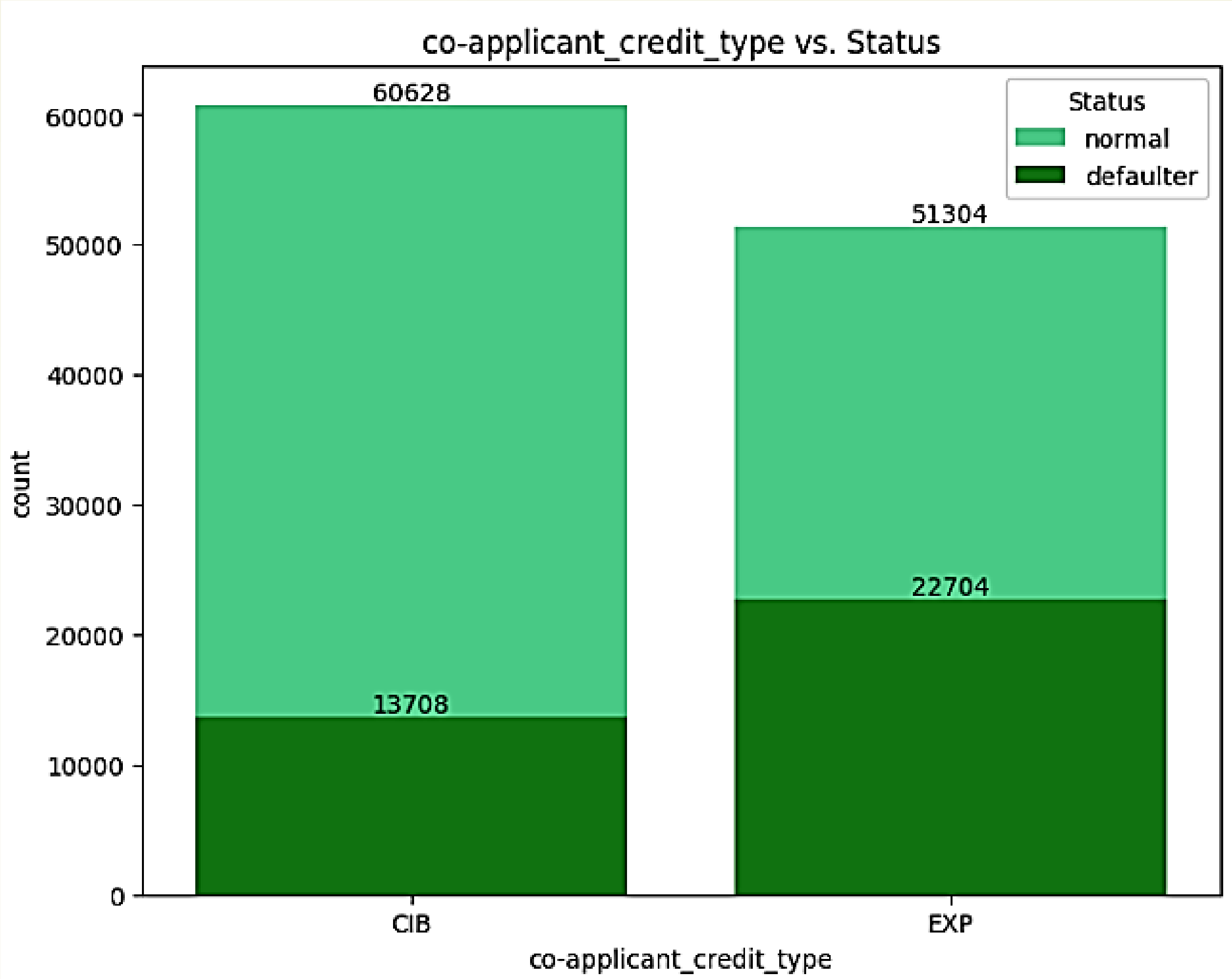
- The distribution of **credit types** is **somewhat balanced**, with **CIB leading**, but a significant portion of applicants also use CRIF and EXP.
- **CIB credit type** has a relatively strong track record with the **lowest default rate among credit types**.
- The **EQUI credit type** has only **1 normal borrower and 15,080 defaulters**. This suggests that EQUI credit is predominantly linked to defaults and poses a **significant risk to lenders**.

Recommendation:

Tighten lending criteria for EQUI credit types to mitigate the overwhelming risk of defaults





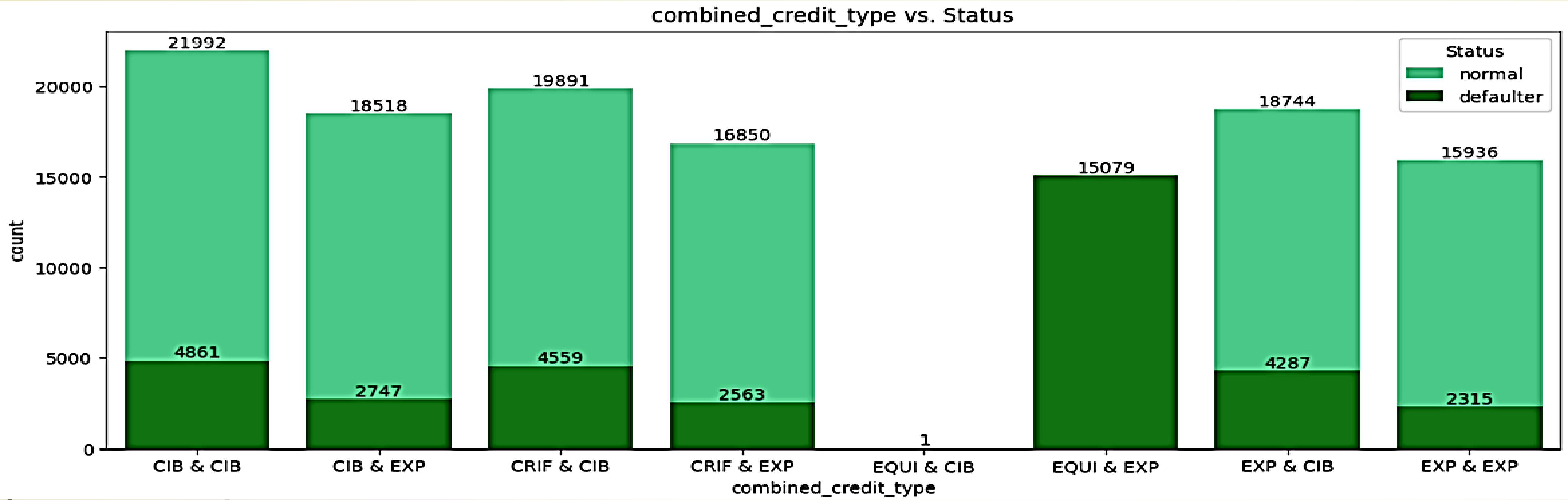


COAPPLICANT CREDIT TYPE ANALYSIS

- There is **no significant preference for one credit type** over the other when it comes to co-applicants.
- Loans with **CIB as the co-applicant credit type** show a good proportion of **normal status**, although slightly higher default risk compared to primary credit types.
- Loans with **EXP as the co-applicant credit type** have a significantly **higher default rate**, suggesting co-applicants with EXP credit may represent a higher risk.

Recommendation:

Strengthen co-applicant assessments, especially when EXP is the co-applicant credit type, as this significantly increases the likelihood of default.

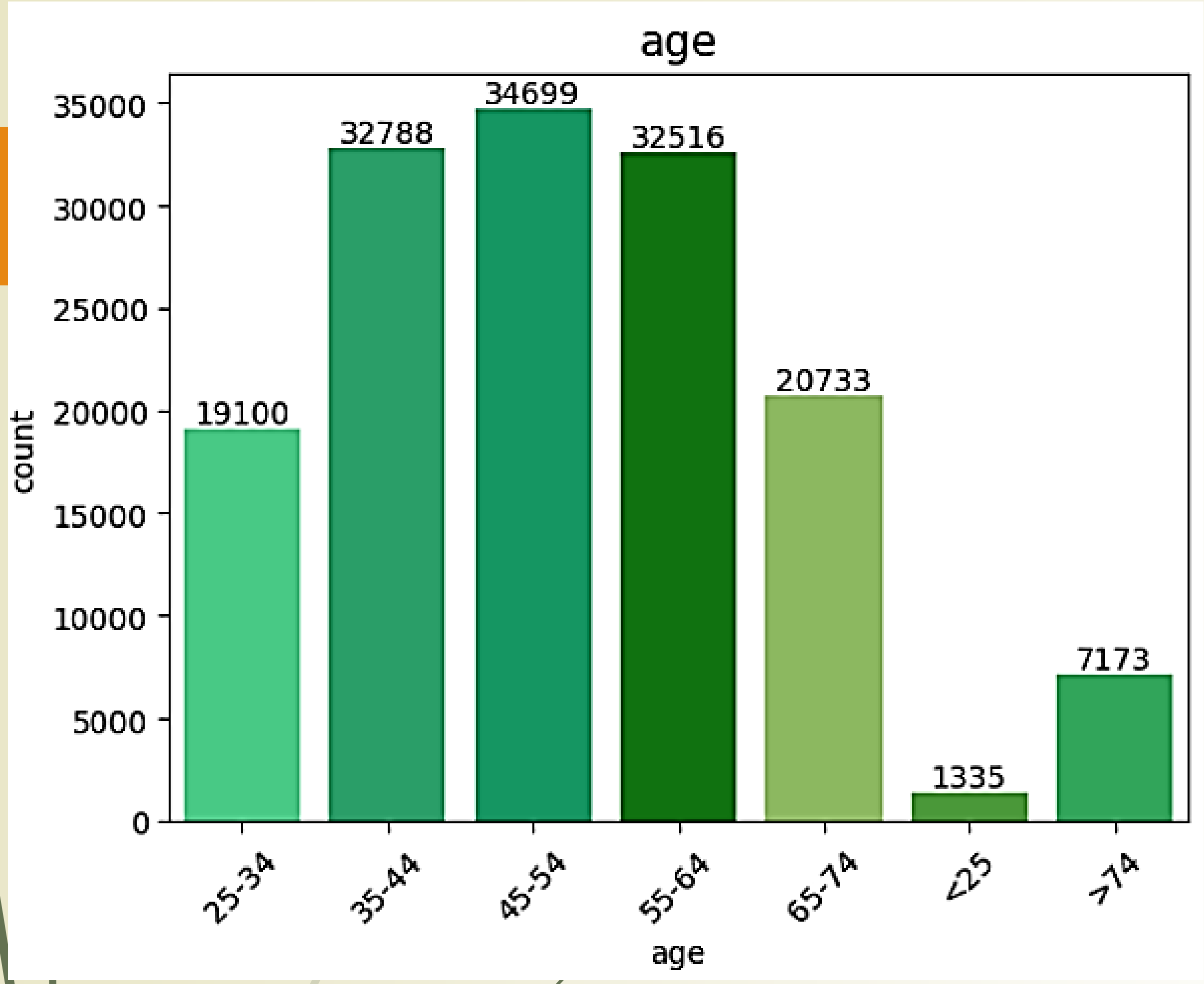


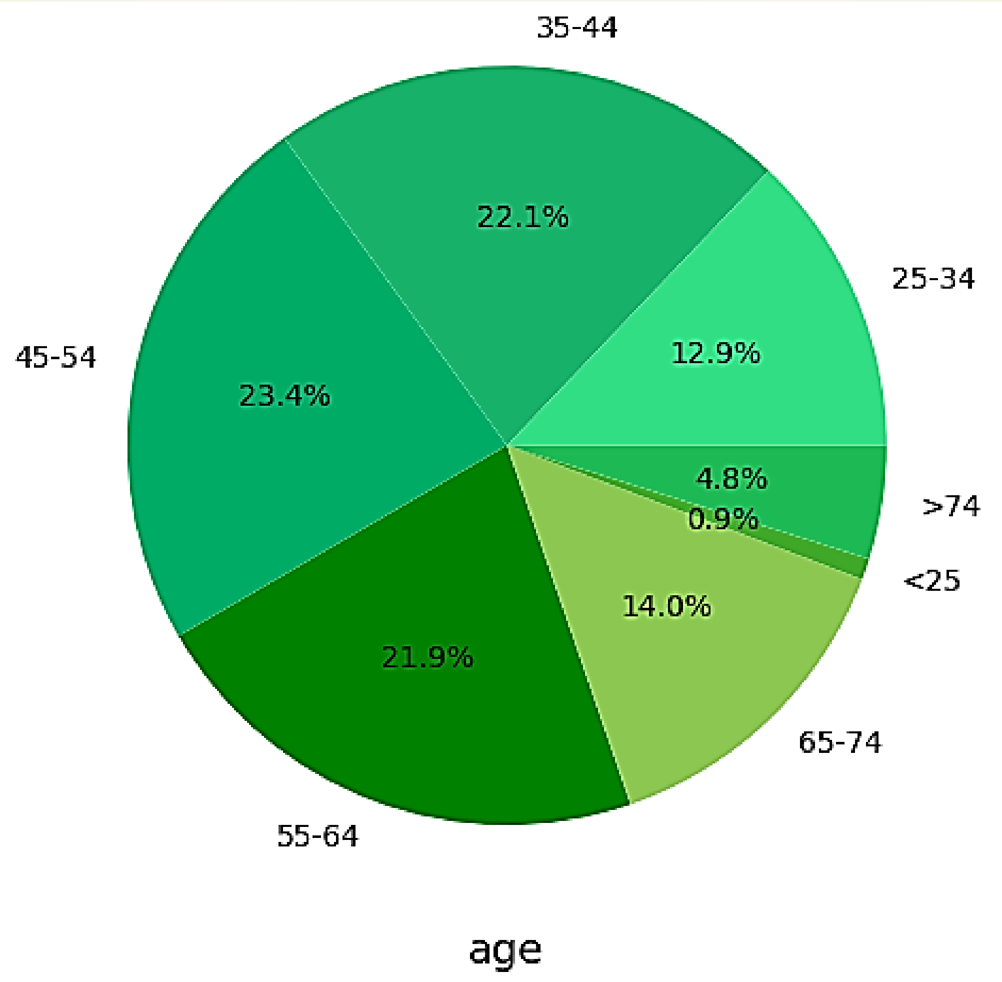
COMBINED CREDIT TYPE ANALYSIS

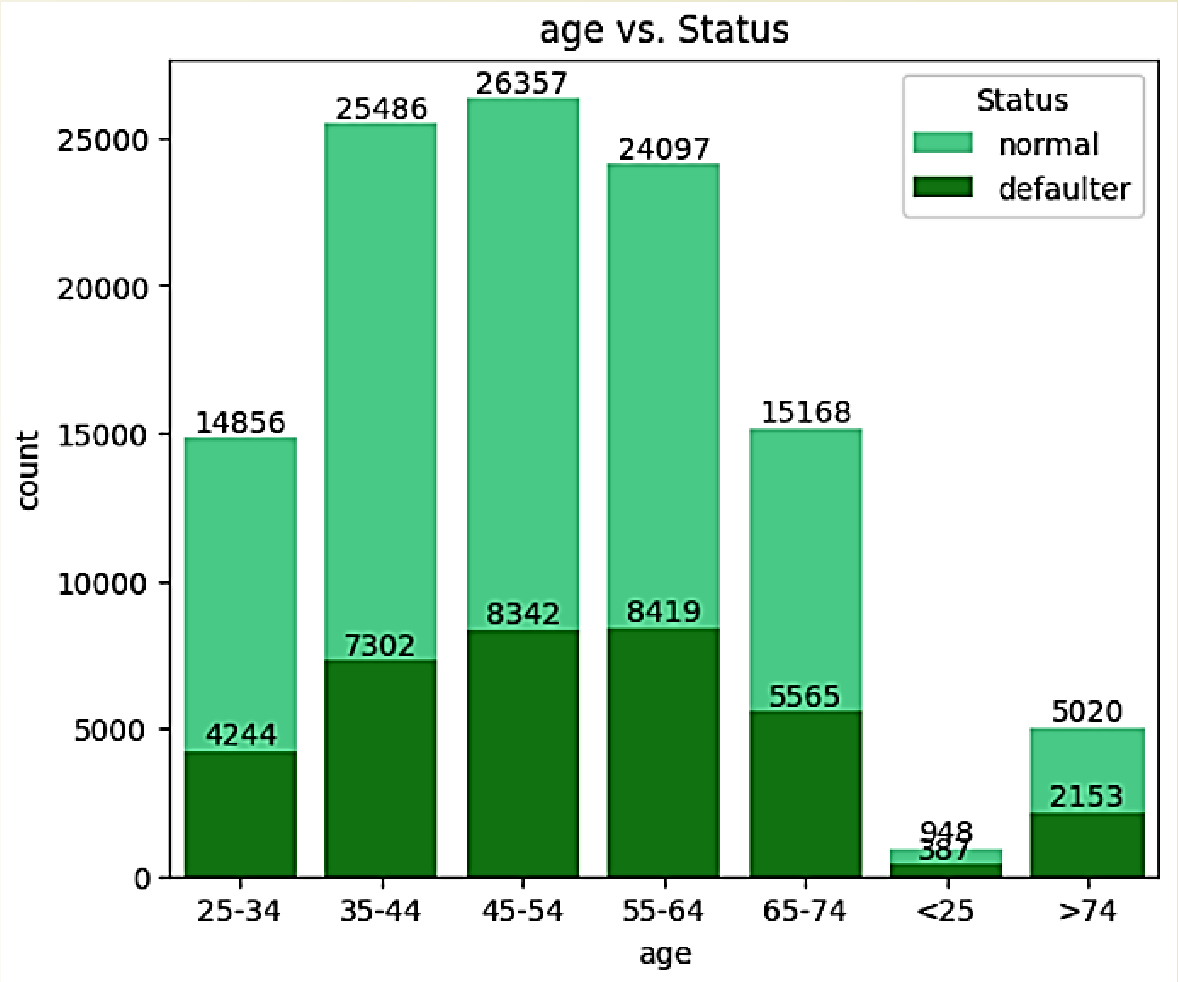
- **CIB as a co-applicant credit type** consistently **reduces the default rate**, making it a more reliable choice across different primary credit types (CIB, CRIF, EXP).
- **In most cases, EXP as a co-applicant** results in a higher success rate, showing **lower default rates**.
- **EQUI is highly risky**, especially when **paired with EXP as the co-applicant credit type**, which leads to **100% default rates. This combination should be avoided.**
- The **combination of EXP as both credit type and co-applicant** performs surprisingly well, with **a low default rate (12.86%)**. This shows that EXP credit type can be reliable when both borrower and co-applicant have the same credit type.

<u>Recommendation:</u>

Avoid lending to borrowers with EQUI credit type, especially when **paired with EXP as the co-applicant credit type**, as this combination has an extremely high default risk.





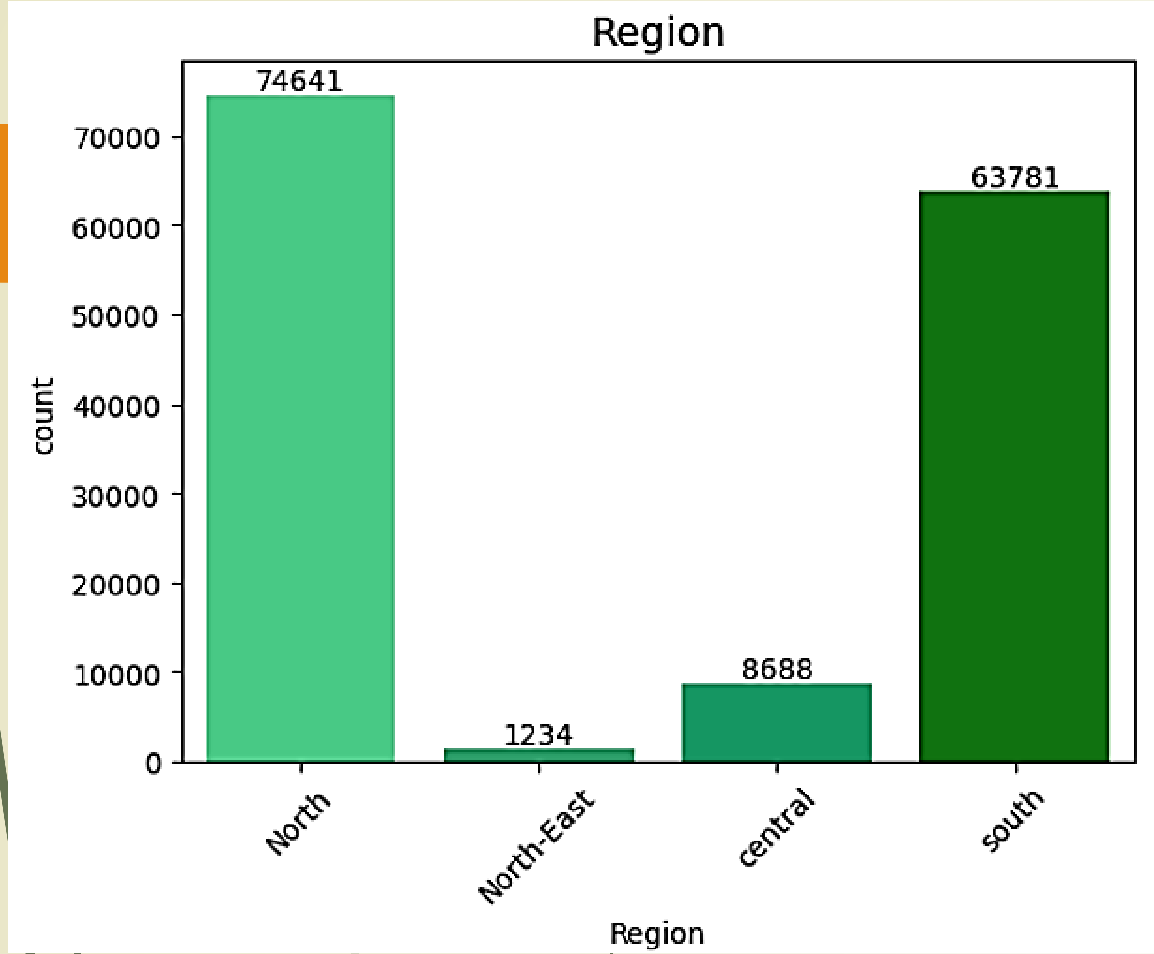


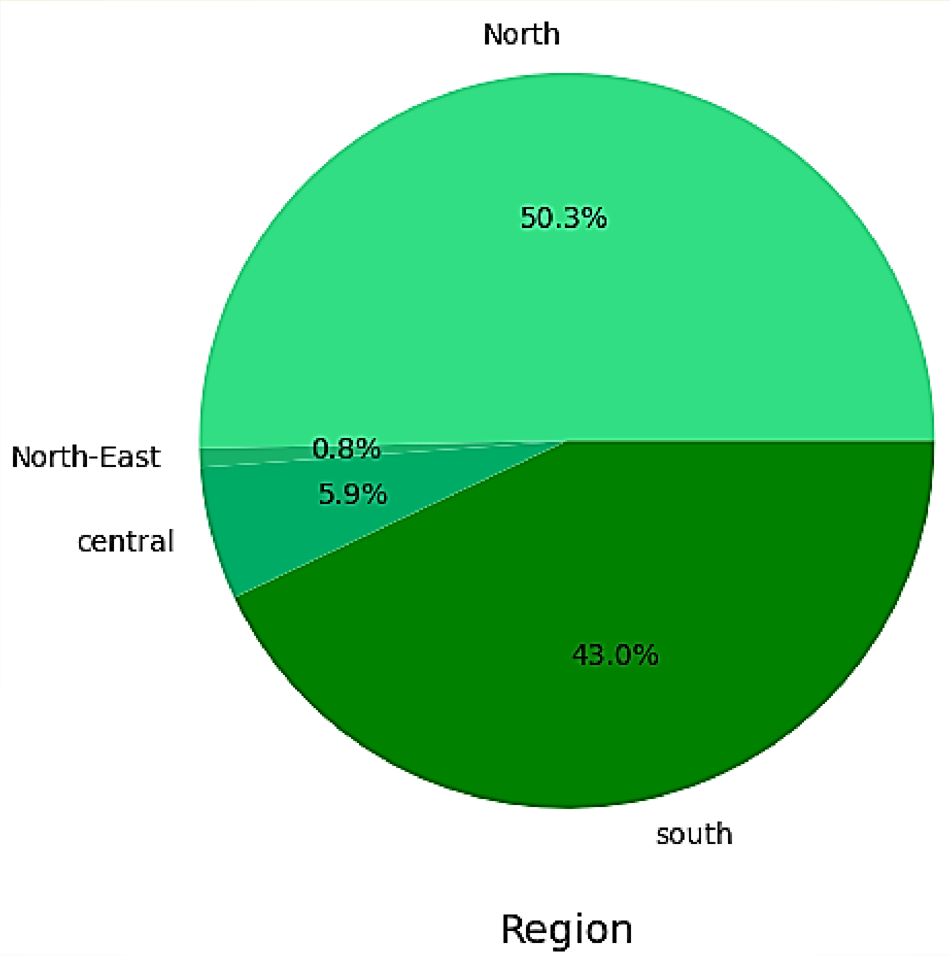
AGE ANALYSIS

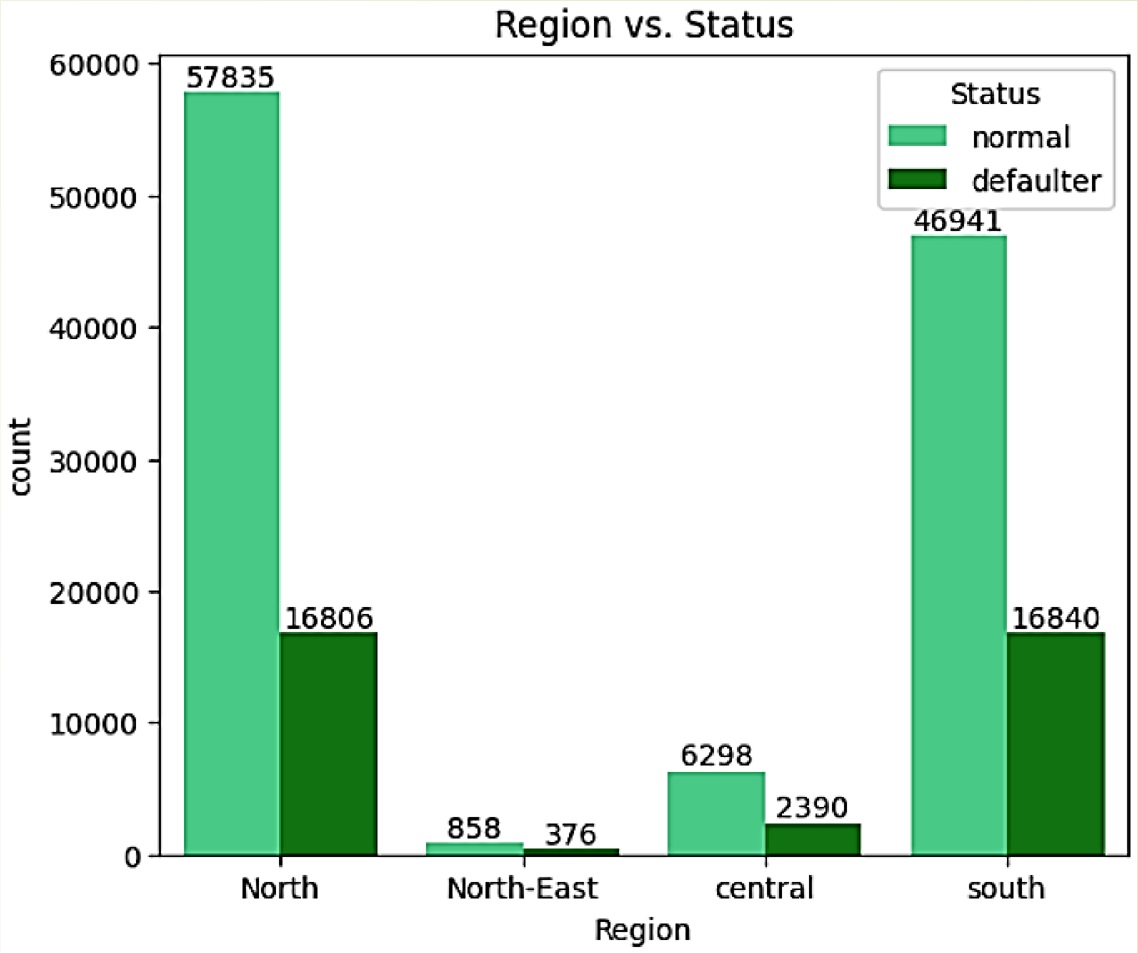
- **Most applicants** fall within the **middle-age range**, particularly between **35 and 64**. Younger and older age groups are underrepresented.
- The **default risk seems to increase with age beyond 55**, especially for the **65-74 and >74 age** groups, where **defaulters** make up a significant portion of the total. The **younger age groups**, though fewer in number, show higher sensitivity to economic stress, reflected in their **default numbers**.

Recommendation:

Develop tailored financial education and support programs for **middle-aged (45-54) and near-retirement (55-64) borrowers**, as these groups have both the highest loan participation and default risks.





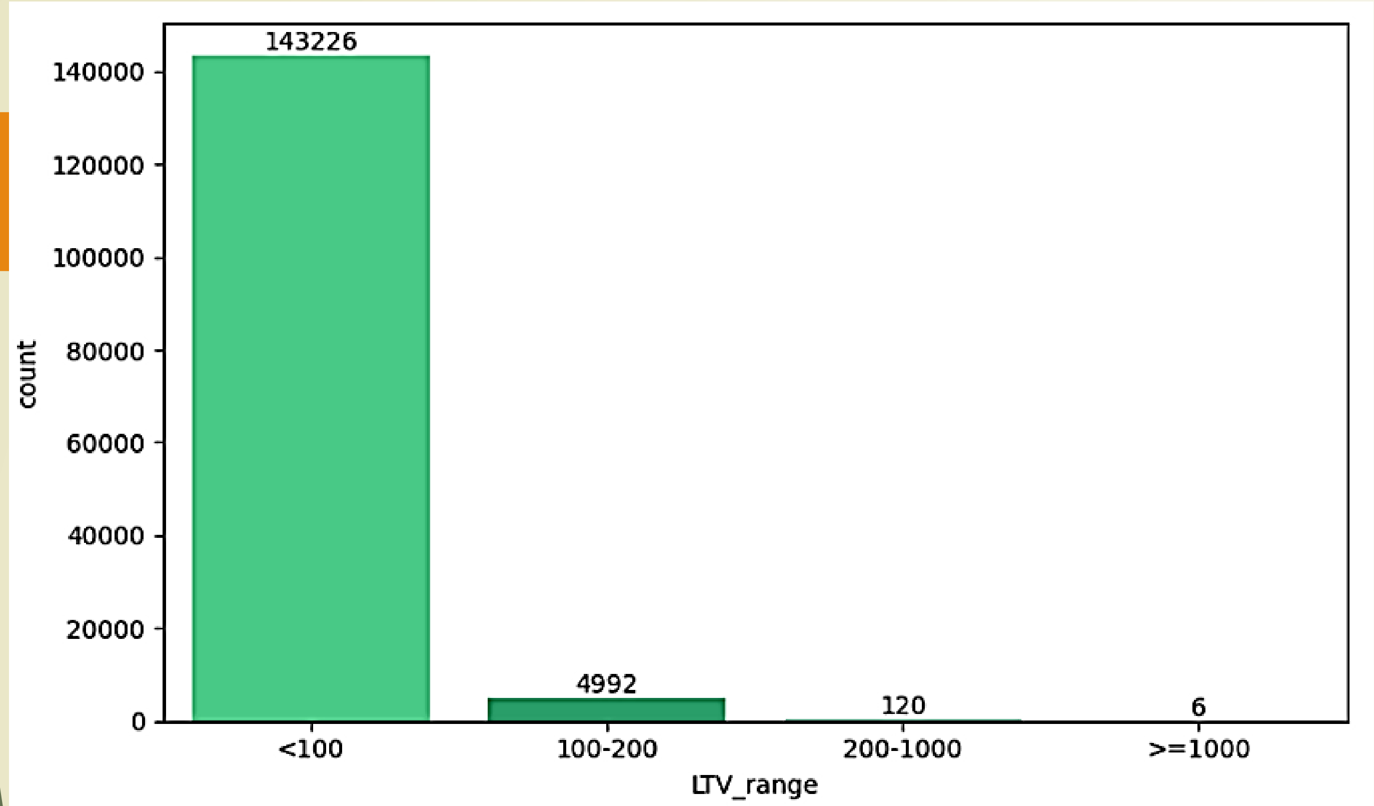


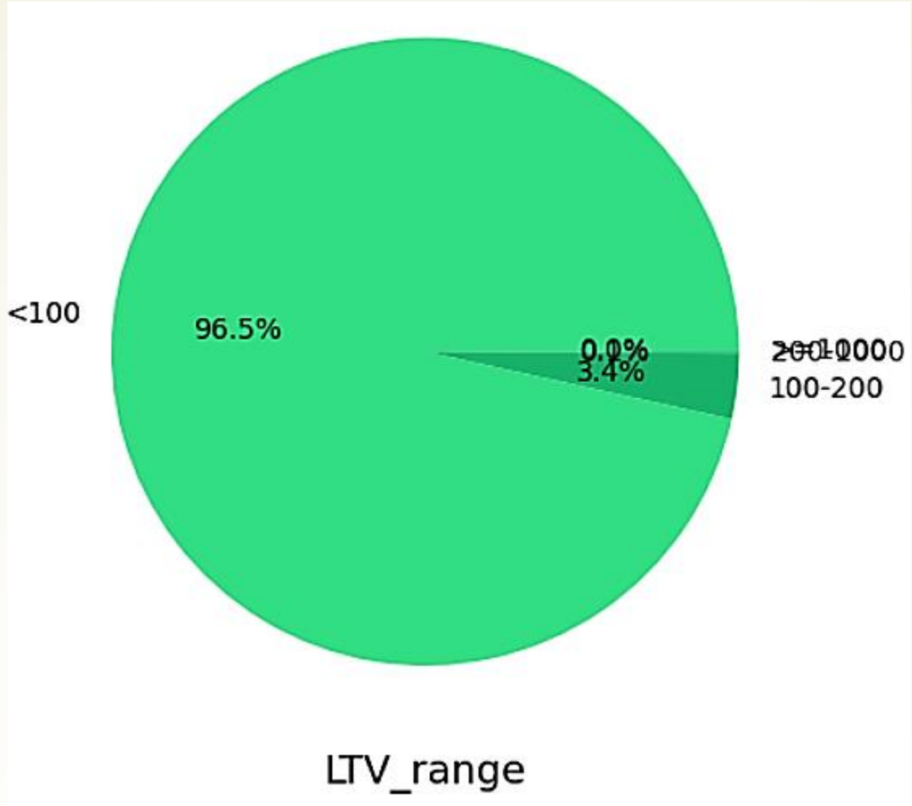
REGION ANALYSIS

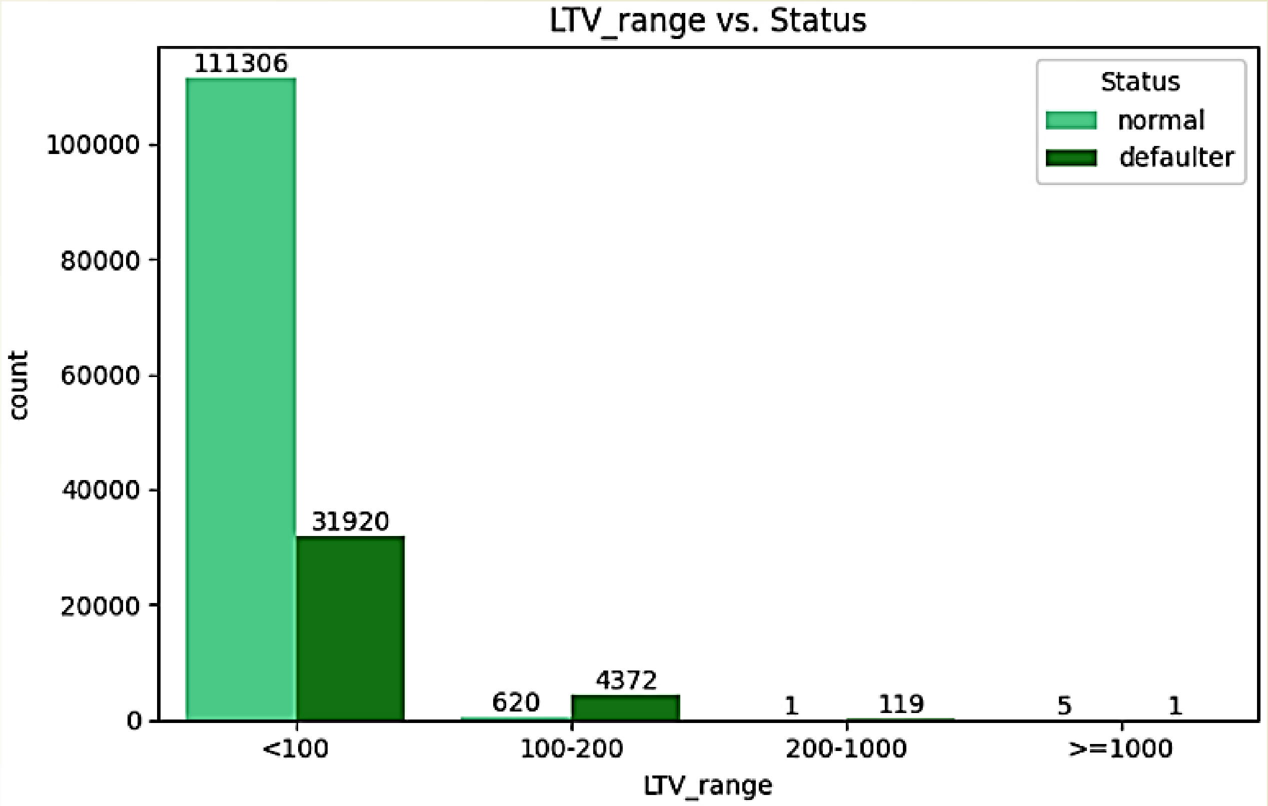
- **Majority of applicants** are from the **North and South regions**, with very few from the Central and North-East regions.
- **North Region** shows a strong performance with the **highest** number of **normal loans** and a relatively lower default rate.
- **North-East Region** is the **highest-risk area**, with nearly **a third of loans in default** despite having the smallest number of loans.

Recommendation:

Since the North-East and Central regions show significantly higher default rates, the business should consider **implementing stricter loan approval criteria or higher collateral requirements in these areas**.







LTV RANGE ANALYSIS

- **(<100): Majority of loans** have an LTV ratio of less than 100%, indicating that borrowers generally have **more equity in the property than the loan amount**.
- **(>=1000):** Very few loans (6 loans) have an LTV ratio greater than 1000%, which is a **rare and extremely high-risk situation.**
- Almost all loans with **LTV between 200 and 1000%** are in **default (99.17%)**, showing that excessively high LTV ratios lead to an **extremely high risk of default**.

Recommendation:

Lenders should be cautious in approving loans where LTV exceeds 100, as these loans are prone to default. Special attention should be given to loans with LTV > 200, as they are almost guaranteed to default.

INSIGHTS AND RECOMMENDATIONS BASED ON HYPOTHESIS TESTING

❑ Loan amount Vs. Status, Mann-Whitney U test (Right tailed):

Insight:

Borrowers in the **Normal group** tend to **have higher loan amounts** compared to those in the **Defaulter group**, indicating that **larger loans are associated with more responsible repayment behavior.**

Recommendation:

Focus on strengthening risk assessment criteria for smaller loan amounts, as borrowers with smaller loans show a higher likelihood of default. Offering financial literacy programs or additional credit counseling for smaller loan applicants may help mitigate this risk.

❑ Rate of Interest Vs. Status, Mann-Whitney U test (Right tailed):

Insight:

The **Normal group** tends to have loans with a **higher rate of interest** compared to the **Defaulter group.** suggesting that borrowers who **manage to pay back their loans** successfully are more likely to do so even when faced with **higher interest rates**.

Recommendation:

Increase vigilance for borrowers with lower interest rates, as they might pose a higher risk of default. **Consider reviewing the loan approval criteria for lower-interest** loans and enhancing support mechanisms, such as offering financial counseling, to reduce the risk of default in this segment.

❑ Upfront charges Vs. Status, Mann-Whitney U test (Left tailed):

Insight:

Borrowers in the **Defaulter group** tend to have **higher upfront charges** compared to those in the **Normal group**, indicating that **higher initial costs may be associated with an increased likelihood of default**.

Recommendation:

Consider offering loans with lower or flexible upfront charges to reduce the financial burden on borrowers. This could improve repayment rates and lower the default risk, particularly for those who might struggle with high initial loan costs.

INSIGHTS AND RECOMMENDATIONS BASED ON HYPOTHESIS TESTING

❑ Property Value Vs. Status, Mann-Whitney U test (Right tailed):

Insight:

The **Normal group** tends to have a **higher property value** compared to the **Defaulter group**, suggesting that borrowers with **more valuable properties are less likely to default on their loans**.

Recommendation:

Implement a policy to conduct thorough evaluations of property values during the loan application process, **prioritizing loans secured by higher-value properties**. This could enhance risk assessment strategies and potentially reduce default rates by focusing on more stable asset backing.

❑ Income Vs. Status, Mann-Whitney U test (Right tailed):

Insight:

The **Normal group** has a **higher average income** compared to the **Defaulter group**, indicating that borrowers with **greater income levels are less likely to default** on their loans.

Recommendation:

Consider **implementing income-based lending criteria that favor borrowers with higher income levels**, as this could improve loan performance and reduce default rates. Additionally, targeted financial education programs could be developed for lower-income borrowers to enhance their financial literacy and repayment capabilities.

❑ LTV Vs. Status, Mann-Whitney U test (Left tailed):

Insight:

The **Normal group** has a **lower loan-to-value (LTV)** ratio compared to the **Defaulter group**, suggesting that **borrowers who take on less debt relative to the value of the collateral (property) are less likely to default**.

Recommendation:

Implement stricter LTV limits for loan approvals to mitigate risk. Encourage borrowers to maintain a lower LTV ratio, which could improve loan stability and reduce the likelihood of defaults. Consider providing additional support or incentives for borrowers who achieve lower LTV ratios.

THANK YOU