2021 MMA Online Datathon

Case Challenge: Analyzing the Nebraska Mortgage Loan Market

A mortgage loan, or simply mortgage, is a loan used to purchase real estate. Primary lenders such as banks and credit unions provide funding to individual borrowers to buy homes via long-term amortization period mortgages. Individuals may obtain, or *originate,* the loan directly from the lender, or in many cases from a third-party mortgage broker. A mortgage states that each period (e.g., a month) the borrower must make a payment consisting of a principal payment and interest. The mortgage loan is *secured* by the underlying property. In the event the borrower cannot make payments (i.e., defaulting on the loan) or fails to abide by its terms, the lender has the legal right to take possession and sell the secured property to pay off the loan (also known as *foreclosure* or *repossession*).

The secondary mortgage market is where existing mortgage loans are bought and sold between lenders and investors. In the United States, one of the largest purchasers of mortgage loans is the government-sponsored enterprise Federal National Mortgage Association, commonly known as Fannie Mae. They purchase loans from primary lenders, bundle them together, and package them into a mortgage-backed security, which can be sold to investors in the secondary mortgage market. Fannie Mae sets guidelines for loans that it will accept for purchase such as the maximum size of the loan. By purchasing loans and selling mortgage-backed securities, Fannie Mae provides liquidity to lenders, which allows them to fund or *underwrite* more mortgages, making it easier for individuals to buy homes.

You and your team have been brought in as consultants of Great Lakes Midwest Bank, a regional bank operating in the states of Illinois, Iowa, and Wisconsin. They are planning an expansion of their mortgage operations into the neighboring state of Nebraska. Fortunately, there is a significant amount of data available to understand the market via Fannie Mae. They have provided you with a dataset of all conventional single-family, fixed interest rate mortgages from 2000 – 2021Q1. This is convenient since almost all the loans underwritten by Great Lakes Midwest are within Fannie Mae guidelines, and many of its loans are sold to Fannie Mae.

Your task is to analyze the data and determine a recommendation on which segments of the Nebraska mortgage market to focus on. The primary consideration should be maximizing the dollar value of mortgages issued while limiting the number of defaulting loans with additional considerations for future changes in the interest rates, state of the economy, and the ability to execute on the strategy. Provide your reasoning and any insights into the data that led you to your recommendation. The audience for the presentation will be senior directors from the bank.

Dataset

The dataset contains approximately 270K records of mortgages that Fannie Mae acquired between 2000 and 2021. The mortgage terms range from 5 years to 30 years containing approximately 195K matured or prepaid mortgages and 70K active mortgages with the balance in some sort of delinquent status that may require disposing of the property. The dataset contains numerous additional fields about the mortgage such as property details, primary mortgage seller, original borrowing amount, credit scores, and various delinquency statuses. Additionally, when a sale does occur due to a foreclosure, it also contains details about the sale. See the accompanying data dictionary for more details.

Deliverables

- A presentation of up to 15 slides in PPT or PDF format with appendix. While the Appendix is not limited in size, the relevance of every page in the Appendix and how it supports the main body of your presentation should be very clear to the audience (reader). Note that your presentation should be self-contained: the only reason a reader would open the appendix is to get more details on some of the results/visualizations presented in the main body; the reader should never need to open the appendix to understand the statements made in the main body of the presentation.
- You can use analytical tools of your choice; if you would like to include your code, please do so in the Appendix.
- Submit presentation via Quercus website.

Appendix: Additional Background Information

As stated above the dataset contains mortgages purchased by Fannie Mae. Fannie Mae purchases loans from *sellers* or first party *originators* of the loan. Once the loan is active, the *servicer* is the company who collects mortgage payments from the borrower and provides other services in connection with the mortgage.

A mortgage loan can have different purposes. The main purpose is an outright *purchase* of a property. Another common purpose is to *refinance* a mortgage where you pay off the original mortgage and replace it with a new one. Lastly, a special type of refinancing is a *cash-out refinance* where the mortgage loan is greater than the original one it is replacing so the borrower can get some extra cash.

When a borrower has failed to make payments as required by the mortgage contract, the mortgage is considered *delinquent*. If the borrower cannot make the outstanding payments (including late fees) within a certain time period, then the lender may foreclose on the property. Before this happens, the lender may help prevent foreclosure by providing the borrower with several options. Foreclosure is usually the last resort option because it is an expensive process and lenders typically lose money during foreclosure proceedings.

A mortgage can be in one of several statuses described below:

- **Prepaid**: Borrower has paid off the balance of their mortgage before the end of the term.

- **Matured**: The term of the mortgage has ended, and the borrower has fulfilled the payment terms.
- **Third Party Sale**: Mortgage has been sold to a third part for various reasons.
- **Short Sale**: Property is sold for less than the amount due on the mortgage with the proceeds going to the lender. The balance may be forgiven by the lender, or the lender may take legal action against the borrower.
- **Repurchased**: The originator of the mortgage is forced to purchase the mortgage back, most commonly due to fraudulent or faulty origination documentation in which some aspect of the mortgage was misrepresented.
- **Deed-in-Lieu:** Transfer the title of the property from the property owner to the lender in exchange for relief from the mortgage debt.
- **REO Disposition:** A REO property is one owned by a lender (e.g., Fannie Mae) that has not been successfully sold at a foreclosure auction.
- **Notes Sale:** Mortgage (i.e., the note) is sold off to another investor who takes on the responsibility of the mortgage.
- **Reperforming Loan Sale:** A reperforming loan is one that became delinquent because the borrower was behind on their payments but since then has resumed making payments. Although the borrower has begun making payments again, the missed payments may not necessarily have been paid.

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