Loan Characteristic Analysis Report

# 1. Introduction

This report provides a detailed analysis of loan characteristics, focusing on key metrics such as Loan-to-Value (LTV) ratios, credit scores, Debt-to-Income (DTI) ratios, and prepayment rates. The analysis is based on data calculations performed in Excel and visualized using Tableau.

# 2. Data Overview

The dataset includes important loan metrics such as:

• Credit Score  
• Mortgage Insurance Premium (MIP)  
• Units  
• Original Combined Loan-to-Value (OC LTV) Ratio  
• Debt-to-Income (DTI) Ratio  
• Original Unpaid Principal Balance (UPB)  
• Loan-to-Value (LTV) Ratio  
• Original Interest Rate  
• Original Loan Term  
• Average Delinquent Months  
• Month Delinquents  
• Month in Repayments  
• Credit Range: **1, 2, 3, 4**

**Ranges: 1=**0-650 **,2=**650-700, **3=** 700-750 **4=**750-900

**Note-** Credit score is varry Between 0-900

• LTV Range: **Low, Medium, High**

(0-25 (low), 25-50 (medium), 50-1000 (high))

• Repayment Range**: 0-4 years, 4-8 years, 8-12 years, 12-16 years, and 16-20 years**  
• Monthly Repayment Rate (SMM)  
• Annual Prepayment Rate (CPR)

# 3. Excel Calculations Overview

In this section, I detail the calculations performed in Excel to derive key metrics for the Loan Characteristic Analysis dashboard.

1. Monthly Interest Rate Calculation: The monthly interest rate is calculated by dividing the original interest rate by 12.

r = annual interest rate / 12

2. Next Month Repayment Calculation (t+1): Using the repayment for the current month (t), the next month's repayment is calculated.

3. Amortization Value (m): This value is computed to determine the portion of the loan payment that goes toward the principal reduction.

M = P \* (r \* (1 + r) \* n) / ((1 + r) \* n - 1)

4. Remaining Balance (b): The remaining loan balance after accounting for the amortization value is computed.

B = P \* ((1 + r) \* n - (1 + r) \* t) / ((1 + r) \*\* n - 1)

5. Remaining Balance for Next Month (b+1): The remaining balance for the subsequent month is calculated using the current month's balance and repayments.

B\_next = P \* ((1 + r) \* n - (1 + r) \* (t + 1)) / ((1 + r) \*\* n - 1)

6. Monthly Prepayment Rate (SMM): The SMM (Single Monthly Mortality) rate is calculated to reflect the monthly prepayment rate.

SMM = (B - B\_next) / B

7. Annual Prepayment Rate (CPR): The CPR (Conditional Prepayment Rate) is then calculated on an annual basis using the SMM.

CPR = 1 - (1 - SMM) \*\* 12

# Dashboard

# 4. Key Performance Indicators (KPIs)

* • Average Original Interest Rate: 6.75%  
  • Average Original Loan Term: 360 months

# 5. Analysis of Loan Characteristics

## Chart 1: LTV Range vs CPR

* **High LTV Range:**  
  • Loan Count: 198,032  
  • Annual Prepayment Rate (CPR): 3,284  
  • Original UPB: $25.42 Billion
* **Medium LTV Range:**  
  • Loan Count: 13,176  
  • Annual Prepayment Rate (CPR): 237  
  • Original UPB: $1.34 Billion
* **Low LTV Range:**  
  • Loan Count: 1,361  
  • Annual Prepayment Rate (CPR): 25  
  • Original UPB: $0.10 Billion

Insight: The majority of loans fall within the High LTV Range, indicating higher risk levels and a corresponding need for careful management of prepayment rates.

## Chart 2: Credit Score vs CPR

* **Credit Range 3:**  
  • Count of Credit Score: 72678  
  • Average Annual Repayment Rate: 1.63%  
  • Average LTV: 78.61
* **Credit Range 4:**  
  • Count of Credit Score: 57181  
  • Average Annual Repayment Rate (CPR): 1.70%  
  • Average LTV: 72.06
* **Credit Range 2:**  
  • Count of Credit Score: 54762  
  • Average Annual Repayment Rate: 1.67%  
  • Average LTV: 81.66
* **Credit Score 1:**• Count of Credit Score: 27948  
  • Average Annual Repayment Rate: 1.71%  
  • Average LTV: 82.62

Insight: The highest CPR is observed in Credit Range 3, indicating a correlation between credit scores in this range and higher prepayment activity.

## Chart 3: Repay Range vs CPR

* 0 to 4 years:  
  • Average Original UPB: $ 1,34,252  
  • Average Annual Repayment Rate (CPR): 1.28%
* 4 to 8 years:  
  • Average Original UPB: $ 1,22,498  
  • CPR: 1.54%
* 8 to 12 years:  
  • Average Original UPB: $ 1,07,760  
  • Average Annual Repayment Rate: 2.37%
* 12 to 16 years:  
  • Average Original UPB: $ 1,01,826  
  • Average Annual Repayment Rate (CPR): 3.41%
* 16 to 20 years:  
  • Average Original UPB: $ 91,191  
  • Average Annual Repayment Rate(CPR): 4.92%

Insight: As the repayment period increases, the Annual Repayment Rate (CPR) also increases, indicating that loans with longer terms are more likely to be prepaid.

## Chart 4: LTV vs DTI vs Credit Range

* **Credit Range 4:**  
  • High LTV Range:   
   • Average DTI: 29.47  
   • Average LTV: 77.17
* • Medium LTV Range:  
   • Average DTI: 26.79  
   • Average LTV: 40.98
* • Low LTV Range:  
   • Average DTI: 25.34  
   • Average LTV: 20.24
* **Credit Range 3:**  
  • High LTV Range:  
   • Average DTI: 32.03  
   • Average LTV: 81.11
* • Medium LTV Range:  
   • Average DTI: 29.21  
   • Average LTV: 41.51
* • Low LTV Range:  
   • Average DTI: 28.25  
   • Average LTV: 19.99
* **Credit Range 2:**  
  • High LTV Range:   
   • Average DTI: 33.44  
   • Average LTV: 83.13
* • Medium LTV Range:  
   • Average DTI: 31.79  
   • Average LTV: 41.76
* • Low LTV Range:  
   • Average DTI: 27.78  
   • Average LTV: 19.72
* **Credit Range 1:**  
  • High LTV Range:   
   • Average DTI: 32.91  
   • Average LTV: 83.67
* • Medium LTV Range:  
   • Average DTI: 31.88  
   • Average LTV: 42.16
* • Low LTV Range:  
   • Average DTI: 32.73  
   • Average LTV: 20.24

Insight: The scatter plot shows a correlation between LTV and DTI across different Credit Ranges, highlighting the risk profiles associated with different combinations of LTV and DTI values.

# 5. Conclusion

The Loan Characteristic Analysis provides valuable insights into the relationships between key loan metrics such as Loan-to-Value (LTV) ratios, credit scores, Debt-to-Income (DTI) ratios, and prepayment rates. Through detailed calculations and visualizations, several important trends and correlations have been identified:

## LTV and Prepayment Rates:

A significant portion of loans fall within the **High LTV Range**, indicating that these loans are associated with **higher risk and a greater likelihood of prepayment**. Effective risk management strategies are crucial for this segment to mitigate potential losses.

## Credit Score and Prepayment Activity:

The analysis reveals that higher credit scores, particularly in **Credit Range 3**, are associated with **increased prepayment activity**. This correlation suggests that **borrowers with better credit profiles may be more likely to refinance or pay off their loans early,** possibly due to better access to favorable refinancing terms.

## Repayment Range and Prepayment Rates:

**Loans with longer repayment periods tend to have higher Annual Prepayment Rates (CPR).** This trend highlights the need for lenders to monitor loans with extended terms more closely, as they may be at **greater risk of prepayment**, impacting the overall yield.

## DTI and LTV Across Credit Ranges:

**Higher-risk borrowers (lower credit ranges)** tend to take on higher LTV loans and have higher DTI ratios, particularly in the High LTV range. This trend suggests a correlation between lower credit scores, higher borrowing amounts relative to the property's value (LTV), and higher debt obligations (DTI).

The **Medium LTV range shows more stability** across credit ranges, indicating a balanced risk profile in this category.

**Lower-risk borrowers (higher credit ranges)** are more conservative, maintaining lower DTI and LTV ratios, especially in the Low LTV range.

In conclusion, this analysis emphasizes the importance of understanding the interplay between various loan characteristics and their impact on prepayment behavior and overall risk. By leveraging these insights, lenders can make informed decisions to optimize loan portfolio management and enhance the profitability of their lending operations.