# Swift Loan Data Review & Action Plan

This presentation outlines our approach to ensure data quality in our loan platform, leading to accurate reporting, informed decision-making, and improved efficiency. We will review current data quality, define key metrics, and propose an action plan.

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# 1. Introduction

**Objective:** Evaluate Swift Loan’s suitability for $1 million in debt capital investment.

**Role of Data Analysis:**

- Validate loan tape data quality.
- Derive actionable insights and recommendations.
- Support the investment team with key performance metrics.

**Swift Loan's Opportunity:** Showcase RealFi’s analytical capabilities to support their business performance.

# 2. Process

## Collection and Preparation

The first step in data analysis involves gathering raw data. Once collected, the data must be cleaned to address missing values, outliers, and inconsistencies, ensuring its accuracy and reliability. This step also includes organising and formatting the data, such as normalizing values and converting types, to make it suitable for analysis. Proper preparation ensures the foundation for a successful and meaningful analysis.

## Exploration and Analysis

In this step, the focus shifts to exploring the prepared data through descriptive statistics and visualizations to identify patterns, trends, and correlations. Analytical techniques such as regression, clustering, or hypothesis testing are applied to uncover deeper insights and relationships within the data. This process helps analysts transform raw data into meaningful information, setting the stage for drawing conclusions and making data-driven decisions.

## Interpretation and Communication

The final step is to interpret the analytical findings and communicate them effectively. This involves summarizing key insights and presenting them clearly through visualizations like charts, graphs, or dashboards. Analysts also provide actionable recommendations based on their results, ensuring stakeholders can understand and use the information to inform strategies and decision-making. This step bridges the gap between data insights and practical applications.

# 3. Rationale

**Collection and Preparation**

- Download the supplied files from Google Cloud as supplied.
- Create a file structure that would support storage for the review, analysis, coding scripts, and explanations (readme files) for the duration of the project.
- Create Private **GitHub** repository and share it with the relevant team members to ensure collaboration.

**Exploration and Analysis**

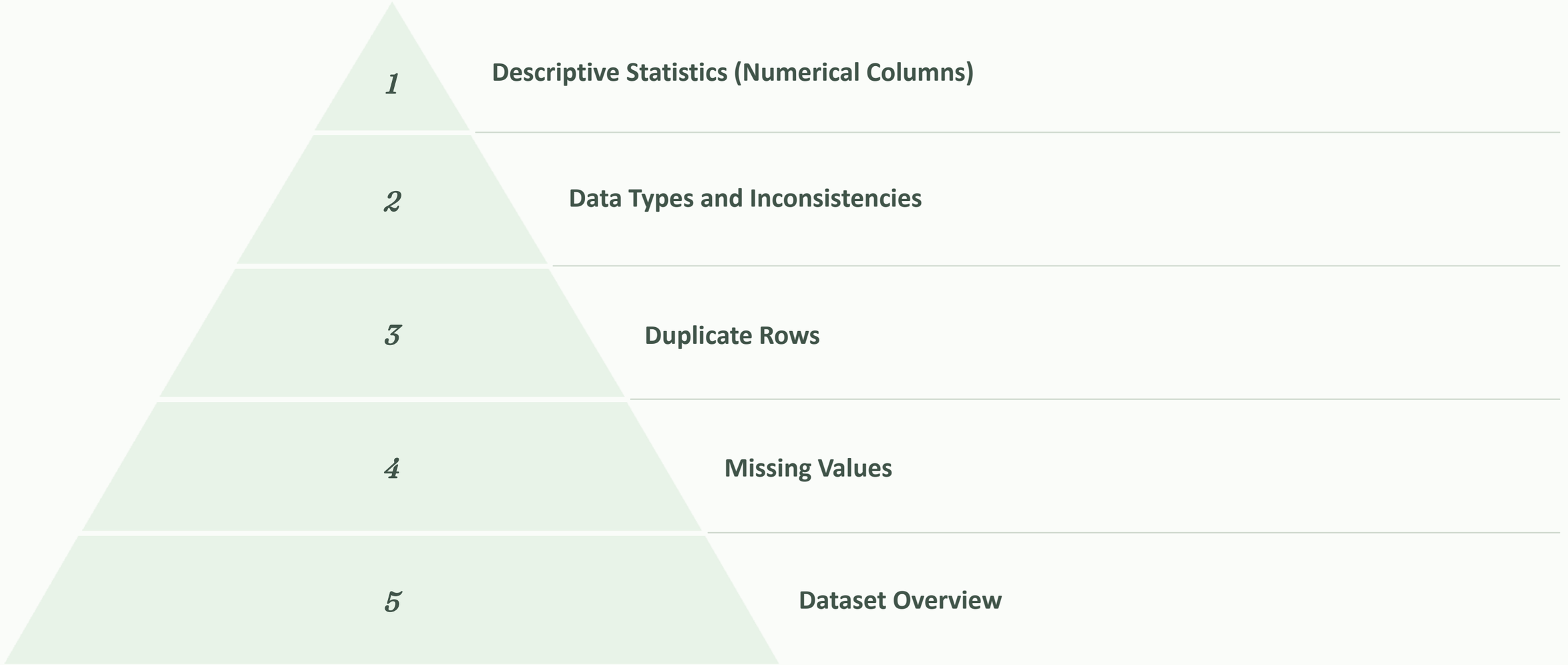
- Using **Python** in **VSCode** write a simple script that would extract 20 rows of each dataset for general investigation.
- Explore the sample data extractions with MS Excel
- Write a reusable Python script to generate data quality reports per data source.
- Set up a cloud environment in **AWS** to support storage with **AWS S3**
- Use **AWS Glue** to create data catalog, validate data quality and clean data
- Create **ETL** (Extract, Transform, Load) pipelines in AWS Glue to Clean and Join data
- Use **AWS Athena** to query, check, validate data by means of **SQL** queries

**Interpretation and Communication**

- **AWS QuickSight** was used to develop visual representations of the data
- Compile **MS PowerPoint** presentation to share findings
- Communication by Email

# 4. Data Quality Findings

Our script (data_quality_analysis.py) analyzes the loan tape data and generates an initial report per data table shared. The focus of the analysis is broken down below.



# 4. Data Quality Findings continued..

In the initial review of the data, we identified some key findings.

**Borrowers Dataset** (borrowers.csv):

- A large number of missing ‘geo_classification’ values (not critical for analysis)
- Incorrectly classified data types (**critical for analysis**)

- **Loans Dataset** (loans.csv):
- A number of missing ‘borrower_id’ values. (**statistically makes up 1.8% of unique values**)

- **Payments Dataset** (payments.csv):
- Some incorrectly classified data types (**critical for analysis**)
- Two missing ‘loan_id’ values. (statistically makes up 0.00015% of unique values)

# 5. Plan of Action

To ensure the successful management of data quality going forward we would like to suggest:

### 1 Data Completeness

Ensure that checks are in place for user fields, ensuring that the user can not complete an application before all fields are completed.

### 2 Data Accuracy

Implement a data management system that will automatically generate key system fields through automation.

### 3 Data Consistency

To ensure uniform data formats, develop ETL pipelines that aligning with the established data dictionary.

# 6. Benefits of Improved Data Quality

### Accurate Reporting

Generate reliable and insightful reports for decision-making.

### Enhanced Risk Management

Identify potential risks and vulnerabilities more effectively.

### Improved Customer Experience

Offer better service by providing accurate and timely information.

# 7. Portfolio Performance Metrics

To clean and join data we used AWS Glue. Scripts provided in GitHub repo. Examples of tables pre- and post cleaning.

**Tables** (5)

Last updated (UTC)
November 23, 2024 at 10:50:55

Delete

View and manage all available tables.

Filter tables

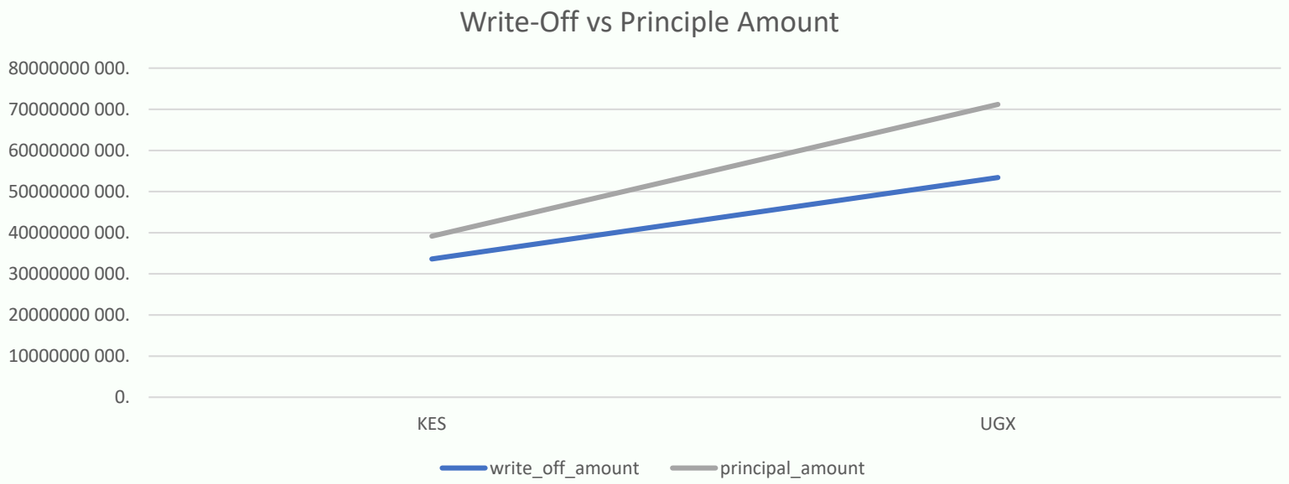
| Name | Database | Table fo... | Location | Classific... | Last Updated (UTC) |
|---|---|---|---|---|---|
| payments | raw_data | - | s3://realfi-loan-tape-data-nov-2024/rawData/payments/ | CSV | November 23, 2024 at 06:20:16 |
| loans | raw_data | - | s3://realfi-loan-tape-data-nov-2024/rawData/loans/ | CSV | November 23, 2024 at 06:19:42 |
| borrowers | raw_data | - | s3://realfi-loan-tape-data-nov-2024/rawData/borrowers/ | CSV | November 23, 2024 at 06:17:30 |
| combined_loans_payments | processed_data | - | s3://realfi-loan-tape-data-nov-2024/processedData/ | Parquet | November 23, 2024 at 06:47:12 |
| combined_borrowers_loans | processed_data | - | s3://realfi-loan-tape-data-nov-2024/processedData/ | Parquet | November 23, 2024 at 06:34:57 |

# 7a. Portfolio Performance Metrics

## Write off rate

The write-off rate was calculated to assess the portion of the total loan principal that could not be collected and was subsequently written off as a loss. To determine this rate, we first filtered the dataset to include only loans with a maturity date on or before 31 July 2024, ensuring that the analysis focused on loans that had reached the end of their term.

| Currency | Write-Off Rate (%) |
|---|---|
| KES | 85,85% |
| UGX | 75,02% |




# 7b. Portfolio Performance Metrics

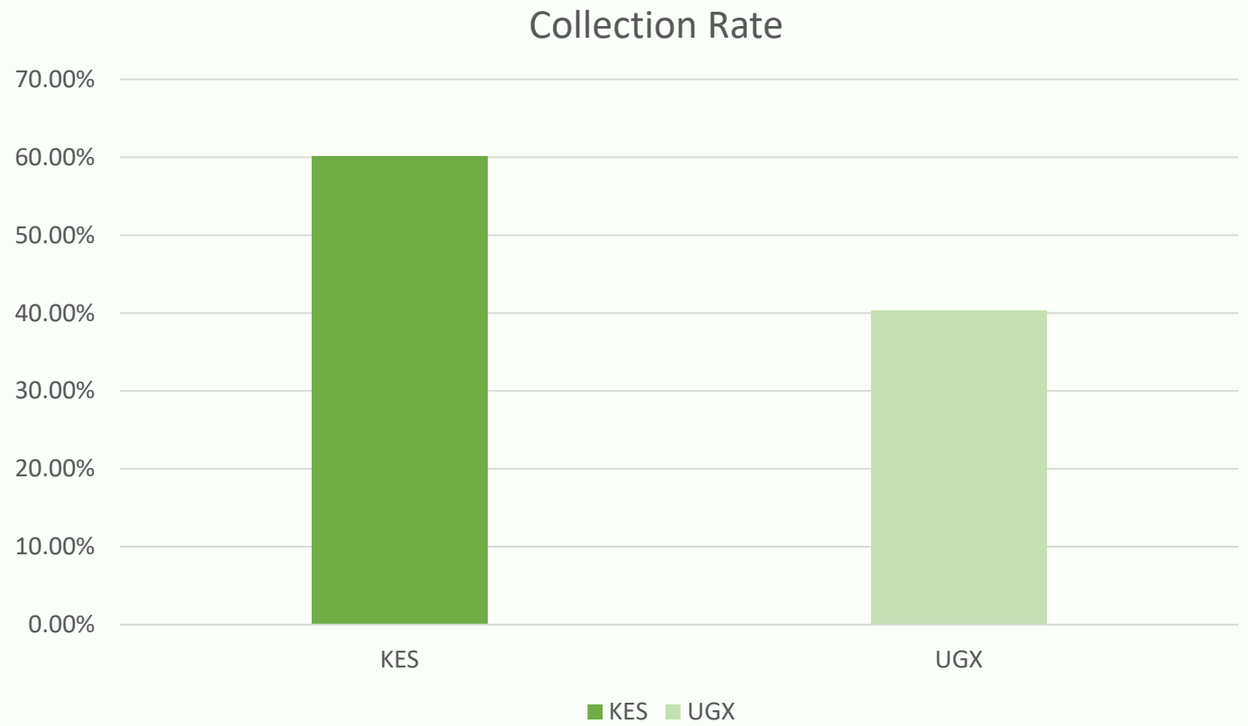
## Collections rate

The Collections rate was calculated as Total Write-Offs / Total Loan Volume for both genders, rural and urban filtered by country.

| Currency | Collections Rate (%) |
|---|---|
| KES | 60,17% |
| UGX | 40,31% |

Based on the results loans issued as KES has a better collection rate than UGX.

**Note, *last collected payment across currencies were noted to be 31 July 2024, therefore we considered only calculating the collection rate per currency for loans maturing before 31 July 2024.*



# 7b. Portfolio Performance Metrics continued..

## Collection rate – per Gender

Research shows that woman score better on loan repayments in Africa.

Ref:

- https://www.businessdailyafrica.com/bd/economy/women-score-better-than-men-in-loan-repayment-4715160
- https://www.un.org/africarenewal/magazine/august-2015/loans-women-smart-economics

**Hypothesis:** Focus on female lenders to increase collection rates.

**Calculation:** Total Collection Amount divided by the Total Principal Amount by currency and gender for loans that matured before 31 July 2024.

| Currency | Gender | Collection Rate (%) |
|---|---|---|
| KES | Female | 8,45% |
| KES | Male | 14,44% |
| UGX | Female | 7,24% |
| UGX | Male | 9,25% |

## Insights

**Gender Disparity:** In both currencies (KES and UGX), male borrowers have a higher collections rate compared to female borrowers. This could indicate differences in repayment behavior or financial capabilities between genders.

**Collections Rate Variance:** The collections rates vary significantly between currencies and genders. Understanding the underlying reasons for these differences could help in tailoring financial products or strategies to improve collections.

**Potential Areas of Focus:** Swift Loan might want to explore targeted interventions or support mechanisms to assist female borrowers in improving their repayment performance, given the lower collections rates observed.

# 7c. Portfolio Performance Metrics

## Gross Yield

In order to calculate the gross yield we had to first determine the loan period. Interest income is calculated by multiplying the principal amount by the interest rate, adjusted for this period. Payments collected are aggregated to understand the total amount received for each loan.

Principal, interest, penalties, fees, and payments—are combined to compute total income for each loan. Gross yield is then calculated by dividing total income by the principal amount, resulting in a percentage that indicates profitability.

| Country | Gross Yield(%) |
|---|---|
| Kenya (KES) | 13,83% |
| Uganda (UGX) | 4,10% |

## Insights

**In Interest Rates:** The disparity might be due to higher interest rates on KES loans, resulting in greater income relative to the principal.

**Loan Terms:** Differences in loan terms (such as duration and repayment schedules) could contribute to the higher yields in KES.

**Economic Conditions:** Economic conditions in Kenya might be more favorable for borrowers, leading to better loan performance and, consequently, higher yields.

**Borrower Profiles:** The profile of borrowers in each currency could also differ, with KES borrowers potentially representing sectors or demographics with higher repayment capabilities.

# 7d. Portfolio Performance Metrics

## Average Days in Arrears

The table provides insights into various time intervals associated with loans, particularly focusing on default and write-off processes.

| Description | Number of Days |
|---|---|
| Average Loan Period (days): | 28,72 |
| Average Days Between Default and Maturity (for loans with defaults): | 76,00 |
| Average Days Between Write-off and Default (for loans with defaults and write-offs): | 10,64 |

## Insights

- The Average Days Between Default and Maturity (for loans with defaults) is 76 days which may indicate borrowers' inability to manage repayment schedules or unexpected financial hardships. This could be a sign of either insufficient vetting processes or external economic factors affecting borrowers' financial stability. There might be an opportunity to decrease the period required to trigger default status to ensure a higher chance of being able to collect the outstanding balance.
- A fast transition to write-off could indicate aggressive write-off policies or a decision to quickly clear non-performing loans from the books. While this can clean up the financial records, it may also suggest a lack of robust collection efforts or borrower support mechanisms.

# 8. Insights

Based on the analysis conducted on the loan data for Kenyan Shillings (KES) and Ugandan Shillings (UGX), several key insights and recommendations emerge:

**High Write-off Rates:** The write-off rates are notably high for both KES and UGX loans, with KES loans experiencing an 85.85% rate and UGX loans a 75.03% rate. This indicates a significant challenge in loan recovery, where a large proportion of the principal amount has been deemed uncollectible.

**Gross Yield Disparity:** Loans in KES exhibit a higher average gross yield (13.83%) compared to UGX (4.10%). Despite the high yields, the profitability is overshadowed by the elevated write-off rates, particularly for KES.

**Early Defaults:** The average number of days between default and maturity suggests that defaults are occurring well before loans reach their maturity, signaling potential issues in borrower creditworthiness or economic pressures affecting repayment capabilities.

**Short Loan Periods:** The average loan period is relatively short, around 29 days, which may limit borrowers' ability to repay comfortably and contribute to the high default and write-off rates.

# 9. Recommendations

**Enhance Risk Assessment:** Strengthening risk assessment and borrower screening processes could help identify potential default risks early on, allowing for more informed lending decisions and tailored loan terms.

**Improve Collection Strategies:** Implementing more robust collection strategies, including proactive borrower communication and support, could mitigate write-offs. Exploring flexible repayment plans or restructuring options might enhance recovery rates.

**Review Loan Terms:** Consider extending loan durations slightly to provide borrowers with more time to manage repayments, potentially reducing default rates and improving loan performance.

**Focus on Economic Conditions:** Conduct an in-depth analysis of the macroeconomic factors impacting borrowers in both currencies. Understanding these conditions could guide strategic adjustments in lending practices and risk management.

**Granular Data Analysis:** Collect and analyze more granular data to differentiate between rural and urban clients, male and female borrowers, and various age segments. This segmentation can provide insights into demographic influences on loan performance and help tailor products and services to specific groups.

**Borrower Education Programs:** Develop education programs to better inform borrowers about the terms and expectations of their loans. Clearer understanding and communication can empower borrowers to manage their finances more effectively and meet repayment obligations.

**Diversify Loan Portfolio:** To mitigate risks, financial institutions might benefit from diversifying their loan portfolio across different sectors or borrower profiles, reducing dependency on high-risk segments.

By addressing these areas, financial institutions can work towards reducing write-offs, enhancing loan performance, and improving overall financial health. These insights and recommendations provide a roadmap for strategic improvements in loan management and risk mitigation.

# 10. Conclusion

In conclusion, the analysis of the loans data by Swift Loan in Kenyan Shillings (KES) and Ugandan Shillings (UGX) reveals significant challenges in loan recovery, highlighted by high write-off rates and early defaults. Despite the higher gross yields observed for KES loans, the profitability is undermined by the elevated write-off rates, suggesting the need for strengthened risk assessment, improved collection strategies, and potentially extended loan terms to enhance repayment capabilities.

To address these challenges, financial institutions should focus on more granular data analysis to understand demographic influences on loan performance, such as differences between rural and urban clients, gender, and age segments. Additionally, implementing borrower education programs to clarify loan terms and expectations can empower borrowers to manage their finances effectively, thereby reducing default rates. By incorporating these strategies, institutions can work towards improving loan performance and overall financial health.

# Thank You

**GitHub Repo:** https://github.com/Lucrotech/data_analyst_takehome_test
(feel free to request access)
**AWS Resources:** can be shared on request