Mortgage Loan Denial Classification

Using HMDA Data

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Business Problem

Overview:

- The growth of the U.S.'s diverse Hispanic population has caused a demographic shift, diversifying different communities across the nation.
- According to Urban Institute, The Hispanic population will comprise of 56 percent of all new homebuyers by 2030.
- A fifth of millennial population in the county is Hispanic who are currently at the prime age to buy their first home.
- Affordability has become an increasing challenge across the nation, causing a nearly historic low homeownership.

- With the fifth of all millennials entering their prime ages to purchase real estate, and of that group another fifth identifies as either Hispanic or Latino this can be seen as a long-term investment that will drive future ROIs.
    - What are the obstacles holding back minority groups, specifically people that identify with the Hispanic/Latinos ethnicity group?
    - What are the most important features that go into getting approved for a mortgage loan
    - What strategies can be formulated from this analysis to help in obtaining a mortgage loan
    - Can we create an automated underwriting system with using supervised learning models

Methodology

01.

Gathered data from
A reputable source

02.

Explore, clean, and
analyze. Find those
Insights

03.

Build your
predictive model

04.

Evaluate models and
make
recommendations

Denial Reason:2017

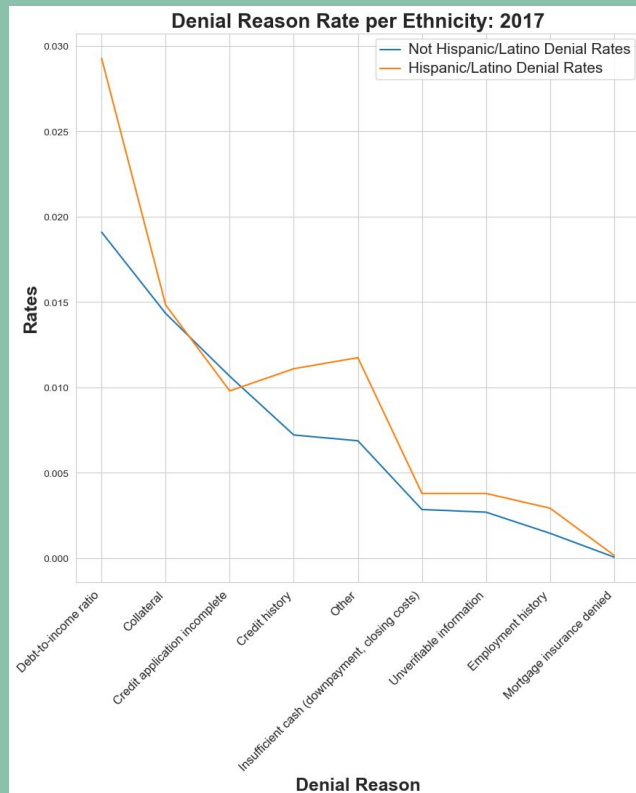NJ Mortgage Loan application Denial Reason: 2017
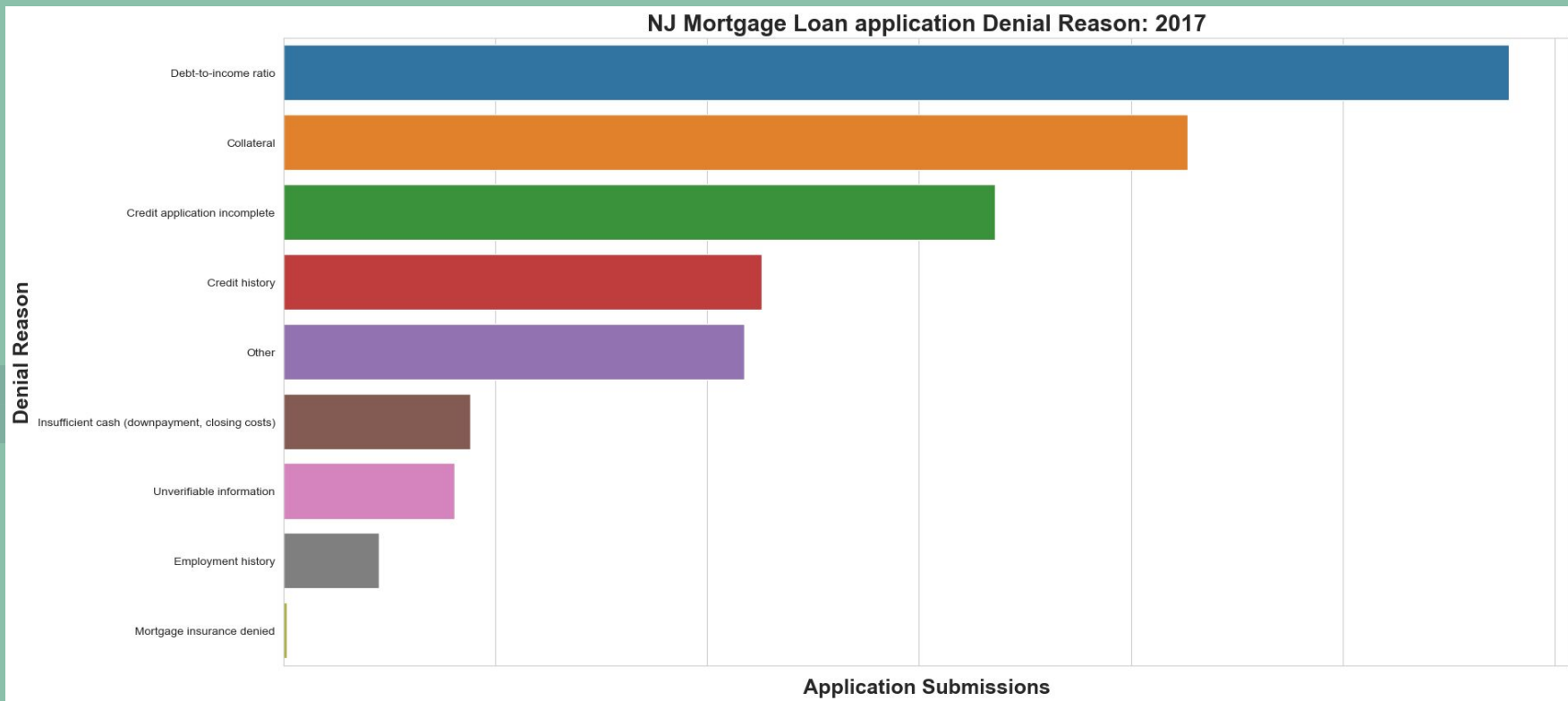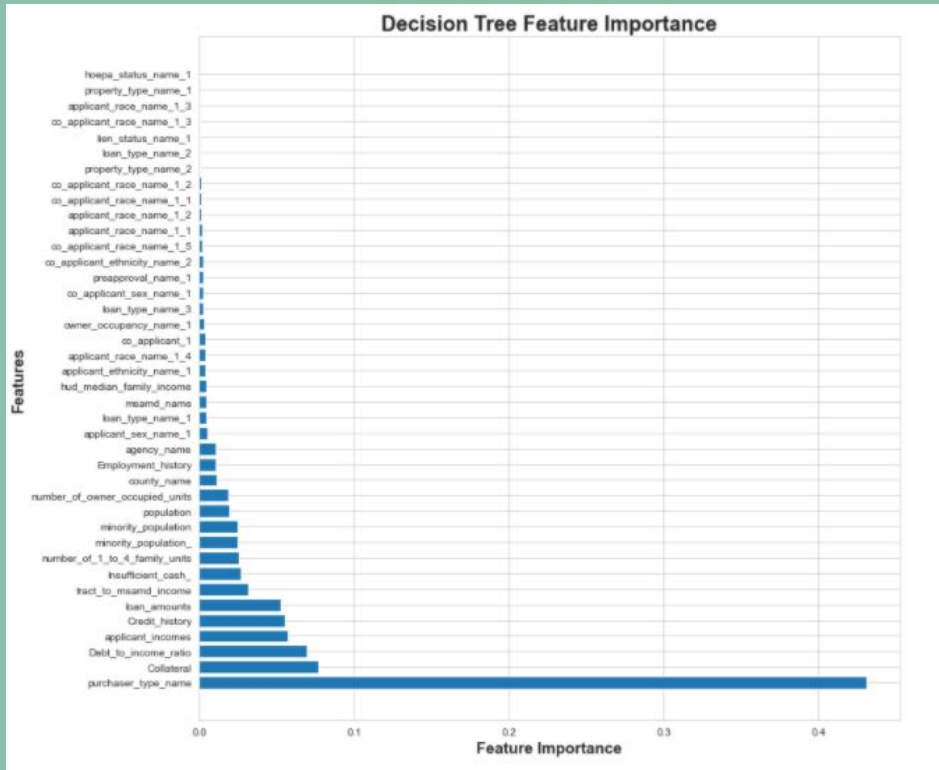
Denial Reason Rate per Ethnicity

A

The only area we are doing better than other ethnic groups in completing the credit application

B

For some reason the reason behind our denials got lost in the automated underwriting system

Models Feature Importance

Decision Tree Feature Importance

Not a shock!!

Most of the important features are the ones that are most know

But....

The model has learned that one reason that can cause a denial is trying to purchase a manufactured home

GridSearchCV: Evaluation

Confusion Matrix

Classification Report

Decision Tree: GridSearchCV

```
AUC is :0.87

Classification Report:
              precision    recall  f1-score   support

           0       0.99      0.87      0.92     43437
           1       0.29      0.87      0.44      2802

    accuracy                           0.87     46239
   macro avg       0.64      0.87      0.68     46239
weighted avg       0.95      0.87      0.89     46239
```
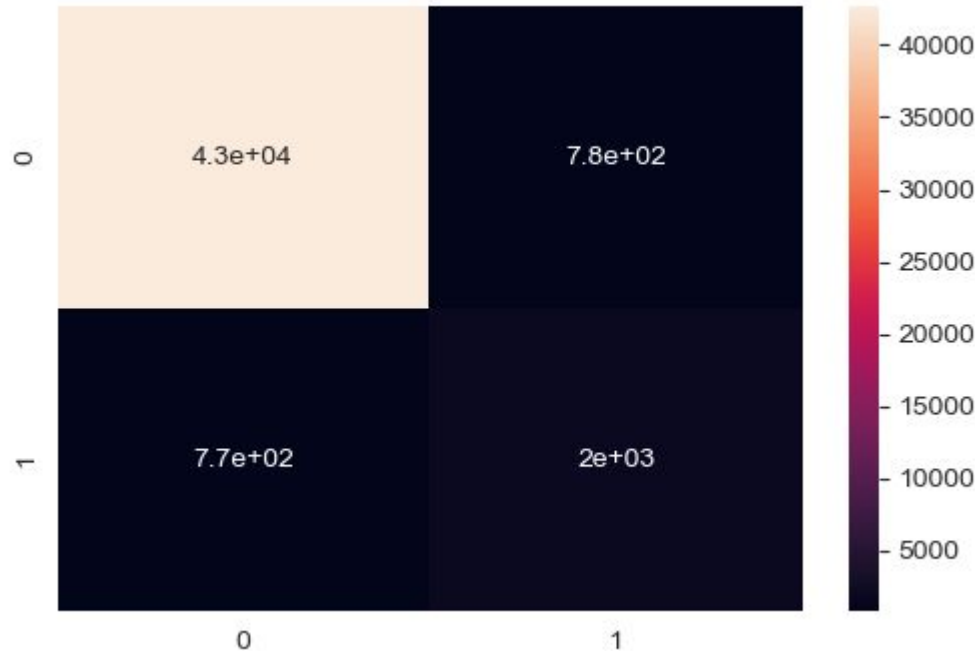
Final Model: Evaluation

Confusion Matrix

Classification Report

Decision Tree

```
AUC is :0.85

Classification Report:
              precision    recall  f1-score   support

           0       0.98      0.98      0.98     43437
           1       0.72      0.73      0.72      2802

    accuracy                           0.97     46239
   macro avg       0.85      0.85      0.85     46239
weighted avg       0.97      0.97      0.97     46239
```

Actionable Plans to take

- Find Lender to check if you get approved, no credit run
- Increase your income, apply with a co-applicant or multiple co-applicant
- Work on your credit score. Aim for a 640!!
- Do your homework if you plan on getting a manufactured home
- Don't be afraid of FHA loans

US

Saturn is a gas giant and has rings. It's composed mostly of hydrogen and helium

The two main types of mortgage loans:

Conventional Loans
and
FHA Loans

Credit Score Ranges

500 - 640 VS. **620 - 850**

FHA Loan
(HUD underwriting)

Conventional Loan
(GSE Underwriting)
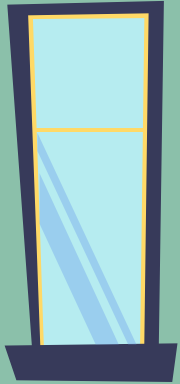
Credit scores are a HUGE determining factor in qualifying someone for a mortgage loan

It can either make or break your possibility of being accepted

Breakdown

	Mortgage Insurance	Low down payment	Ability to refinance
FHA	**YES** Everyone is charged a MI regardless of down payment.	**YES** 3.5% for credit scores above 580 10% for credit scores below 580	**YES** Made easy with the streamline
Conventional	**YES** Down payment less than 20% MUST pay PMI. (Which is most borrowers)	**YES** 3% for FTHB 5% for everyone else 20% for no PMI	**YES** More tedious due to no streamline

There is a large number of applicants who are rejected because of their credit score.

PROBLEM

Apply for the FHA loan. They are more lenient with their credit score threshold and are willing to take more "risky" borrowers.

SOLUTION

FHA advantages

LOW DOWN PAYMENT
3.5% for credit scores above 580 and 10% for credit scores below 580

ACCEPTANCE
More likely to be accepted because of willingness to accept "risky" borrowers

REFINANCE
After building credit and equity, refinance is possible and made simple with the streamline

SAVE MONEY
A "lower" credit score will lead to a higher interest rate and PMI with conventional loans
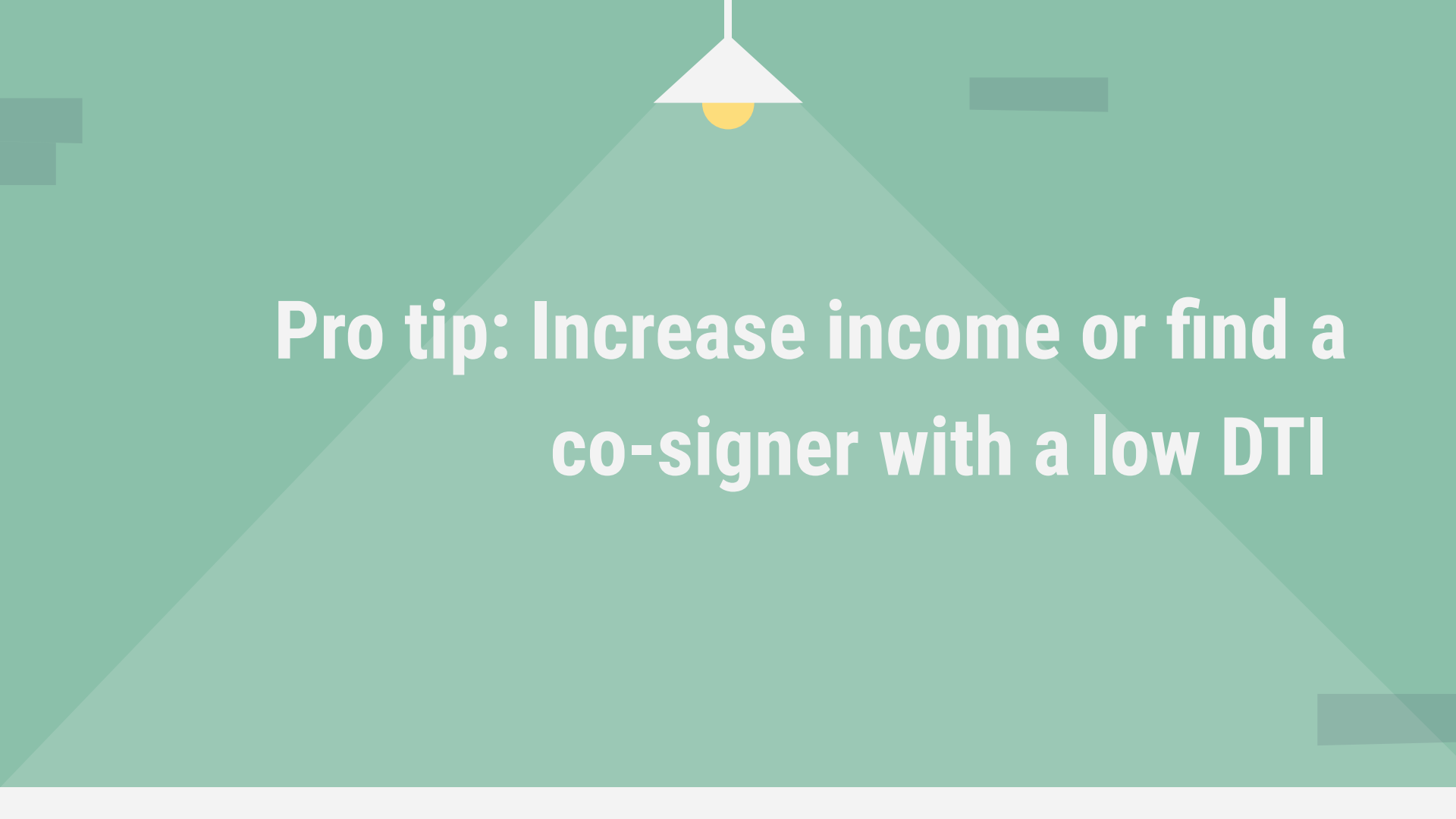
FHA loans have higher DTI ratios

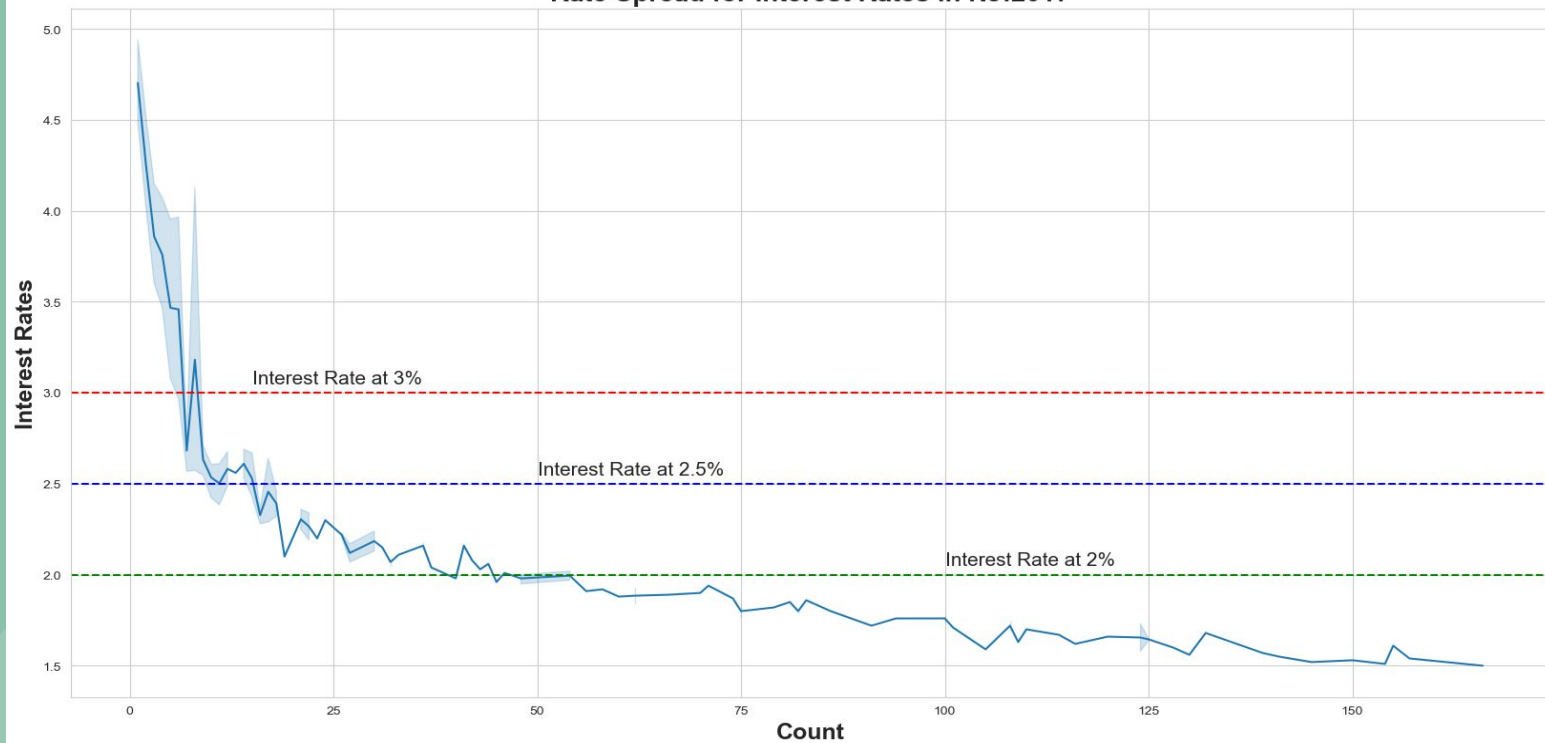PRO TIP: If their DTI is too high, the borrower must either increase their income, decrease their debt or do both

Pro tip: Manufactured homes are covered by FHA loans and are more lenient with their restrictions

Pro tip: Increase income or find a co-signer with a low DTI

Future Work

Rate Spread for Interest Rates in NJ:2017

Questions?
I'll wait

THANKS!!

Do you have any questions?

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