

# An Analysis of Financial Health between Married and Non-Married people

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2025-04-30

## Introduction

The ‘American Dream’ is a profound concept that encapsulates the enduring success that America promises. While success can be measured in various ways, financial well-being is one of the most significant factors. In today’s world, a credit score plays a pivotal role in determining an individual’s economic health. Whether it is buying a car, purchasing the perfect home to start a family, investing in large appliances, or pursuing higher education, all these aspirations are tied to one’s credit score. It is a reliable metric to gauge an individual’s financial management skills and debt-handling capabilities.

Our research question delved into the significant impact of marital status on an individual’s financial health. We meticulously gathered a comprehensive dataset from the ISLP library called Credit to answer this question. This dataset allowed us to thoroughly analyze various variables between two distinct groups: married and non-married individuals. The variables we scrutinized included net worth, number of credit cards, credit scores, debt-to-income ratio, and credit limits.

Before we looked into our dataset, we analyzed other studies and stats to see if there was an initial reading or trends. According to Experian, a significant Credit reporting agency, in 2019, married individuals had an average credit score of around 715. Non-married individuals had an average of 659. It is important to note that from 2015 to 2019, the mean credit score for both groups has increased, but there could be some underlying factors in why married people have higher credit scores. Some of them could be the combined income status leading to banks trusting them more or higher income because they are later in their lives. The latter makes sense since married applicants can count household income on their credit applications. According to Chase Bank, a leading credit card giver, credit limits are based highly on one’s income, and the fact that married individuals can count combined income can mean that they enjoy higher credit limits than singles. According to Moneywise, in the US, married householders have more wealth than single homeowners. According to Pew Research, married households have an average of 120k in assets, compared to single householders with 60k in assets.

Our Research Questions: **Does Martial Status influence financial well-being?** To answer this question, we divided it into five sub-questions. The first question was, “How does income compare between married and non-married people?” The second question is: “Does the variance in credit card usage (Cards and Balance) differ significantly between married and unmarried people across age groups?” The third question is: “If we take random samples of married and unmarried individuals, do we consistently see differences in average credit score (Rating)?”. The fourth question is: “How do the credit limits compare between married and non-married people?” The last sub-question is: “Do married individuals have a lower debt-to-income ratio than unmarried individuals?”

Our first question deals with comparing income across the two groups and trying to fit an equation to it. We expect that married individuals probably have higher incomes than singles. Our second question concerns whether the two groups have a high variance in credit card usage. A higher variance suggests less

financial stability since it indicates a higher credit balance. We expect to see married folks have a lower variance. The third and fourth questions deal with credit scores and credit limits comparisons but also see significance between the two groups. We expect to see a significance with higher being with the married people. Moreover, the final question compares the debt-to-income ratio. Married people should have lower DTI compared to single people.

## Methodolgy

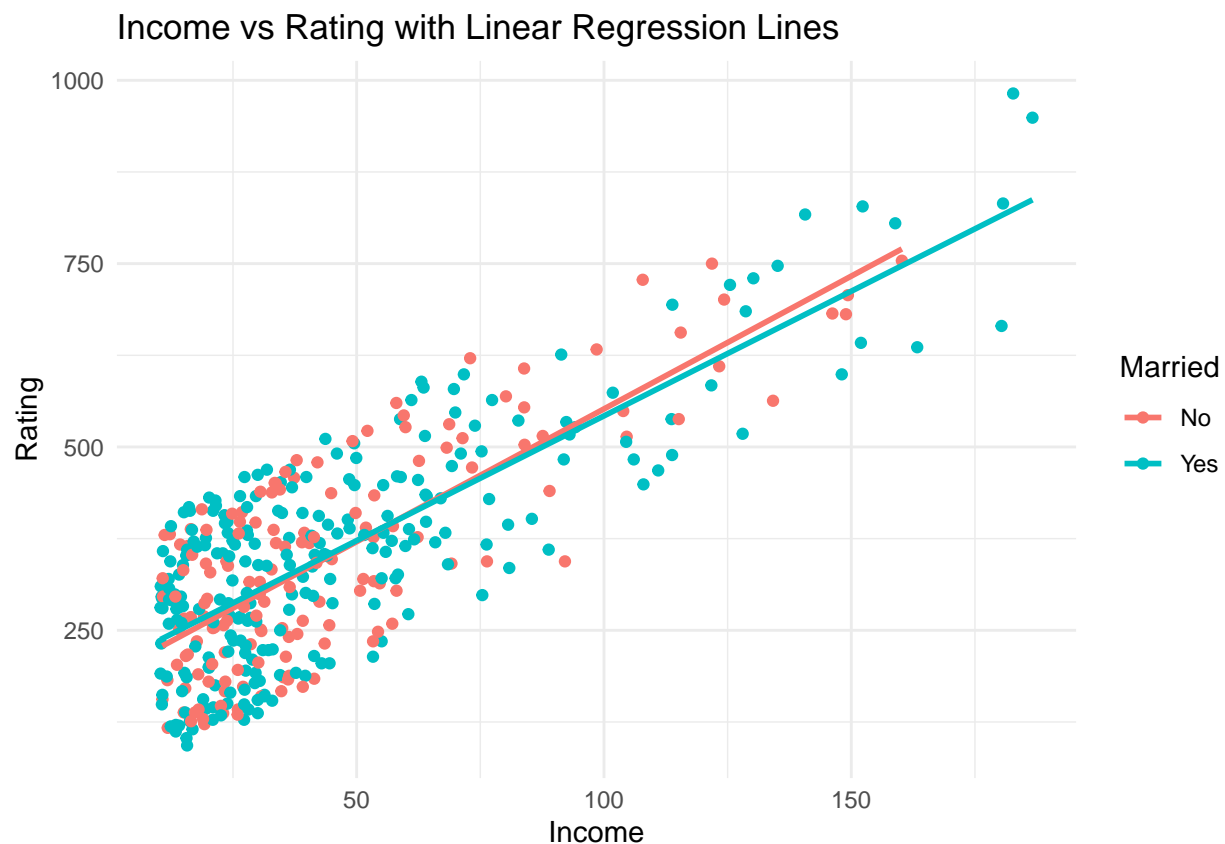
### Data

For this project, we utilized the *'Credit'* dataset from the *'ISLR'* package, which comprises roughly 400 simulated observations across 12 variables, including credit limit, credit rating, age, and ethnicity. As our research focused on comparing credit card usage between students and non-students, we segmented the data into two groups: married and non-married individuals. We then conducted separate analyses for each group, based on the five sub-questions we aimed to explore.

## Results

### Question 1: What is the Income Vs Scores for Married vs non-Married

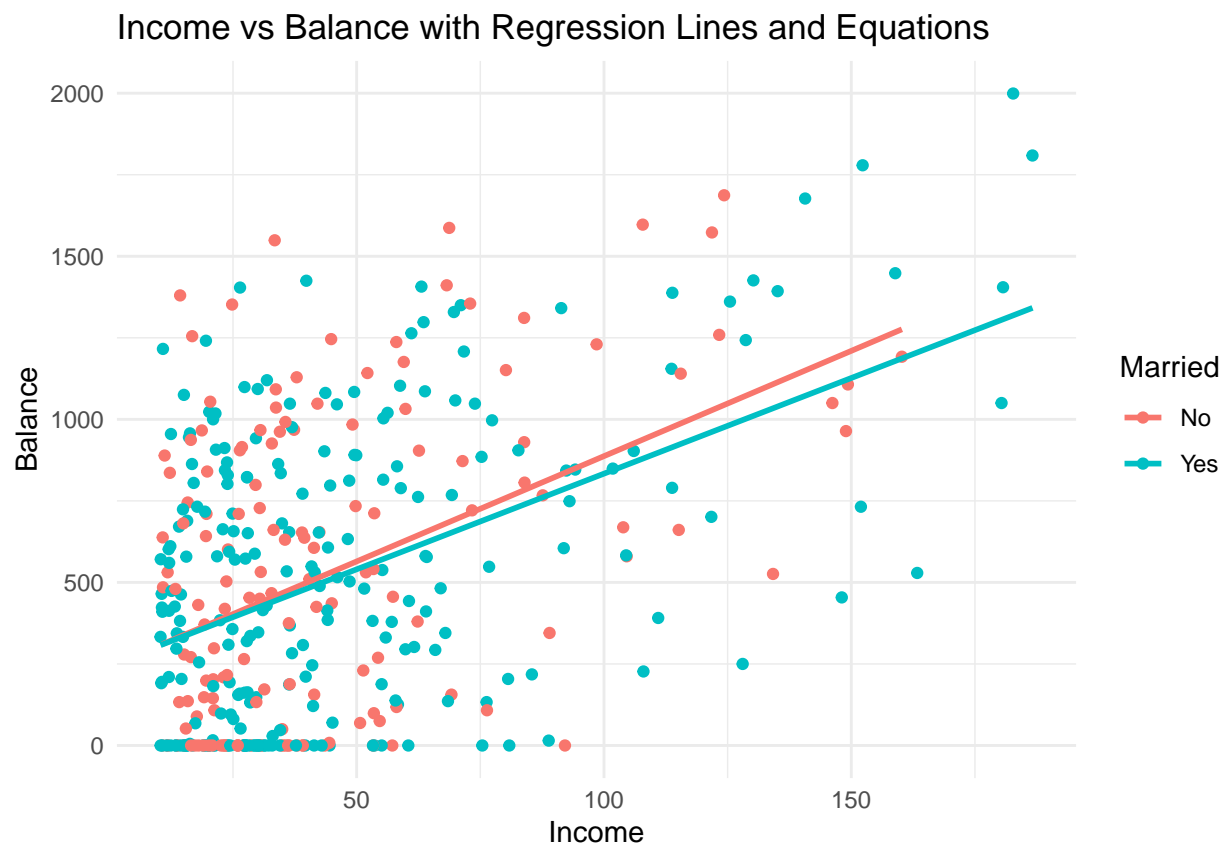
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## `geom_smooth()` using formula = 'y ~ x'
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The graph shows the relationship between Income and Credit Rating, with data points color-coded by

Marital Status. Each group has its own linear regression line, indicating how credit rating changes with income for married and unmarried individuals. The regression equations and  $R^2$  values are included, showing the direction and strength of each linear relationship. The lines suggest a slight positive correlation between income and rating, though the relationship appears weak based on the low  $R^2$  values. This graph shows that non married individuals have a higher credit score then married couples. This graph allows for comparison of how credit rating trends with income across marital status groups.

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## `geom_smooth()` using formula = 'y ~ x'
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The graph displays the relationship between Income and Balance from the credit dataset, with points colored by Marital Status. Each group (Married and Not Married) has its own linear regression line, indicating the trend between income and balance for that subgroup. The regression equations and corresponding  $R^2$  values are shown on the graph, helping quantify the strength and direction of each relationship. Overall, the graph suggests a no relationship between income and balance. In the visualization it is clear to see that non married people tend to have a higher balance then people that are married. This visualization helps compare how balance behavior varies across income levels and marital groups.

**Question 2: Does the variance in credit card usage (Cards and Balance) differ significantly between married and unmarried people across age groups?**

To answer the question of whether the variance in credit card usage (measured by Cards and Balance) differs significantly between married and unmarried individuals across age groups, the following methods were used:

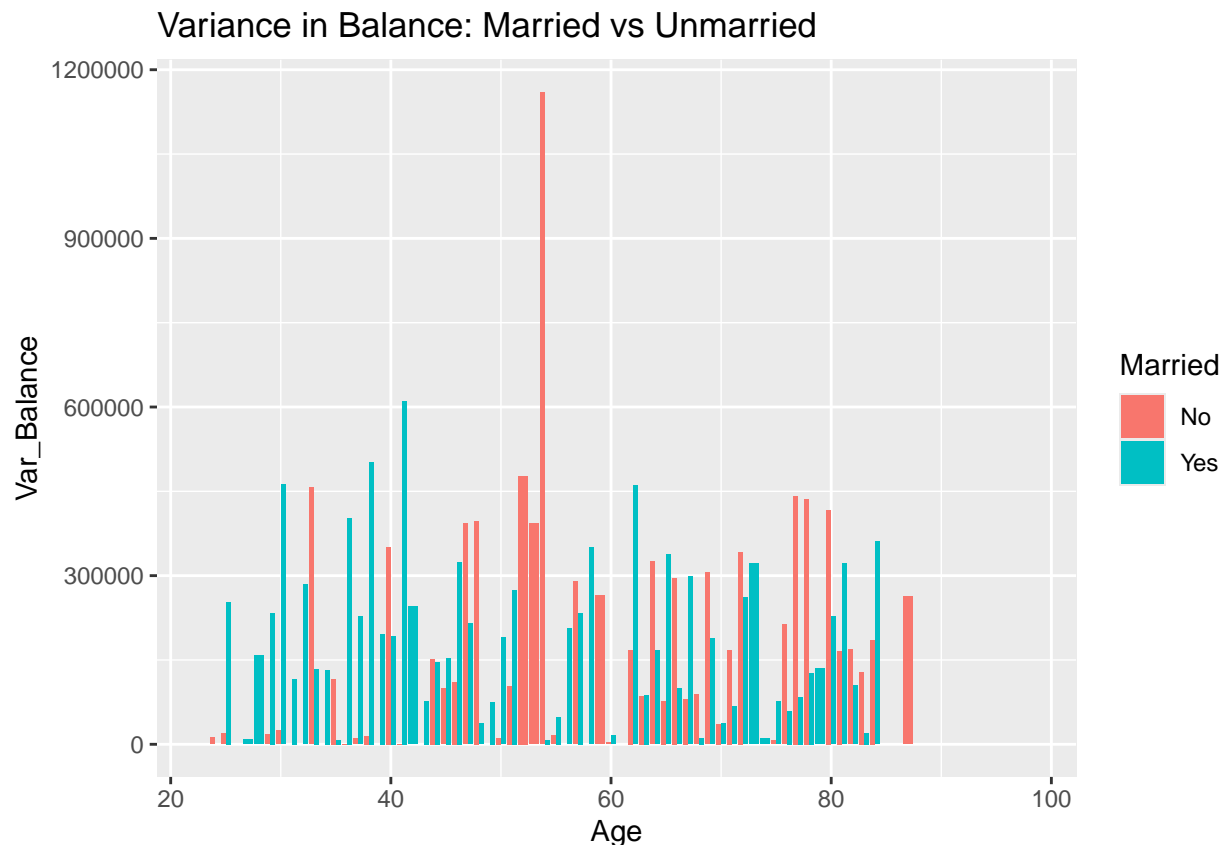
- Data Preparation
  - The data set “Credit.csv” was loaded.

- Key variables of interest were determined, such as “Age”, “Married”, “Balance”, and “Cards” by using the `view()` and `head()` functions.
- Variance Calculation by Group
  - The data was grouped by “Married” status and “Age”, using the `group_by()` function.
  - Variance for both Cards and Balance was calculated using the `var()` function.
- Married vs Unmarried Variance Comparison
  - The variance summary was reshaped to compare the Married and Unmarried groups side by side using the `pivot_wider()` function.
  - Logical comparisons were added to determine which group had less variance in each metric.

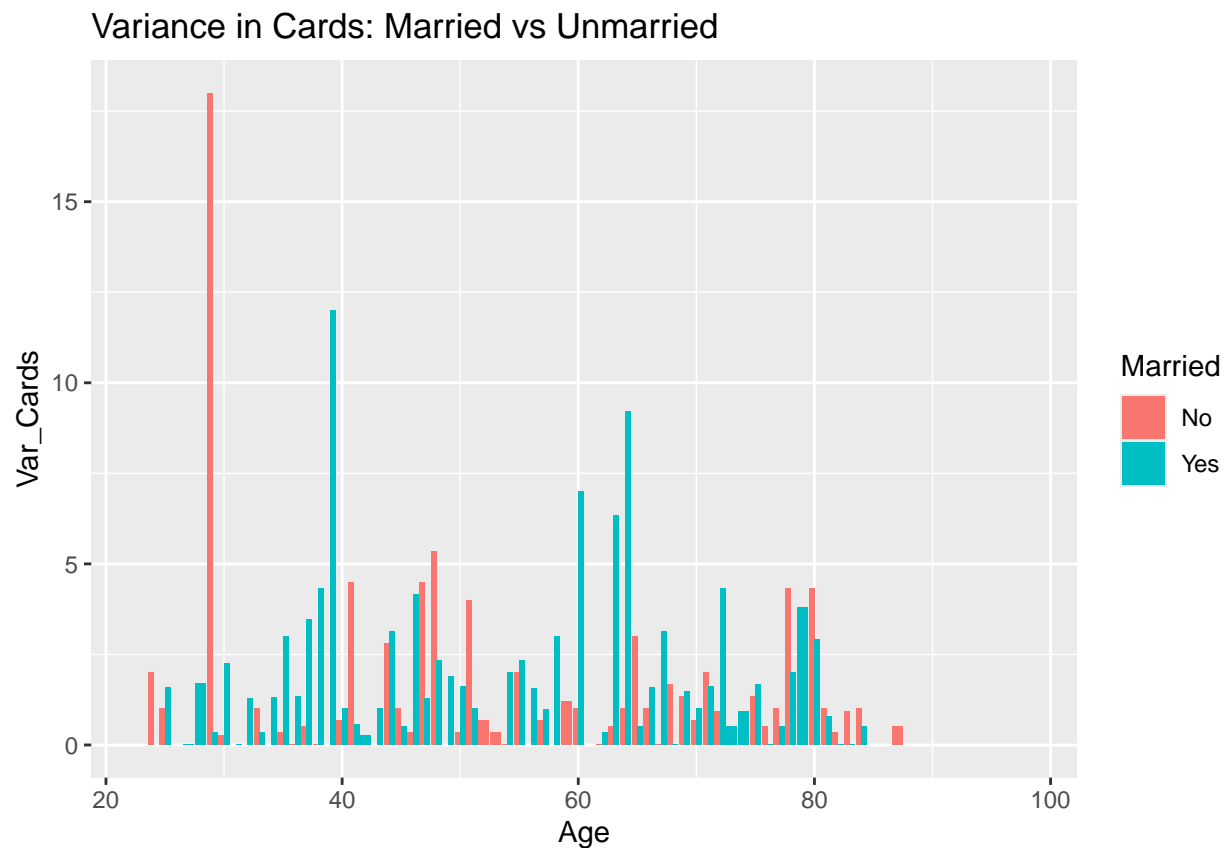
To analyze the data that was accumulated, we used the following method:

- Boxplot for Variance Comparison Between Married and Unmarried People
  - A combined bar plot was used to see the difference between the variance in Balance and Cards between married and unmarried individuals across age groups, which helped see the patterns in variability between the groups.
  - Through this, it was seen that in several age groups married individuals had lower variance in credit card balance compared to unmarried individuals. However, this pattern was not consistent across all age groups.
  - Variance in the number of cards also showed mixed results, as some age groups had lower variance for married individuals, while others had higher variance.

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## Warning: Removed 17 rows containing missing values or values outside the scale range
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Through these methods and measures we found that there was no uniform pattern indicating that married or unmarried individuals consistently have higher or lower variance in credit card usage. However, it was seen that the relationship between marital status and variance in Balance and Cards is age-dependent. Across most age groups, married individuals showed lower variance in credit card balance and number of cards. This suggested that married people may have more stable and predictable financial behaviors—possibly due to dual income, shared responsibility, or long-term financial planning.

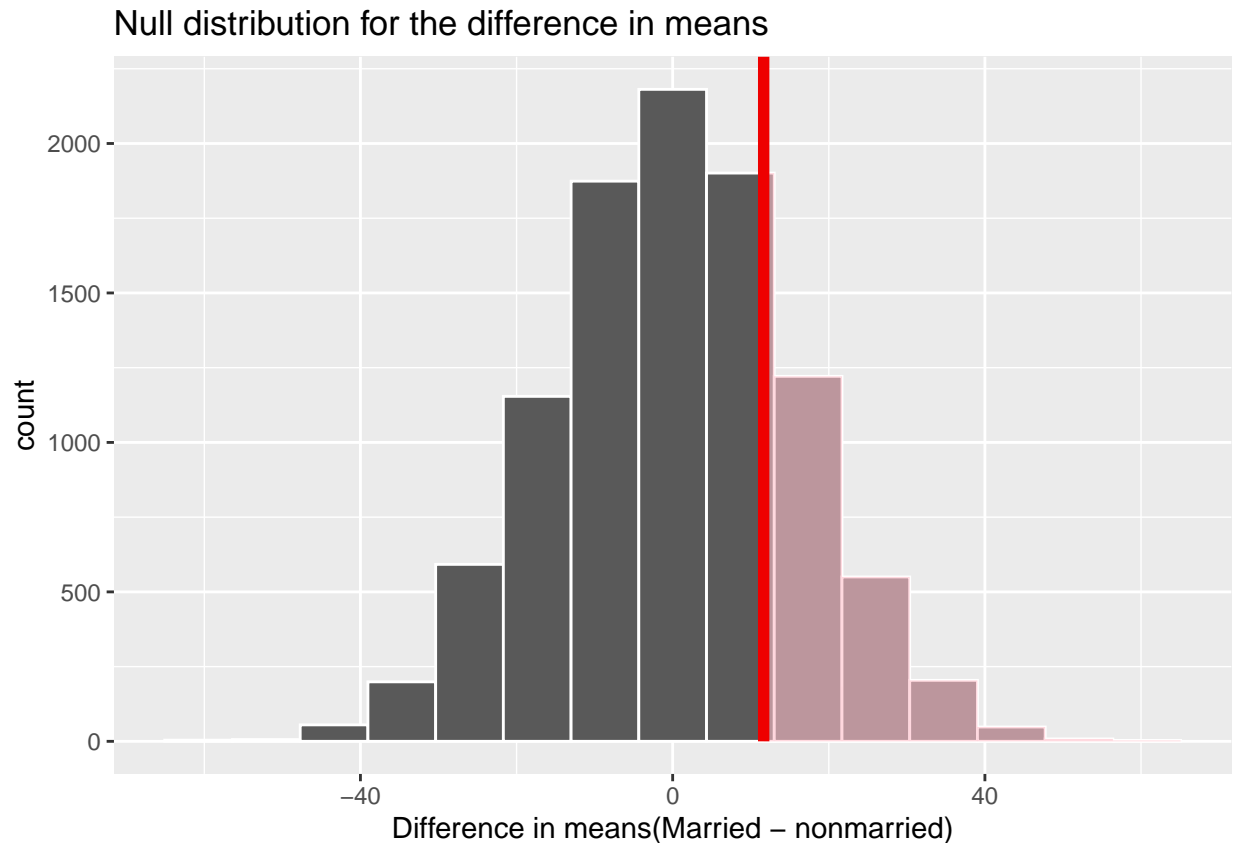
### Question 3: Is there a significant difference on credit score between married and single individuals?

Credit scores are a good indicator of one's financial health, which refers to their ability to manage debt and make timely payments. Particularly, if one has a higher credit score, the person is better at handling debt responsibly and making timely payments. This is a good indicator of their financial health since worse decisions indicate missed payments on one's debts.

For the first question, we split our dataset according to the Married column and then calculated each group's mean credit score, better known as rating. We found that the mean for nonmarried people was **347**, and the mean for married people was **359**. The median credit score for married people was **354**, and for nonmarried people was **329**. From these calculated statistics, married people may have a higher credit score, indicating better financial health. However, we must remain cautious that these may not indicate significance. So, to analyze further and determine its significance, we proceeded to a classic hypothesis test. See our null and alt hypotheses below:

H0: Mean Rating for married people = Mean rating for non-married people  
HA: Mean Rating for married people > Mean rating for non-married people

Our null hypothesis posits that the mean rating for married individuals is equal to that of nonmarried individuals. In contrast, our alternative hypothesis suggests that the mean credit score for married individuals is greater than that of their nonmarried counterparts. To test this, our team constructed a null distribution, focusing on the difference in means between married and nonmarried individuals. We conducted a P-value test in a one-tailed manner. Given that we are calculating the difference as married minus nonmarried, we aim to determine if the mean difference favors the married group over the nonmarried group.



In this graph, we illustrate the calculated differences in means, specifically the mean credit scores of married individuals minus the mean credit scores of non-married individuals. The red line represents the observed statistics, highlighting the difference in means within our dataset. The shaded area in red indicates all instances where the difference in means exceeds our observed statistic. Following the creation of this graph, we computed the p-value for our difference in means to assess statistical significance. The resulting p-value was **0.22**, which is above the 0.05 threshold. This implies a 22% probability of observing a difference in means greater than our observed statistic under the assumption that marital status has no effect. Since this value exceeds 0.05, we fail to reject our null hypothesis, indicating that we cannot determine whether married individuals have higher credit scores than their non-married counterparts.

Additionally, we performed a t-test to evaluate the relevance of our findings, which, given its comparative nature between the two groups, yielded a p-value of **0.2292**. This further reinforces the conclusion that we cannot assert that married individuals possess higher credit scores than non-married individuals.

Our analysis indicates no statistical significance in the credit scores between married and nonmarried individuals. Consequently, we cannot firmly establish that married individuals exhibit better financial health than their nonmarried counterparts. While there may be a correlation, we lack definitive proof of causation.

#### Question 4: Is there a difference in Credit Limit between Married and Non-Married people?

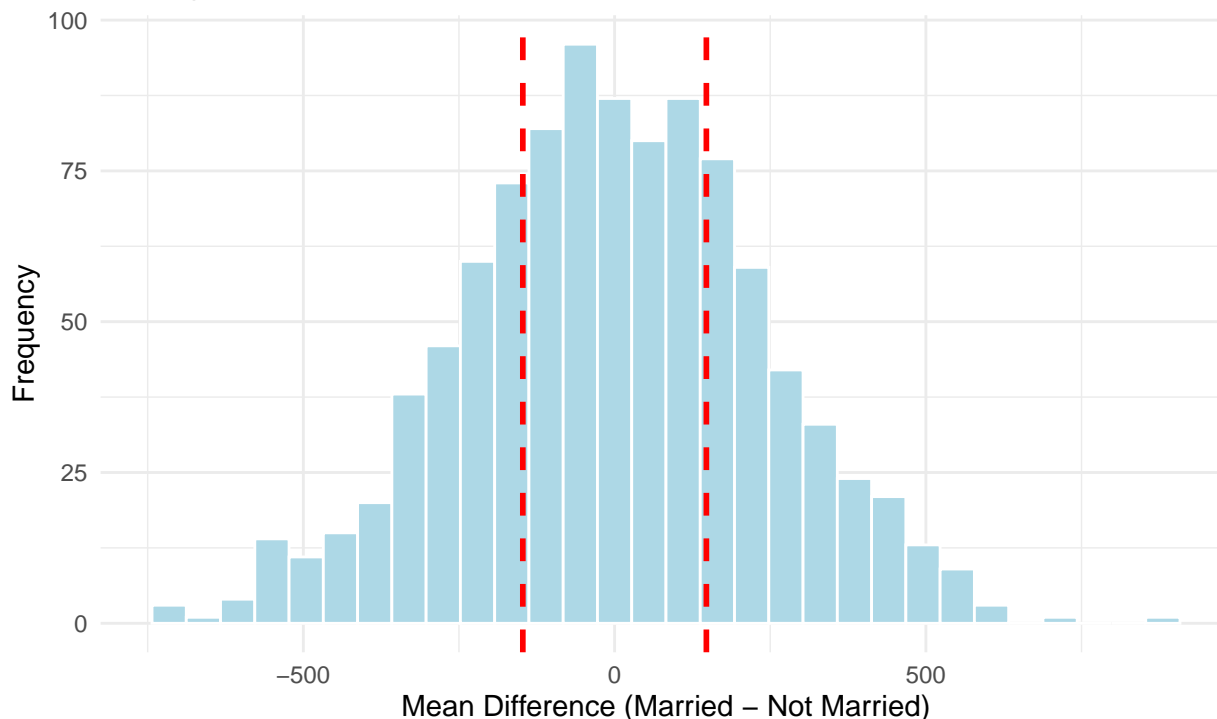
Credit limits are important when looking at an individual's financial profile, particularly their level of trustworthiness in the eyes of lenders. A higher credit limit suggests that a person has shown responsible credit behavior over time, such as making timely payments and maintaining low balances relative to their available credit. Lenders are more likely to extend larger credit lines to individuals they view as low-risk borrowers. As a result, a higher credit limit can reflect stronger financial stability and a proven ability to manage debt responsibly. On the other hand, lower credit limits may indicate limited credit history, higher risk factors, or previous difficulties with debt management

To evaluate if there was a difference in credit limit between Married and Non-Married people we split the data set into Married people and Non-Married people and took each mean credit limit. We found that the mean credit limit for non-married people was 4792.727, and the mean for married people was 4645.303. From these results we can see that there is a chance married people have a higher credit limit, but we know mean values don't mean that there is significant evidence to come to a conclusion. To test if there is a significant difference we ran a t-test using these hypotheses: **Ho: Mean credit limit for married people - Mean credit limit for non-married people = 0** **Ha: Mean credit limit for married people - Mean credit limit for non-married people  $\neq$  0**

Our null hypothesis is that the difference between the mean of married people and non-married people is zero. Contrarily, the alternative hypothesis is that the difference between the mean of married people and non-married people does not equal zero. We tested this by making a null distribution, focusing on the differences between the means of married vs. nonmarried people's credit limit. Our t-test was two tailed to capture values both greater than and less than zero. We plan to use the outputted p-value to determine if there is significant evidence that there is a difference between the married and nonmarried credit limits.

#### Simulated Null Distribution of Mean Differences (of Credit Limit between Married vs Non-Married People)

T-test p-value: 0.529



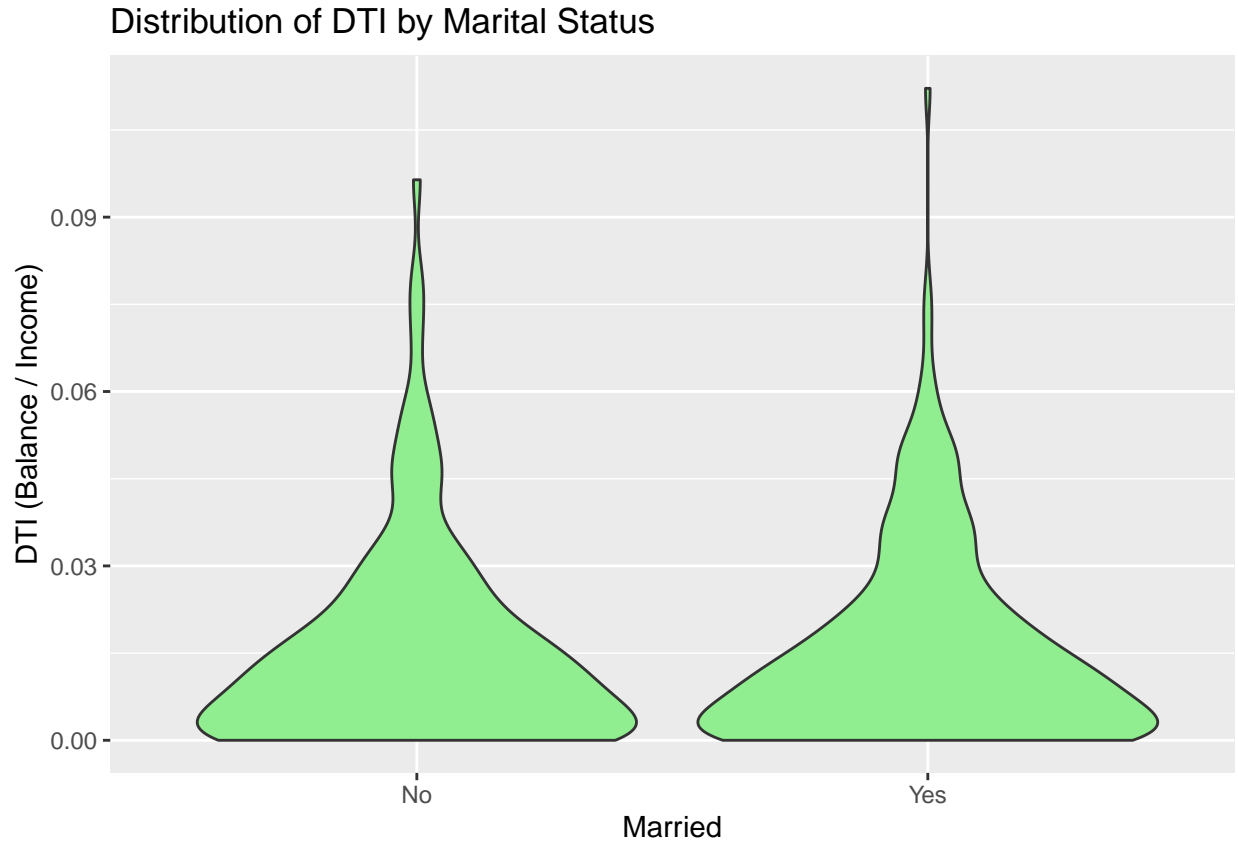
This graph shows the null distribution of mean differences between Married vs. Non-married people. The red dashed lines represent the actual observed difference from zero between the married vs. Non-married credit limits, there are 2 lines due to the t-test being a two-tailed. The p-value calculated from this null

From the findings of this test, between the graph and the p-value, our group can conclude that we did not find significant evidence that there is a difference in credit limit based on an individual being married or nonmarried.

This question examines whether marital status is associated with individuals' credit-card Balance(what they have to pay) is related to income. We start by transforming the original Income field (in thousands of dollars) and multiply it by 1,000 to get the Annual Income, and divided by 12 to obtain Monthly Income.

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To explore how DTI varies with marital status, we use ggplot to produce boxplots and violin plots. A boxplot of DTI highlights the medians, interquartile ranges, and outliers for married versus single people. Both groups seem to have a nearly identical median, along with similar sized boxes and only slight variations in outliers. A violin plot reveals the shape of each group's distribution. Visually, married borrowers cluster toward lower DTI values with a tighter spread, while singles have a higher median and a longer upper tail.

To quantify these patterns, we calculate summary statistics separately for each group. For married individuals, the mean DTI is 0.0151, the median is 0.010, and the standard deviation is 0.017. In contrast, single borrowers exhibit a mean DTI of 0.0151, a median of 0.0099, and a larger standard deviation of 0.0176. These numbers confirm that married people have nearly the same levels and ranges of debt to income ratios as single people.

The two-sample t-test comparing mean DTI for unmarried versus married individuals found a t-value of 0.024 with a p-value of 0.9806. Because this p-value far exceeds the significance level, we fail to reject the null hypothesis of equal means and the 95% confidence interval (−0.00346 to 0.00355) goes through zero. In short, there is no evidence in this sample that marital status is associated with any meaningful difference in DTI.

## Conclusion

In question 1, we used scatter plots to see the relationship between income vs. score and income vs. balance for both groups. In our graphs, we also fitted a linear regression line for both groups to see if one group had a more significant balance or rating increase. However, we concluded that both lines are very similar in slope, thus concluding there was a significant difference. In question 2, where we tried finding variance between married and nonmarried people, we see a higher variance in balance with nonmarried people, suggesting some non-consistent financial behavior, indicating poor financial health. In question 3, where we tried to

see if there was a significant difference in mean credit scores between each group, our p-value was higher than the threshold, indicating no significant differences. In question 4, we tested for a significant difference in our credit limit between each group and, again, found no cause for statistical significance as our p-value was high. Finally, in question 5, where we looked at DTI, both groups had similar distributions of DTI, indicating no huge difference in financial health. Overall, for our research question, we conclude from this given dataset that although we saw a correlation between married people having better financial health, there is no significant difference, proving it to be a cause.

## **Critique of methodology**

Looking back at our methodology, we did find some minor issues with our analysis. In question 2, we should have used a lot better of a graph to better visualize the variances between each age group rather than doing a bar chart. The bar chart is very hard to really see if there is any difference in variances. In question 1, we should have accounted for age group for married and non-married people. This is because in our dataset, it does look like age does play a role where when people get older, there is a natural increase in income and balance but also credit rating. This means, it doesn't matter if the person is married or not, as they get older, there is a increase. We could've done different graphs for different age ranges and then see if there is a difference in slopes. Also in our question 4, we should've done a 1 tailed test instead of 2 tailed, because we wanted to see if the credit limit for married people was higher or not. This would have meant that a difference in mean credit limits between the groups should have been conducted in a 1 tailed test manner. Overall, we believe our methodology here was a good starter to test for any statistically significant impact of marital status on financial health.

## **Limitations/Reliability**

The data set we obtained for the ISLP package was not reliable enough as this data set was a simulated one rather than it being a real collected data set. This means since there was no random sampling, the conclusion we found cannot not be generalized to the rest of the population. Another issue was that this dataset did not contain a lot of datapoints. This meant that our hypothesis tests we conducted were severely impacted by this fact, and thus our test can't be relied upon for the general conclusion of our research question.

## **Future Research**

For future research purposes, we should have obtained a better, more accurate dataset, that contain real population data. We should have also created a correlation matrix between each variable just to see if there is any significant correlation and then picked those value to investigate more future.

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