 analysing the data to visualise the possible indicators that a customer will not be able to pay the loan.

---

### \*\*Numeric Features\*\*:

1. \*\*Annual Income (`annual\_inc`)\*\*:

- Both \*\*Charged Off\*\* and \*\*At-Risk\*\* customers exhibit very similar distributions of annual income, with the median close to 8 (in log scale). There’s no significant distinction in income between the two groups.

- \*\*Insight\*\*: Annual income does not seem to be a strong indicator of loan default risk.

2. \*\*Debt-to-Income Ratio (`dti`)\*\*:

- \*\*At-Risk\*\* customers tend to have a slightly higher median DTI compared to \*\*Charged Off\*\* customers, though the difference is marginal.

- \*\*Insight\*\*: DTI could be a minor contributing factor, but it is not a dominant indicator of default risk based on this comparison.

3. \*\*Employment Length (`employment\_length`)\*\*:

- The distribution of employment length between the two groups is nearly identical, suggesting no major differences in the length of employment.

- \*\*Insight\*\*: Employment length does not appear to be a key differentiator between \*\*Charged Off\*\* and \*\*At-Risk\*\* customers.

4. \*\*Loan Amount (`loan\_amount`)\*\*:

- The distributions of loan amounts are very similar between the two groups, with slightly lower median loan amounts for \*\*At-Risk\*\* customers.

- \*\*Insight\*\*: Loan amount is not a strong indicator of default risk as both groups share similar characteristics.

5. \*\*Open Accounts (`open\_accounts`)\*\*:

- The number of open accounts shows similar distributions between both groups, though \*\*At-Risk\*\* customers have slightly higher median open accounts.

- \*\*Insight\*\*: This feature doesn’t provide a clear distinction between the two groups in predicting loan defaults.

6. \*\*Outstanding Principal (`out\_prncp`)\*\*:

- The \*\*At-Risk\*\* group shows much higher outstanding principal values compared to \*\*Charged Off\*\* customers, whose values are near zero.

- \*\*Insight\*\*: This is a critical indicator of risk since customers with higher outstanding principal amounts are more likely to default. The large outstanding principal in the \*\*At-Risk\*\* group indicates a potential future loss.

7. \*\*Total Accounts (`total\_accounts`)\*\*:

- There’s no significant difference in the total number of accounts between \*\*Charged Off\*\* and \*\*At-Risk\*\* customers.

- \*\*Insight\*\*: Total accounts is not a reliable indicator of default risk.

8. \*\*Total Payment (`total\_payment`)\*\*:

- \*\*At-Risk\*\* customers have made higher total payments than \*\*Charged Off\*\* customers, suggesting they may still be active, but with delayed payments.

- \*\*Insight\*\*: This could indicate that while these customers are making some payments, they may still pose a future risk of default if their payments slow or stop.

---

### \*\*Categorical Features\*\*:

1. \*\*Loan Grade (`grade`)\*\*:

- \*\*Charged Off\*\* customers are concentrated more heavily in lower loan grades (D, E, F, G), while \*\*At-Risk\*\* customers are more evenly distributed across higher loan grades (A, B, C).

- \*\*Insight\*\*: Loan grade is a significant indicator, as customers with lower grades are more likely to default.

2. \*\*Home Ownership (`home\_ownership`)\*\*:

- Both \*\*Charged Off\*\* and \*\*At-Risk\*\* customers are mostly renters or mortgage holders, though \*\*Charged Off\*\* customers have a higher proportion of \*\*renters\*\*.

- \*\*Insight\*\*: Home ownership (specifically renting) seems to be associated with a higher risk of loan default.

3. \*\*Loan Purpose (`purpose`)\*\*:

- \*\*Charged Off\*\* customers primarily took loans for \*\*debt consolidation\*\* and \*\*credit card payments\*\*, while \*\*At-Risk\*\* customers also have a high concentration in these areas, but with a more balanced spread across other purposes.

- \*\*Insight\*\*: The loan purpose, especially \*\*debt consolidation\*\* and \*\*credit card repayment\*\*, is a strong indicator of default risk.

---

### \*\*Recoveries (`recoveries`)\*\*:

- Both groups have minimal recoveries, indicating that once a customer defaults, there is little chance of recovering the outstanding amounts.

- \*\*Insight\*\*: Recoveries do not appear to be a meaningful factor for understanding default risk.

---

### \*\*Key Indicators of Default Risk\*\*:

Based on this analysis, the following features are most likely to contribute to \*\*loan default risk\*\*:

1. \*\*Outstanding Principal (`out\_prncp`)\*\*: Customers with high outstanding principal are at significant risk of default.

2. \*\*Loan Grade\*\*: Lower grades (D, E, F, G) are strongly associated with default.

3. \*\*Loan Purpose\*\*: Debt consolidation and credit card repayment loans tend to have a higher likelihood of default.

4. \*\*Home Ownership\*\*: Renters show a higher tendency to default than homeowners or those with mortgages.

---

### \*\*Recommendations\*\*:

1. \*\*Focus on Monitoring Lower Loan Grades\*\*: Customers with low loan grades (D, E, F, G) should be closely monitored for payment delays or increased risk of default.

2. \*\*Prioritize Debt Consolidation Loans for Early Action\*\*: Debt consolidation and credit card repayment loans should be given priority when assessing risk and offering restructuring options.

3. \*\*Target Renters with Support Options\*\*: Since renters are at higher risk, the company should consider targeted financial support or early intervention for these customers.

4. \*\*Monitor Customers with High Outstanding Principal\*\*: A significant outstanding principal balance should be flagged as an early warning sign for potential default.

---

Let me know if you’d like further details or specific actions based on this analysis!

Yes, I received the images. I'll extract the data from them and proceed with the analysis based on the \*\*categorical comparisons\*\* and \*\*indicator correlation summary\*\*.

I'll start processing the insights and provide you with the key takeaways from the additional data you've provided.

Let me begin analyzing this!

I have manually extracted and processed the data from the images. Now, let's summarize the findings based on this data:

### \*\*Categorical Comparison Findings:\*\*

1. \*\*Home Ownership\*\*:

- \*\*At-Risk Customers\*\*: 202 renters, 192 mortgage holders, 46 owners, and no "other."

- \*\*Charged Off Customers\*\*: Higher proportion of renters (694) and mortgage holders (690), with fewer owners (141) and very few "other" (2).

- \*\*Insight\*\*: Customers who rent their homes seem to have a higher likelihood of being charged off compared to those who own or have a mortgage. Renting appears to be a strong indicator of risk.

2. \*\*Loan Purpose\*\*:

- The distribution of \*\*loan purposes\*\* (e.g., debt consolidation, credit card repayment) is similar between the two groups. However, there seems to be a higher number of \*\*Charged Off\*\* customers in certain categories.

- \*\*Insight\*\*: Loan purpose, especially for debt consolidation and credit card repayment, continues to be a risk factor for default, as observed in earlier findings.

3. \*\*Loan Grade\*\*:

- The distribution of loan grades shows that \*\*Charged Off\*\* customers have more representation in the lower loan grades, which correlates with earlier observations.

- \*\*Insight\*\*: Customers in lower loan grades (D, E, F, G) are at a higher risk of defaulting.

### \*\*Indicator Correlation Summary:\*\*

1. \*\*Loan Amount\*\*:

- \*\*At-Risk Customers\*\*: Average loan amount is slightly higher (14,408) compared to \*\*Charged Off\*\* customers (14,322).

- \*\*Insight\*\*: Loan amount does not seem to significantly differ between the two groups, and thus it’s not a strong predictor of default risk.

2. \*\*Annual Income\*\*:

- Both groups have very similar \*\*annual income\*\* levels, with slight variations.

- \*\*Insight\*\*: Annual income, as in earlier analyses, does not provide a strong distinction between \*\*At-Risk\*\* and \*\*Charged Off\*\* customers.

3. \*\*Debt-to-Income Ratio (DTI)\*\*:

- \*\*At-Risk Customers\*\* have a higher \*\*DTI\*\* (19.22) compared to \*\*Charged Off\*\* customers (17.87).

- \*\*Insight\*\*: DTI could be a moderate indicator of risk, with higher ratios suggesting a potential struggle to meet debt obligations.

4. \*\*Employment Length\*\*:

- Both groups have very similar average \*\*employment lengths\*\*, with \*\*At-Risk\*\* customers having a slightly higher average.

- \*\*Insight\*\*: Employment length does not appear to be a distinguishing factor between these two groups.

5. \*\*Open and Total Accounts\*\*:

- \*\*At-Risk Customers\*\* have more \*\*total accounts\*\* (23.88) and slightly more \*\*open accounts\*\* (3.20) compared to \*\*Charged Off\*\* customers (24.73 total accounts and 3.16 open accounts).

- \*\*Insight\*\*: While not a major differentiator, a higher number of total accounts could indicate potential risk of default due to a heavier debt burden.

6. \*\*Outstanding Principal (`out\_prncp`)\*\*:

- \*\*At-Risk Customers\*\* have a much higher \*\*outstanding principal\*\* (4.27) compared to \*\*Charged Off\*\* customers (0).

- \*\*Insight\*\*: This is a crucial risk indicator. Customers with higher outstanding principal amounts pose a significant risk of future default.

7. \*\*Total Payment\*\*:

- \*\*At-Risk Customers\*\* have made larger total payments (52.28) compared to \*\*Charged Off\*\* customers (43.59).

- \*\*Insight\*\*: Despite making more payments, \*\*At-Risk\*\* customers are still falling behind, indicating that while they continue making partial payments, they remain at high risk of default.

---

### \*\*Conclusion and Recommendations:\*\*

1. \*\*Key Risk Indicators\*\*:

- \*\*Home Ownership\*\*: Renters are at higher risk.

- \*\*Loan Grade\*\*: Lower loan grades (D, E, F, G) correlate with a higher chance of default.

- \*\*Debt-to-Income Ratio\*\*: Higher DTI is associated with higher risk.

- \*\*Outstanding Principal\*\*: Customers with higher outstanding principal are at risk of defaulting.

- \*\*Total Payment\*\*: Customers making higher total payments may still be at risk if they are falling behind in installments.

2. \*\*Next Steps\*\*:

- Focus on \*\*outstanding principal\*\* and \*\*debt-to-income ratios\*\* to identify at-risk customers early.

- Monitor customers in lower loan grades (D-G) and renters more closely.

- Prioritize actions for customers with high DTI and outstanding balances to offer restructuring or support before they default.