Homeownership and Delinquency: Decoding the Impact on Credit Card Holders
Executive Summary - Group C1

I. Introduction

Credit cards are the most prevalent form of household debt and continue to become even more widespread. The pandemic saw a major increase of 70 million in credit card accounts, naturally causing credit card debt to surpass $1 trillion. This was the largest increase among all debts. As Americans grapple with high inflation and record debt, many have fallen behind on credit card payments. In fact, 5.08% of credit card balances fell into serious delinquency in the second quarter of 2023, according to data from the Federal Reserve Bank of New York.

II. Business Problem

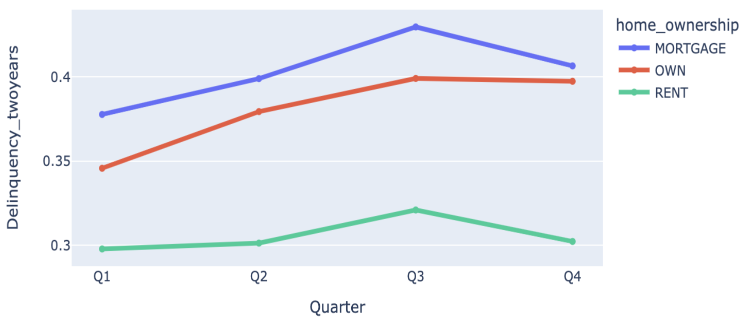
The problem our team aimed to answer was: “Does a credit card holder’s home ownership status impact their delinquent behavior?” We chose this question because it is important for banks to understand what factors influence an individual’s delinquency rate. Through this, banks can identify which consumers are most likely to default and refine strategies to target these consumers. Furthermore, our team believed home ownership would be an interesting factor to test and see how it affects delinquency.

III. Data-driven approach and Possible Outcomes

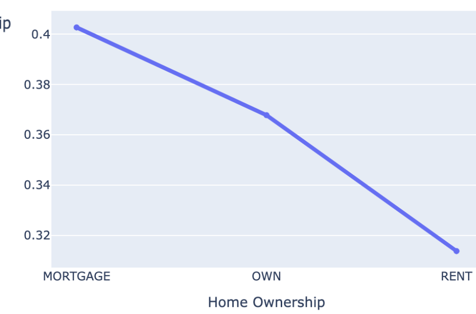
To answer our business question, we looked at an individual’s homeownership status as the dependent variable and delinquency rate as the independent variable. The delinquency variable measures the frequency of delinquent behavior in the past two years. However, in order to consider future business implications, we must assume that an individual’s delinquency rate in the past will stay consistent in the future. We predicted that homeowners experience lower delinquency rates compared to renters or mortgage payers, as they generally have more financial stability. Meanwhile, homeowners may face a higher delinquency risk, potentially attributed to mortgage payments or increased financial responsibilities such as supporting a family.

IV. Data Description

Our study analyzed descriptive statistics across different quarters, as shown in Figure 1. A significant trend emerged that individuals with mortgages consistently showed the highest average delinquency rate. In contrast, those renting homes displayed the lowest average delinquency rate.



(Figure 1: Delinquency Rate in the Past Two Years of Different Home Ownership)



(Figure 2: Simulation of Delinquency Rate with Different Home Ownership)

On average, individuals who own their homes would have a delinquent balance for 0.38 time on average. This number slightly increases to 0.4 for those with a mortgage, indicating a higher tendency towards delinquency and default. In contrast, renters showed the lowest average, 0.31, in the same period.

To reinforce our findings, we conducted a simulation with a sample size of 100,000. The results were in line with our previous analysis. The highest delinquency rate was observed among those with mortgages, while renters had the lowest. This simulation not only confirms our earlier observations but also highlights the robustness of our analytical approach.

V. Comparing Solutions

Conducting hypothesis tests at a significance level of 0.05, the resulting test statistics unveiled compelling insights. Specifically, the p-value associated with the "home_ownership_RENT" variable was calculated as 0, indicating a highly significant relationship. Additionally, the p-value for the "home_ownership_OWN" variable was 0.032, reinforcing its statistical significance. These findings lead us to a confident conclusion: both "home_ownership_RENT" and "home_ownership_OWN" exert a discernible influence on the values of "delinquency_2yrs." It is evident that groups with different home ownership statuses manifest distinct patterns in their occurrences of delinquency over the past two years. This nuanced understanding allows for a more comprehensive interpretation of the relationships between home ownership and delinquency, contributing valuable insights to inform further investigations or policy considerations in relevant domains.

For further analysis, we aim to improve the level of fitness in terms of the value of R-squared. Therefore, we pick additional independent variables for the regression model by referring to the variables with high correlation coefficients in the previously generated heatmap. More specifically, we include 6 variables in the second regression model. Other than the two dummy variables of home_ownership and three other independent variables selected based on the correlation coefficient heatmap, we also included the interaction terms between home_ownership_RENT and avg_cur_bal. The p-value for this interaction term is 0.002 which is lower than 0.05, indicating that, statistically, the impact of average current balance on delinquency behavior changes as the type of home ownership changes. The only issue here is that due to the limitation of our model, the coefficient of the interaction term is small, indicating a less significant impact on the effect of the average current balance on typical delinquency behavior.

In this way, by modifying the variables included in the regression model, we successfully increased the value of R-squared from 0.002 to 0.018. Although seemingly small, this regression model actually improves a lot since our outcome variable is a binary variable. Moreover, we calculate the Mean Square Prediction Error for the two models, the output of which shows that the MSPE decreased by 0.02 from 0.89, which is not a small improvement given that even the 75 percentile of the binary outcome variable, delinq_2yrs, are zero.

VI. Recommendations and Conclusion

In conclusion, home ownership status significantly influences delinquency rates, with mortgage holders having the highest likelihood of default and renters the lowest. This highlights the crucial need for banks to factor in home ownership status when making lending decisions. Nevertheless, it is essential to acknowledge and account for other confounding factors impacting delinquency rates, such as the combined effects of loan amount and home ownership, to shape a more nuanced and effective lending strategy.