



Smith
live
Case

Deloitte.

About the Client

Overview

- **Mortgage Corp** – National Mortgage Association
- Principal financing arm for government mortgage loans and ensures that mortgage lenders have necessary funds to provide loans to customers
- Since 1968...
 - Has served 53 million households, over \$2.0 trillion within their MBS portfolio balance, and has proven to be one of the safest investments for an investor
- Other things important to Mortgage Corp
 - Respect individuals Personally Identifiable Information (PII)
 - Intuitive ways of visualizing data
 - Balancing data driven models with respecting and upholding ethics

About the Client

Challenges & Goals

FY21 Challenges:

1. Drastic growth in US housing market as a result of homebuyer preferences shifting from urban to suburban living situations during COVID-19 pandemic. Due to this change in the market, Mortgage Corp. is currently seeing a dramatic increase in applications for mortgages from housing units spanning across all different socio-economic backgrounds. Taking disparate impact into account has only become more difficult with this influx of mortgage applications.
2. Mortgage Corp has been struggling lately with an accurate predictive model for the probability of Default.
3. Increase in loans/mortgages requested has forced Mortgage Corp. to go on a hiring spree – finding the right talent is a challenge and Mortgage Corp might be interested in hiring additional workers and training them with the help of Deloitte if given a little push.

About the Client

Mortgage Corp Goals

FY21 Goals:

- 1. Reduce Disparate impact:** Keeping current laws, social/socioeconomic trends toward suburbia and regulations regarding the Fair Housing Act at the forefront of mortgage corps mind during the approval/denial for mortgages.
- 2. Improve Web and Mobile User Experience:** With the influx of consumers visiting Mortgage Corp.'s website to fill loan applications, Mortgage Corp. wishes to build a more customer-friendly website.
- 3. Prioritize Internal Security Infrastructure:** While having to process many more loan applications, Mortgage Corp. is currently dealing with more Personal Identifiable Information (PII) and needs to ensure they keep the personal information of their customers safe & secure.
- 4. Modernize and Optimize the Workforce:** Mortgage Corp must identify ways to attract and retain talent to meet the increased demand for mortgages while also determining ways to do more with fewer resources, like implement automation.

Setting the Stage

Deloitte's Engagement with Mortgage Corp

- Deloitte has helped Mortgage Corp on a variety of engagements ranging from financial accounting system modernization to operations and analytics
- Recently, Deloitte was engaged after Mortgage Corp mentioned that they needed assistance with the influx of mortgage applications due to changes in consumer behavior during the COVID-19 pandemic – they realized they were at risk of not fully addressing disparate impact issues when approving/denying applications. This is also an opportunity to explore if there is non-traditional data that might be able to bridge the gap between efficiency of the model and remaining ethical
- A key consideration for Mortgage Corp is making sure their models are ethically sound and don't unintentionally negatively affect protected groups
- Deloitte has received data from the client to utilize when building the model, but also mentioned they would be open to "open source" data if we thought other variables were important for the model (data.gov might be helpful)

Things to consider: Disparate Impact

- With the influx of mortgage applications across a broad range of socio-economic backgrounds, Mortgage Corp. must consider disparate impact to ensure they don't negatively impact loans to protected groups
- What is Disparate Impact?
 - ✓ Disparate impact occurs when policies, practices, rules or other systems that appear to be neutral result in a disproportionate impact on a protected group
- Are statistical models governed by Law?
 - ✓ The disparate impact theory has application also in the housing context under Title VIII of the Civil Rights Act of 1968, also known as The Fair Housing Act
 - ✓ On June 25, 2015, by a 5–4 decision in *Texas Department of Housing and Community Affairs v. Inclusive Communities Project*, the Supreme Court held that disparate-impact claims are cognizable under the Fair Housing Act.

*Taking disparate impact into account in your final presentation is **REQUIRED** and will be considered in the evaluation of your proposed solution to Mortgage Corp.*

The Fair Housing Act

- The Fair Housing Act prohibits discrimination by direct providers of housing, such as landlords and real estate companies as well as other entities, such as municipalities, banks or other lending institutions and homeowner's insurance companies whose discriminatory practices make housing unavailable to persons because of:
 - ✓ Race or color
 - ✓ Religion
 - ✓ Sex
 - ✓ National origin
 - ✓ Familial status, or
 - ✓ Disability*
- The Dept. of Justice may file suit under the Fair Housing Act in cases involving discrimination in mortgage loans*

*Taking the Fair Housing Act into account in your final presentation is **REQUIRED** and will be considered in the evaluation of your proposed solution to Mortgage Corp.*

The Data

Below are data points that Mortgage Corp has included in their initial request in understanding which factors impact high default rates the most:

Data Field	Data Definition
Market Name	Name of the city that corresponds to the zip code
Zip Code	Postal Code used to represent locations
Avg Sq Ft	Total Average area of the house property in the zip code
Avg Credit Score	Average Credit score per zip code. Credit score is a measurement of the consumers credit worthiness.
Median_House_Hold_Income	The median Household income for the zip code
Lat	Latitude is a geographic coordinate that specifies the north–south position of a point on the Earth's surface
Lon	Longitude, is a geographic coordinate that specifies the east–west position of a point on the Earth's surface, or the surface of a celestial body
Median_Home_Value	The median home value for that specific zip code
Employment_Full_Time	How many people are employed full time in the zip code
Employment_Part_Time	How many people are employed part time in the zip code
Employment_No_Earnings	How many people are not employed in the zip code
House_Holds_Mortgages	How many people have mortgages in the zip code
House_Holds_Free_Clear	How many people paid off their mortgage in the zip code
Renter_Occupied_Households	How many households have renters in the zip code
House_Holds_Vacant	How many households are vacant in the zip code
No_Highschool	How many people in the zip code do not have a high school degree
Highschool	How many people in the zip code only have a high school degree
Associate Degree	How many people in the zip code have an associate's degree
Bachelor's Degree	How many people in the zip code have a bachelor's degree
Masters	how many people in the zip code have a master's degree
Professional	How many people in the zip code have some sort of professional degree
Doctorate	How many people in the zip code have a doctorate degree

The Objective: Analyze the Data and *Variable* Selection

With the increase in mortgage applications to Mortgage Corp. due to COVID-19, the Client needs to consider new methods to approve/deny loan requests. What are the most effective and fair data fields for Mortgage Corp to use to accurately determine which markets are at the highest risk of default?

The Goal: Create 3 slides to present your findings and analysis to the client

1. Assess the data (provided and open source if you choose to use additional data, which is not required) and identify what kinds of variables and equations you will use to support the business case
2. Determine the analytical technique and tool you will use to solve the client's problem and perform the analysis
3. Present your process, analysis, and recommendation on the risk of default on Day 2 to the Client

The Objective: Analyze the Data and *Variable* Selection

- Things to consider:
- Ethics: The influx of mortgage applications from a broad range of households due to COVID-19, Fair Housing Act, and disparate impact
- Use of external data: If you decide to use external data, please consider:
 - Reliability of the source
 - Context in which the data was obtained
 - Applicability to the issue the Client is facing
- Non-statistical implications,
- Techniques learned in lecture

Remember:

- 1. There is more than one method of solving these types of problems**
- 2. Get creative → Think of interesting ways to display & present data!**



Deloitte and Mortgage Corp

Questions?