

Mortgage Trading Analysis using Power BI

1. Introduction

This case study focuses on mortgage trading within the U.S. financial system using Power BI. The analysis revolves around a fictional non-bank mortgage lender, Sooper Mortgage, and aims to execute a mortgage trade in the capital markets by analyzing mortgage data, market prices, and targeted profit margins. The study employs various Power BI features, including DAX calculations, Power Query Editor, and data visualization techniques.

2. Financial System Overview

The case study begins with an introduction to the financial system, explaining the relationship between savers, lenders, borrowers, and investors. Key components covered include:

- **Loan Agreements:** A borrower's promise to repay the lender, including principal and interest payments.
- **Loan-to-Value (LTV) and Debt-to-Income (DTI) Ratios:** Important risk indicators used to assess mortgage loans.
- **Mortgage Trading:** The process of lenders selling loans to financial institutions for liquidity.
- **Mortgage-Backed Securities (MBS):** Loans pooled into tradable financial assets, allowing investors to buy securities instead of individual loans.

3. Data Preparation and Cleaning

As a Junior Trader, the first step was data cleaning to ensure accuracy before presenting it to investors. Key tasks included:

- **Loan Data Standardization:** Ensuring consistent formatting for mortgage details.
- **Creating Key Risk Ratios:**
 - "Loan to Value Ratio" using `DIVIDE(Loan_amount, property_value, 0)` , formatted as a percentage.
 - "Monthly Income" calculation by converting annual income to a monthly figure.
 - "Debt to Income Ratio" using `DIVIDE(monthly debt, monthly income, 0)` , formatted as a percentage.
- **Loan Status Tracking:**
 - Created a "Trade Status" column using `IF()` and `ISBLANK()` to determine a loan's readiness for trading.

4. Mortgage Amortization Analysis

Mortgage amortization was analyzed using Power BI's DAX formulas:

- **Scheduled Principal Balance Calculation:**
 - Created a "Payment Period" column using `payment_periods_made + 1` .
 - Used `PPMT()` to calculate the "Amortization Amount" based on interest rate, loan term, and current balance.
 - "Scheduled Principal Balance" was computed by adjusting the current balance with amortization.
- **Handling Incorrect Subtractions:**
 - Loans that had already made their October payments were excluded from further amortization.
 - Applied `IF()` logic to ensure only applicable loans were adjusted.

5. Trading in the Capital Markets

- **Whole Loan Trading vs. Securitization:**
 - Whole loan trading involves individual investor bids on specific loans.

- Securitization pools mortgages into tradable securities.
- **Bid Analysis in Power BI:**
 - Unpivoted bid data to consolidate offers per loan.
 - Identified the highest bid per loan using `Table.Max()` in Power Query.
 - Filtered out passed bids with a `Price = 0` condition.

6. Benchmarking Market Data

To compare whole loan bids against securitized prices:

- Joined **loan_data** with **UMBS prices**.
- Created a "Benchmark Test" column using `IF(Price > umbs_price, TRUE, FALSE)`.
- Filtered data to display only loans with a positive trade premium.

7. Trade Profitability Analysis

To assess profitability:

- **Trade Amount Calculation:**
 - Used `RELATED()` to fetch "Scheduled Principal Balance" and multiplied it by "Price".
- **Trade Premium Calculation:**
 - `Trade Amount - Scheduled Principal Balance` to measure profit per loan.
- **Weighted Average Price Calculation:**
 - Used `DIVIDE(SUM(loan_data[Price] * loan_balance[Scheduled Principal Balance]), SUM(loan_balance[Scheduled Principal Balance]))`.
- **Trade Execution Visualization:**
 - Created tables and charts to showcase trade details by counterparty.

8. Financial Profitability and Target Margins

- **Loan Revenue Calculation:**

- `SUMX(loan_data, Trade Premium + origination_charges)` .
- **Loan Gross Profit Calculation:**
 - `SUMX(loan_data, Total Loan Revenue - lender_credits)` .
- **Profit Margin Calculation:**
 - `DIVIDE(Loan Gross Profit, Scheduled Principal Balance, 0)` .
- **Comparison with Target Profit:**
 - Created "Target Profit Margin" as `DIVIDE(Target Profit, Loan Amount, 0)` .
 - Used Power BI's **Key Influencer** visualization to analyze factors affecting price deviations.

9. Conclusion

This case study successfully demonstrated mortgage trading analysis in Power BI, involving data cleaning, DAX calculations, market benchmarking, and profit analysis. By structuring the trade with optimized pricing and comparing whole loan trading versus securitization, the study showcased effective decision-making strategies in mortgage trading.

The final trade execution report enabled a structured, data-driven approach to trading, ensuring optimal loan pricing and maximizing Sooper Mortgage's profit. This hands-on case study provided practical insights into financial modeling, mortgage trading, and Power BI analytics, bridging data science and finance effectively.