PNC Bank - Mortgage Portfolio Analysis and Peer Comparison

STAT-480 Final Project (Group 16)

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Agenda

1. Introduction
2. Methodology
3. Exploratory Data Analysis (EDA)
4. Modeling
5. Potential customer
6. Recommendation

Background and Significance

In the dynamic landscape of the financial sector it is important for **stakeholders in Lending Market Risk Intelligence teams** - to analyze mortgage portfolios to **make informed decisions and maintain a competitive edge**. This project aims to delve into the intricacies of PNC's mortgage portfolio, drawing comparisons with industry leaders and factors involved in loan approval / disapproval.

By examining the approved loans across institutions, **valuable insights can be gained into market trends, lending practices, and potential areas for strategic improvement**. This comparative analysis will not only aid in understanding the competitive landscape but also serve as a **benchmark for evaluating PNC's mortgage approval processes**, resulting in identifying areas of strength and areas that may require enhancement.

Objectives

1. **To analyze the mortgage portfolio** of PNC bank, and **compare the approved loans between our peers** including JPMorgan Chase, Wells Fargo, Bank of America, and BMO harris bank.
2. **To increase PNC's mortgage portfolio** by defining interesting opportunities or potential customers.

Methodology

Areas	Tasks involved	Breakdown of tasks
Data preparation	Data collection	US Mortgage market and Lenders Data 2022 - Illinois (Source: https://ffiec.cfpb.gov/)
	Exploratory Data Analysis and Data treatment	Summary statistics Missing values using imputation Identify variables for modelling
Modeling process	Building a model	Decision Tree and K-Means clustering
Results	Model and EDA summary	Summarise model findings and EDA Insights

Data Overview & Preprocessing

The dataset has the following columns related to:

1. Applicant and Co-applicant demographics (Example: Gender, Income, Ethnicity, etc.)

2. Loan characteristics (Example: Loan purpose, Loan amount, etc.)

3. Outcome variable: Action taken (Approval / Denial flag)

99 columns and 57,684 rows

Based on business intuition, duplicate fields and variable definition, columns were selected. Rows that had nulls in multiple columns were removed.

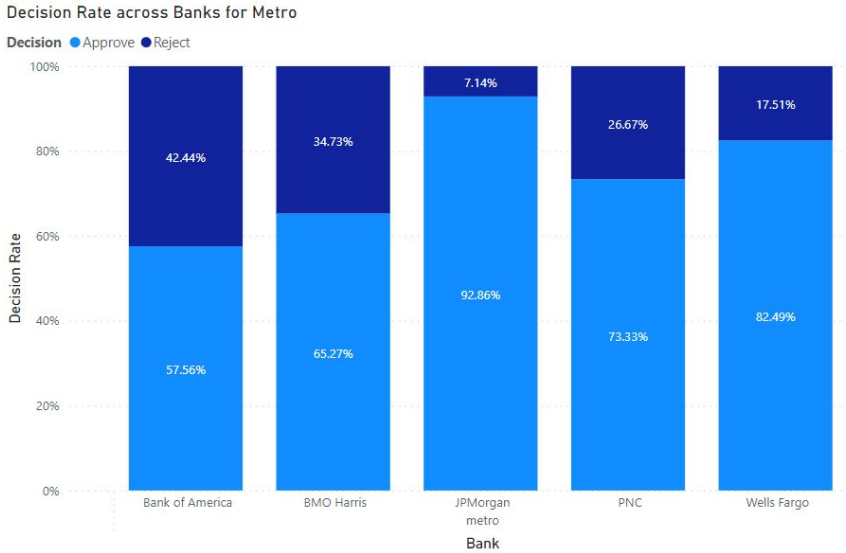
25 columns and 42,543 rows

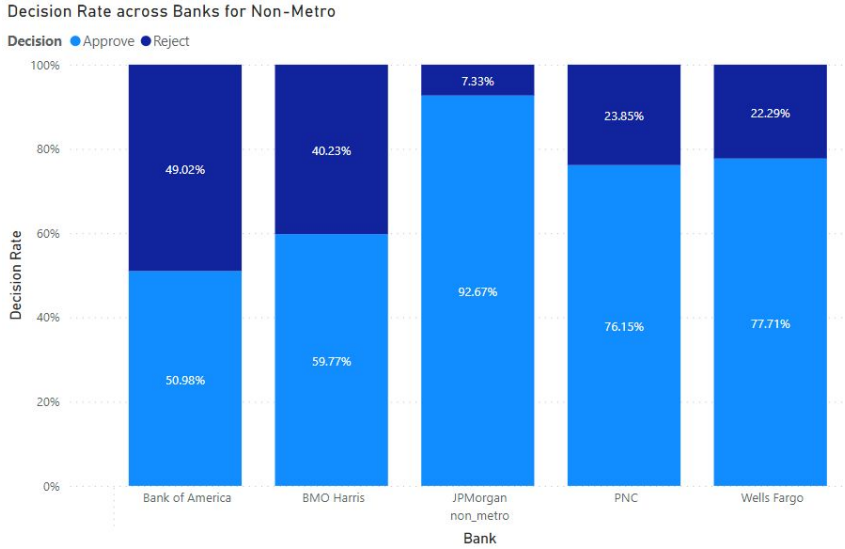
3 Insignificant variable by Lasso method were dropped

22 columns and 42,543 rows

Exploratory Data Analysis (EDA)

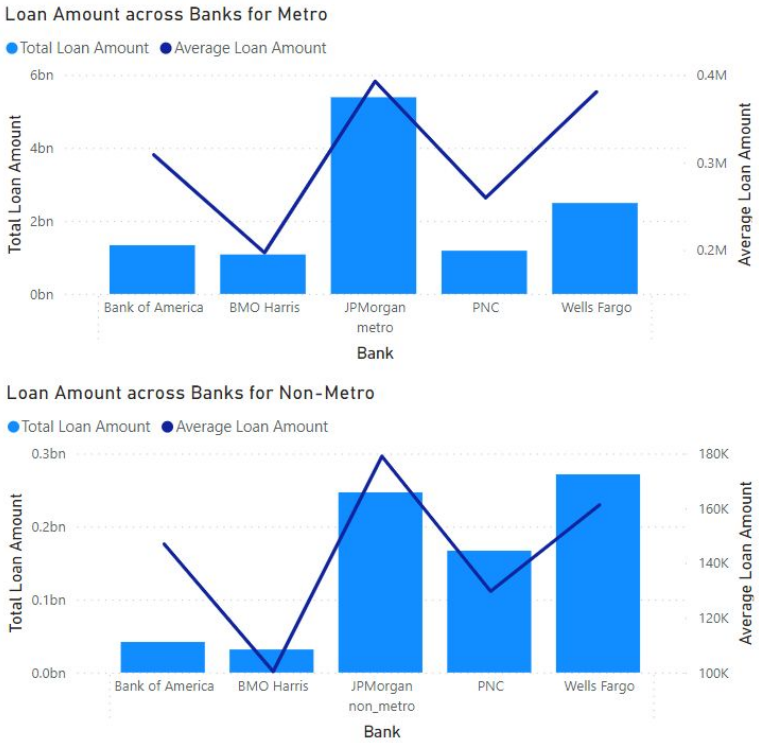
EDA (Approval Rate)





JP Morgan has the **highest approval rate** for both Metro and Non-Metro

EDA (Loan Amount)

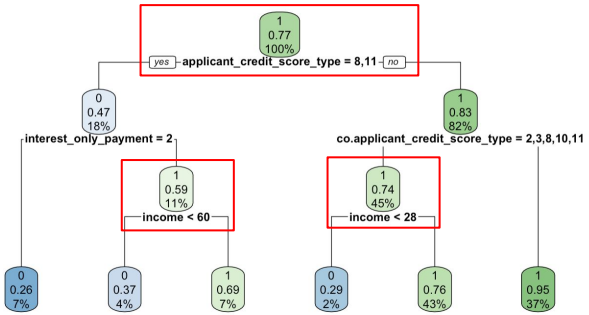


Metro: **JP Morgan** approved the highest amount of loan

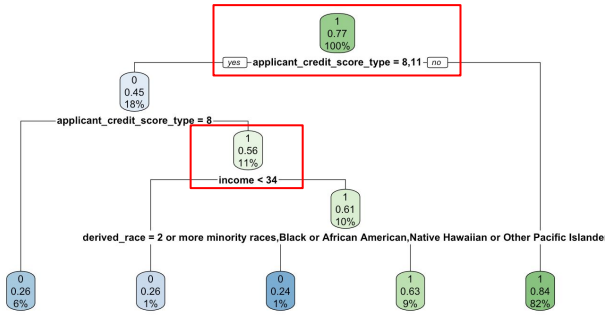
Non-metro: **Wells Fargo** and **JP Morgan** approved the highest amount of loan

Modeling

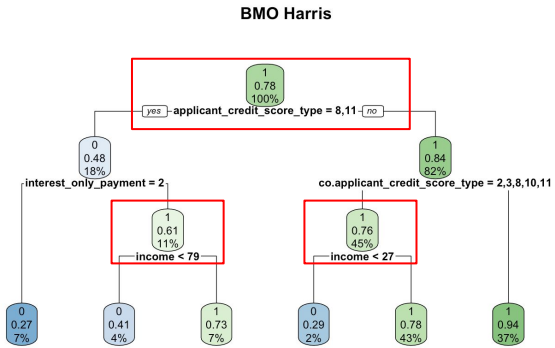
JPMorgan Chase & Co



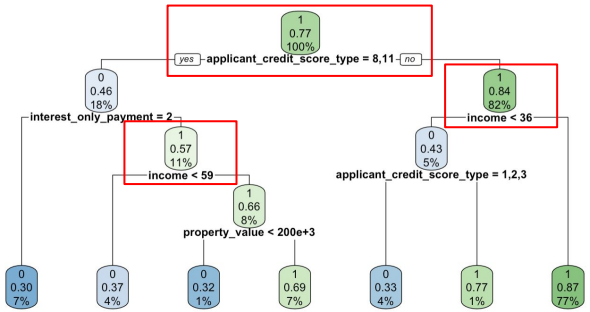
Bank of America



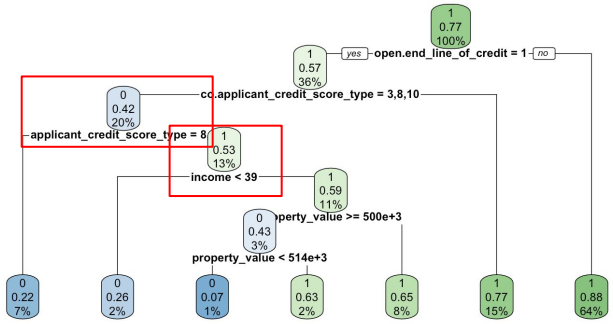
BMO Harris



PNC

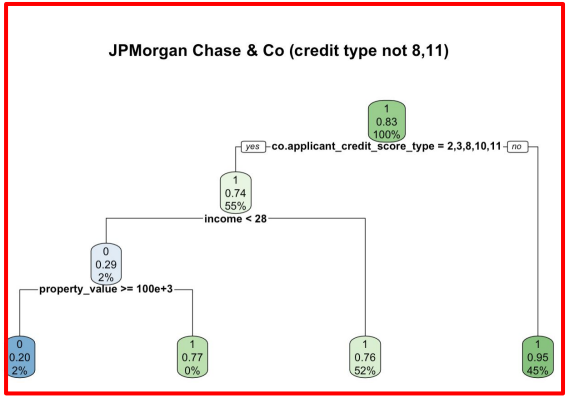


Wells Fargo

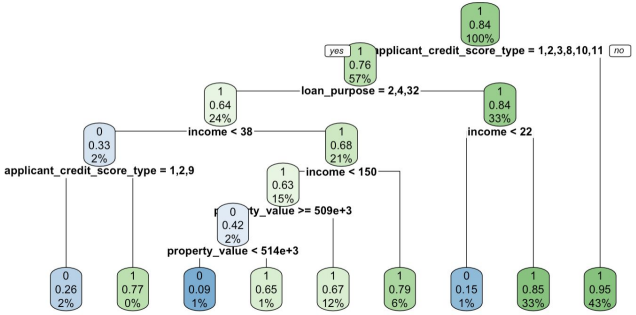


Modeling (common used credit score)

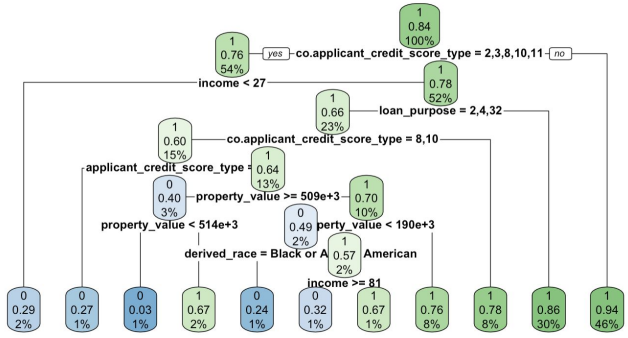
JPMorgan Chase & Co (credit type not 8,11)



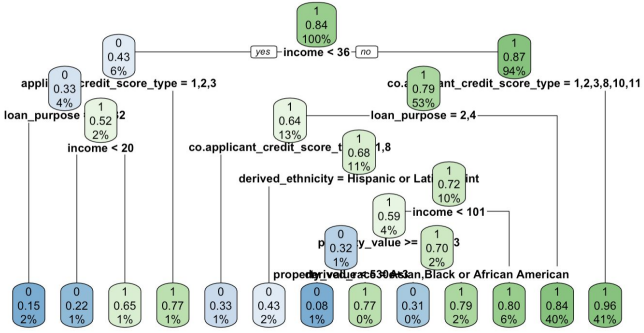
Bank of America (credit type not 8,11)



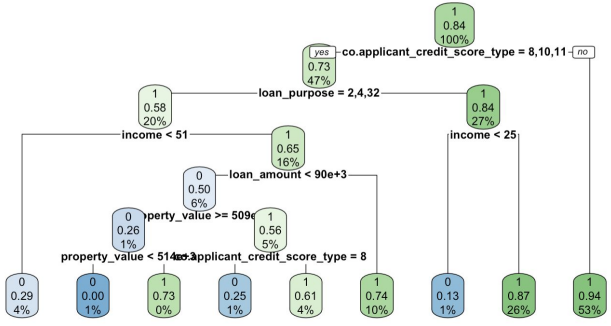
BMO (credit type not 8,11)



PNC (credit type not 8,11)



Wells Fargo (credit type not 8,11)



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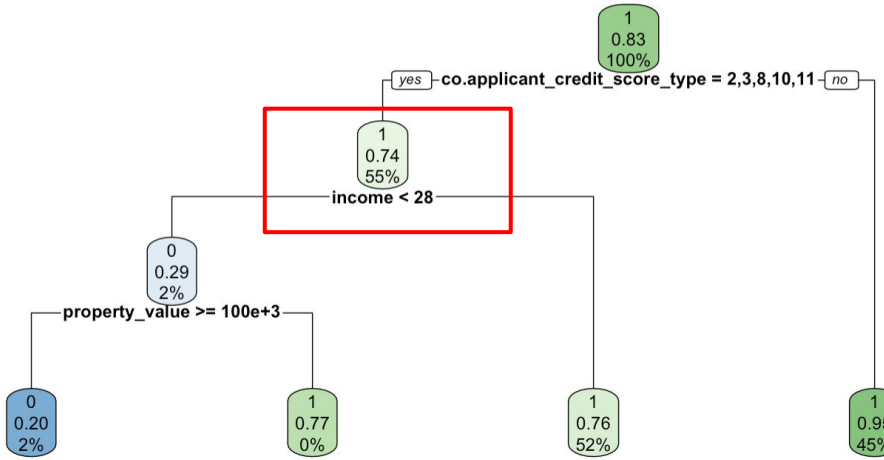
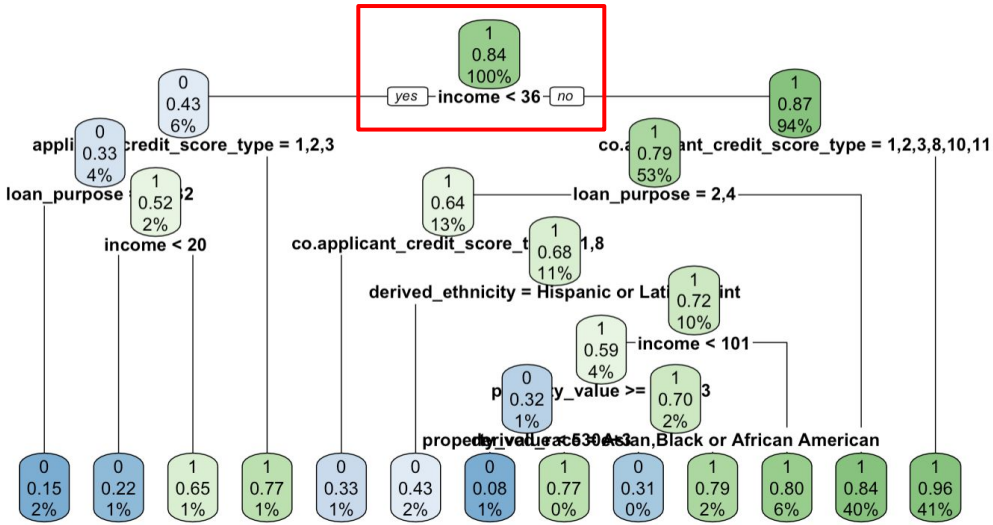
JPMorgan Chase & Co (credit type not 8,11)



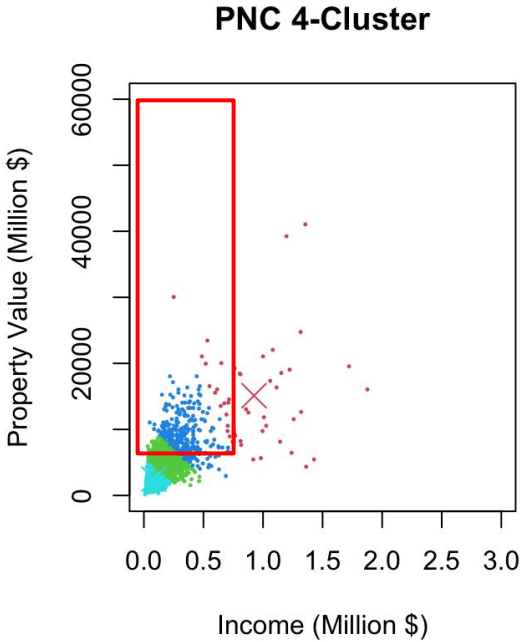
PNC (credit type not 8,11)

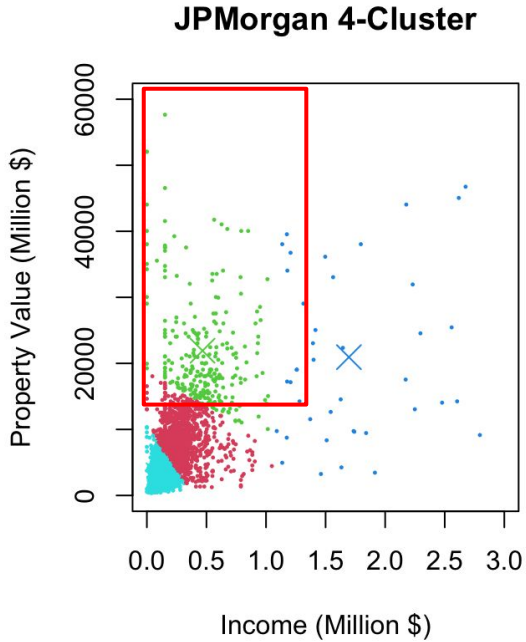


Who is our potential customer?

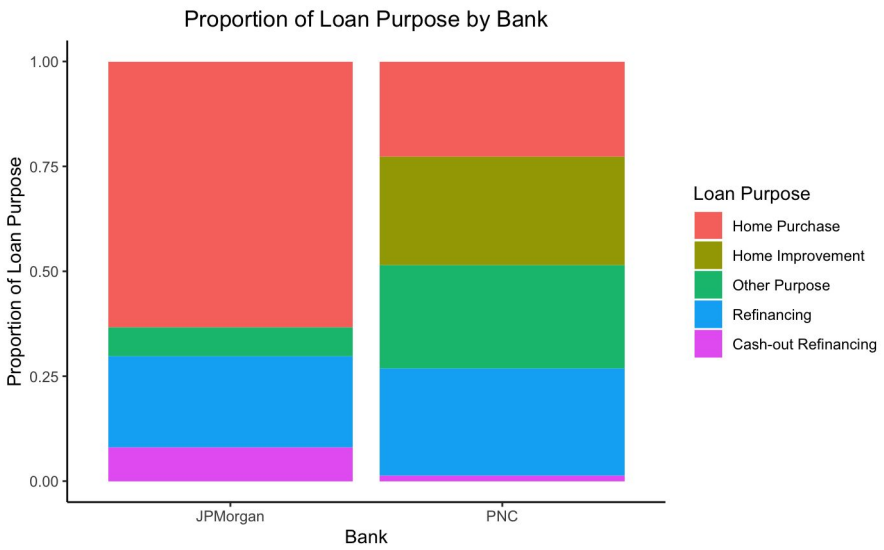
More Investigation using Clustering

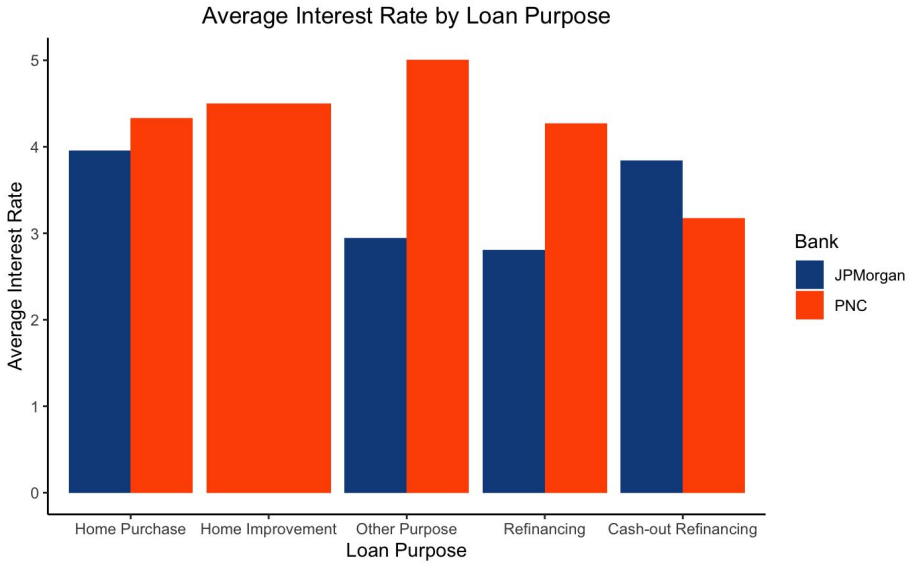
- From elbow-plot, we decide to group customers into **4 clusters**
- Groups of **low income**, but applying for **high property value** are our most interesting group





What's different?





- **Home Purchaser** is our most potential customer here
- JP Morgan has a bit **less interest rate** than PNC for home purchase

Recommendation

- Do **feasibility studies** on a customer group of low income & high property value
- Focus more on **acquiring new customers who want to buy houses** than retention old customer through refinancing and home improvement
- Consider to launch a new mortgage with **lower interest rates**
- Look into peers' cost of fund and try **lowering our cost of fund** if possible

Q&A