Analysing Interest Rate Differences Across Red and Blue States

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MA 705: Data Science
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Question
Do interest rates differ for applicants in Red vs. Blue states?

Answer

Yes, interest rates do differ significantly between applicants in Red and Blue states, though the difference is small in magnitude.

Data Source

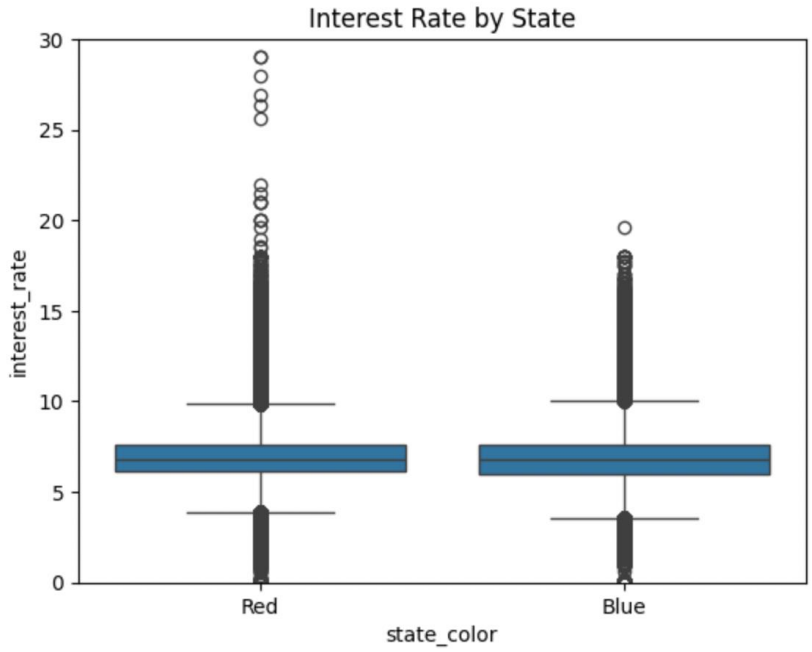
This project uses the 2023 HMDA (Home Mortgage Disclosure Act) dataset from the FFIEC, accessed via the CFPB platform. It includes data on mortgage applications across the U.S., covering variables like interest rate, applicant income, property location, and loan purpose.
https://ffiec.cfpb.gov/data-publication/2023
https://ffiec.cfpb.gov/data-browser/data/

Relevant Terms

- The interest_rate column represents the annual percentage rate (APR) offered to loan applicants. In the dataset, the interest_rate values range from 0 to 120 percent. This variable serves as the key quantitative measure for the analysis, helping to understand how lending conditions might vary across different groups.

- The state_code column identifies the U.S. state associated with each loan application. It is a categorical variable containing two-letter state abbreviations (e.g., CA for California, TX for Texas). This variable serves as the basis for grouping the data according to the political alignment of each state.

Visualization



The boxplot shows that interest rates in Red and Blue states are very similar in terms of median and spread. While Red states have more high-rate outliers, the overall distributions closely align. I chose a boxplot because it clearly shows central tendency, variation, and outliers in one simple visual.

Hypothesis

To assess whether interest rates differ between applicants in Red and Blue states, I performed a two-sample Welch's t-test at a 95% confidence level. The null hypothesis stated there was no difference in mean interest rates, while the alternative proposed a difference. The test yielded a t-statistic of 47.48 and a p-value < 0.0001, leading to the rejection of the null hypothesis. This indicates a statistically significant difference; however, the actual mean difference is only about 0.06%, suggesting the effect is minimal and likely not meaningful in practical lending terms.

Conclusion

This analysis explored whether mortgage interest rates differ between applicants in Red and Blue states using a two-sample Welch's t-test. While the test found a statistically significant difference ($p < 0.0001$), the actual mean difference—6.93% for Red states vs. 6.87% for Blue—is just 0.06 percentage points, suggesting minimal practical impact. Boxplot visualizations and summary statistics support this, showing nearly identical distributions despite slightly more outliers in Red states. Given that interest rates are primarily influenced by personal financial factors and institutional policies, the minor difference observed may reflect indirect regional influences rather than political alignment. A key limitation of this analysis is the absence of variables like credit score, income, and loan type. To draw more robust conclusions, future analysis should apply multivariate regression with richer applicant-level and geographic data.

Link to code

https://deepnote.com/workspace/AugustineDS-83878523-39b9-478b-8fd1-a4558056fa3f/project/DS-Project-2-Code-5254d0f0-50fe-4064-9df6-d53e42b4f942/notebook/Notebook-1-755878c4508e4483941842aef5ea586b?utm_source=share-modal&utm_medium=product-shared-content&utm_campaign=notebook&utm_content=5254d0f0-50fe-4064-9df6-d53e42b4f942