Bank Loan Analysis Project (SQL + Tableau)

Introduction

The **Bank Lending Insights** project explores key patterns and performance indicators within a bank's lending portfolio using **SQL** and **Tableau**. The objective is to transform raw loan data into clear, visual insights that help understand borrower behaviour, repayment performance, and overall loan quality.

By using SQL to extract, aggregate, and analyze loan-related data, and Tableau to visualize those findings, the **Loan Insights Dashboard** presents an interactive summary of loan applications, funded amounts, repayments, and borrower characteristics. It highlights important aspects such as loan purpose, term duration, employment stability, and credit health.

This project demonstrates the value of combining **data analytics and visualization** to gain meaningful financial insights. It reflects how data-driven tools can help financial institutions make more informed, strategic, and efficient lending decisions.

Problem Statement

The main goal of this project is to analyze and monitor the performance of a bank's lending activities through a **comprehensive loan analysis system**.
Using **SQL** for data analysis and **Tableau** for visualization, the project helps understand how loans are issued, repaid, and distributed among different borrower categories.

This analysis allows the bank to:

- Track key performance indicators (KPIs)
- Understand borrower behaviour and financial health
- Identify patterns in disbursement and repayment
- Assess loan quality (Good vs. Bad Loans)
- Support data-driven decision-making for improved lending strategies

Key Performance Indicators (KPIs) Requirements:

1. Total Loan Applications

- Measures the **total number of loan applications** received during a defined period.
- Includes **Month-to-Date (MTD)** loan applications.
- Tracks **Month-over-Month (MoM)** changes to assess application growth trends.

2. Total Funded Amount

- Represents the **total disbursed amount** of approved loans.
- Includes **MTD Funded Amount** and **MoM variations**, helping to analyze disbursement performance over time.

3. Total Amount Received

- Tracks the **total repayments collected** from borrowers.
- Includes **MTD Amount Received** and **MoM comparisons** to evaluate repayment consistency and cash inflow trends.

4. Average Interest Rate

- Calculates the **average interest rate** applied across all active loans.
- Analyses **MTD averages** and **MoM fluctuations** to understand lending rate dynamics and portfolio yield.

5. Average Debt-to-Income (DTI) Ratio

- Evaluates the **average DTI ratio** of borrowers to gauge their repayment capacity.
- Includes **MTD average DTI** and **MoM trends** to assess the financial health of the borrower base.

Loan Summary and SQL Queries

This section summarizes all SQL queries used to calculate KPIs. Each query helps extract important insights from the loan data.

KPI's:

1. Total Loan Applications

```
SELECT COUNT(id) AS Total_Applications FROM bank_loan_data
```

Total_Applications
38576

- **MTD Loan Applications**

```
SELECT COUNT(id) AS Total_Applications FROM bank_loan_data
WHERE MONTH(issue_date) = 12
```

Total_Applications
4314

- **PMTD Loan Applications**

```
SELECT COUNT(id) AS Total_Applications FROM bank_loan_data
WHERE MONTH(issue_date) = 11
```

Total_Applications
4035

2. Total Funded Amount

```
SELECT SUM(loan_amount) AS Total_Funded_Amount FROM bank_loan_data
```

Total_Funded_Amount
435757075

- **MTD Total Funded Amount**

```
SELECT SUM(loan_amount) AS Total_Funded_Amount FROM bank_loan_data
WHERE MONTH(issue_date) = 12
```

Total_Funded_Amount
53981425

- **PMTD Total Funded Amount**

```
SELECT SUM(loan_amount) AS Total_Funded_Amount FROM bank_loan_data
WHERE MONTH(issue_date) = 11
```

Total_Funded_Amount
47754825

3. Total Amount Received

```
SELECT SUM(total_payment) AS Total_Amount_Collected FROM bank_loan_data
```

Total_Amount_Collected
473070933

- **MTD Total Amount Received**

```
SELECT SUM(total_payment) AS Total_Amount_Collected FROM bank_loan_data
WHERE MONTH(issue_date) = 12
```

Total_Amount_Collected
58074380

- **PMTD Total Amount Received**

```
SELECT SUM(total_payment) AS Total_Amount_Collected FROM bank_loan_data
WHERE MONTH(issue_date) = 11
```

Total_Amount_Collected
50132030

4. Average Interest Rate

```
SELECT AVG(int_rate)*100 AS Avg_Int_Rate FROM bank_loan_data
```

Avg_Int_Rate
12.0488314172048

- **MTD Average Interest**

```
SELECT AVG(int_rate)*100 AS MTD_Avg_Int_Rate FROM bank_loan_data
WHERE MONTH(issue_date) = 12
```

MTD_Avg_Int_Rate
12.3560408676042

- **PMTD Average Interest**

```
SELECT AVG(int_rate)*100 AS PMTD_Avg_Int_Rate FROM bank_loan_data
WHERE MONTH(issue_date) = 11
```

PMTD_Avg_Int_Rate
11.9417175498261

5. Average DTI

```
SELECT AVG(dti)*100 AS Avg_DTI FROM bank_loan_data
```

Avg_DTI
13.3274331211432

- **MTD Average DTI**

```
SELECT AVG(dti)*100 AS MTD_Avg_DTI FROM bank_loan_data
WHERE MONTH(issue_date) = 12
```

MTD_Avg_DTI
13.6655377880425

- **PMTD Average DTI**

```
SELECT AVG(dti)*100 AS PMTD_Avg_DTI FROM bank_loan_data
WHERE MONTH(issue_date) = 11
```

PMTD_Avg_DTI
13.3027335836364

Loan Quality Analysis: Good vs. Bad Loans

To measure the quality and risk of the loan portfolio, loans are categorized into two groups:

- **Good Loans:** Loans that are *Fully Paid* or *Current*.
- **Bad Loans:** Loans that are *Charged Off* (defaulted or non-performing).

Good Loan KPIs

1. **Good Loan Percentage:** Percentage of total loans that are either fully paid or current.
2. **Good Loan Applications:** Total number of approved good loans.
3. **Good Loan Funded Amount:** Total amount disbursed for good loans.
4. **Good Loan Amount Received:** Total repayments collected from good loans.

SQL Queries:

1. Good Loan Percentage

```
SELECT
    (COUNT(CASE WHEN loan_status = 'Fully Paid' OR loan_status = 'Current' THEN id END) * 100.0) /
        COUNT(id) AS Good_Loan_Percentage
FROM bank_loan_data
```

Good_Loan_Percentage
86.175342181667

2. Good Loan Applications

```
SELECT COUNT(id) AS Good_Loan_Applications FROM bank_loan_data
WHERE loan_status = 'Fully Paid' OR loan_status = 'Current'
```

Good_Loan_Applications
33243

3. Good Loan Funded Amount

```
SELECT SUM(loan_amount) AS Good_Loan_Funded_amount FROM bank_loan_data
WHERE loan_status = 'Fully Paid' OR loan_status = 'Current'
```

Good_Loan_Funded_amount
370224850

4. Good Loan Amount Received

```
SELECT SUM(total_payment) AS Good_Loan_amount_received FROM bank_loan_data
WHERE loan_status = 'Fully Paid' OR loan_status = 'Current'
```

Good_Loan_amount_received
435786170

Bad Loan KPIs:

1. **Bad Loan Percentage:** Percentage of loans that are *Charged Off*.
2. **Bad Loan Applications:** Total number of bad loan applications.
3. **Bad Loan Funded Amount:** Total loan amount disbursed to bad loans.
4. **Bad Loan Amount Received:** Total repayments collected from bad loans.

SQL Queries:

1. Bad Loan Percentage

```
SELECT
  (COUNT(CASE WHEN loan_status = 'Charged Off' THEN id END) * 100.0) /
      COUNT(id) AS Bad_Loan_Percentage
FROM bank_loan_data
```

Bad_Loan_Percentage
13.824657818332

2. Bad Loan Applications

```
SELECT COUNT(id) AS Bad_Loan_Applications FROM bank_loan_data
WHERE loan_status = 'Charged Off'
```

Bad_Loan_Applications
5333

3. Bad Loan Funded Amount

```
SELECT SUM(loan_amount) AS Bad_Loan_Funded_amount FROM bank_loan_data

WHERE loan_status = 'Charged Off'
```

Bad_Loan_Funded_amount
65532225

4. Bad Loan Amount Received

```
SELECT SUM(total_payment) AS Bad_Loan_amount_received FROM bank_loan_data

WHERE loan_status = 'Charged Off'
```

Bad_Loan_amount_received
37284763

Dashboard Overview and Visual Insights

This section provides a visual overview of how data is represented in **Tableau Dashboards**. Each chart is designed to highlight specific patterns and relationships in the loan data.

1. Monthly Trends by Issue Date (Line Chart):

Chart Type: Line Chart
Metrics: Total Loan Applications, Total Funded Amount
X-Axis: Month of Issue Date
Y-Axis: Application and Amount Values

Objective:
Displays month-wise trends in loan applications, funding, and repayments.
Helps identify seasonal patterns, growth rates, and changes in lending performance.

Query:

```
SELECT

        MONTH(issue_date) AS Month_Munber,

        DATENAME(MONTH, issue_date) AS Month_name,

        COUNT(id) AS Total_Loan_Applications,

        SUM(loan_amount) AS Total_Funded_Amount,

        SUM(total_payment) AS Total_Amount_Received

FROM bank_loan_data

GROUP BY MONTH(issue_date), DATENAME(MONTH, issue_date)

ORDER BY MONTH(issue_date)
```

	Month_Munber	Month_name	Total_Loan_Applications	Total_Funded_Amount	Total_Amount_Received
1	1	January	2332	25031650	27578836
2	2	February	2279	24647825	27717745
3	3	March	2627	28875700	32264400
4	4	April	2755	29800800	32495533
5	5	May	2911	31738350	33750523
6	6	June	3184	34161475	36164533
7	7	July	3366	35813900	38827220
8	8	August	3441	38149600	42682218
9	9	September	3536	40907725	43983948
10	10	October	3796	44893800	49399567
11	11	November	4035	47754825	50132030
12	12	December	4314	53981425	58074380

2. Loan Term Analysis (Donut Chart):

Chart Type: Donut Chart
Metrics: Total Applications, Funded Amount, Amount Received
Segments: Loan Terms (e.g., 36 months, 60 months)

Objective:
Shows how borrowers prefer short-term or long-term loans and how term length affects repayment and disbursement.

Query:

```
SELECT
        term AS Term,
        COUNT(id) AS Total_Loan_Applications,
        SUM(loan_amount) AS Total_Funded_Amount,
        SUM(total_payment) AS Total_Amount_Received
FROM bank_loan_data
GROUP BY term
ORDER BY term
```

	Term	Total_Loan_Applications	Total_Funded_Amount	Total_Amount_Received
1	36 months	28237	273041225	294709458
2	60 months	10339	162715850	178361475

3. Employee Length Analysis (Bar Chart):

Chart Type: Bar Chart
Metrics: Applications, Funded Amount, Amount Received
X-Axis: Employment Length (1 year, 5 years, 10+ years)
Objective:
Analyzes how employment stability affects loan approvals, disbursements, and repayments.

Query:

```
SELECT
    emp_length AS Employee_Length,
    COUNT(id) AS Total_Loan_Applications,
    SUM(loan_amount) AS Total_Funded_Amount,
    SUM(total_payment) AS Total_Amount_Received
FROM bank_loan_data
GROUP BY emp_length
ORDER BY emp_length
```

Employee_Length	Total_Loan_Applications	Total_Funded_Amount	Total_Amount_Received
< 1 year	4575	44210625	47545011
1 year	3229	32883125	35498348
10+ years	8870	116115950	125871616
2 years	4382	44967975	49206961
3 years	4088	43937850	47551832
4 years	3428	37600375	40964850
5 years	3273	36973625	40397571
6 years	2228	25612650	27908658
7 years	1772	20811725	22584136
8 years	1476	17558950	19025777
9 years	1255	15084225	16516173

4. Loan Purpose Breakdown (Bar Chart):

Chart Type: Bar Chart
Metrics: Applications, Funded Amount, Amount Received
X-Axis: Loan Purpose (e.g., Debt Consolidation, Credit Card)

Objective:
Highlights the reasons borrowers apply for loans and helps the bank understand which categories generate the most demand.

Query:

```
SELECT
    purpose AS PURPOSE,
    COUNT(id) AS Total_Loan_Applications,
    SUM(loan_amount) AS Total_Funded_Amount,
    SUM(total_payment) AS Total_Amount_Received
FROM bank_loan_data
GROUP BY purpose
ORDER BY purpose
```

PURPOSE	Total_Loan_Applications	Total_Funded_Amount	Total_Amount_Received
car	1497	10223575	11324914
credit card	4998	58885175	65214084
Debt consolidation	18214	232459675	253801871
educational	315	2161650	2248380
home improvement	2876	33350775	36380930
house	366	4824925	5185538
major purchase	2110	17251600	18676927
medical	667	5533225	5851372
moving	559	3748125	3999899
other	3824	31155750	33289676
renewable_energy	94	845750	898931
small business	1776	24123100	23814817
vacation	352	1967950	2116738
wedding	928	9225800	10266856

5. Home Ownership Analysis (Tree Map):

Chart Type: Tree Map
Metrics: Applications, Funded Amount, Amount Received
Hierarchy: Home Ownership Type (Own, Rent, Mortgage)

Objective:
Shows how home ownership status affects loan volume and repayment behavior.

Query:

```
SELECT
        home_ownership AS Home_Ownership,
        COUNT(id) AS Total_Loan_Applications,
        SUM(loan_amount) AS Total_Funded_Amount,
        SUM(total_payment) AS Total_Amount_Received
FROM bank_loan_data
GROUP BY home_ownership
ORDER BY home_ownership
```

Home_Ownership	Total_Loan_Applications	Total_Funded_Amount	Total_Amount_Received
MORTGAGE	17198	219329150	238474438
NONE	3	16800	19053
OTHER	98	1044975	1025257
OWN	2838	29597675	31729129
RENT	18439	185768475	201823056

Dashboard Filters

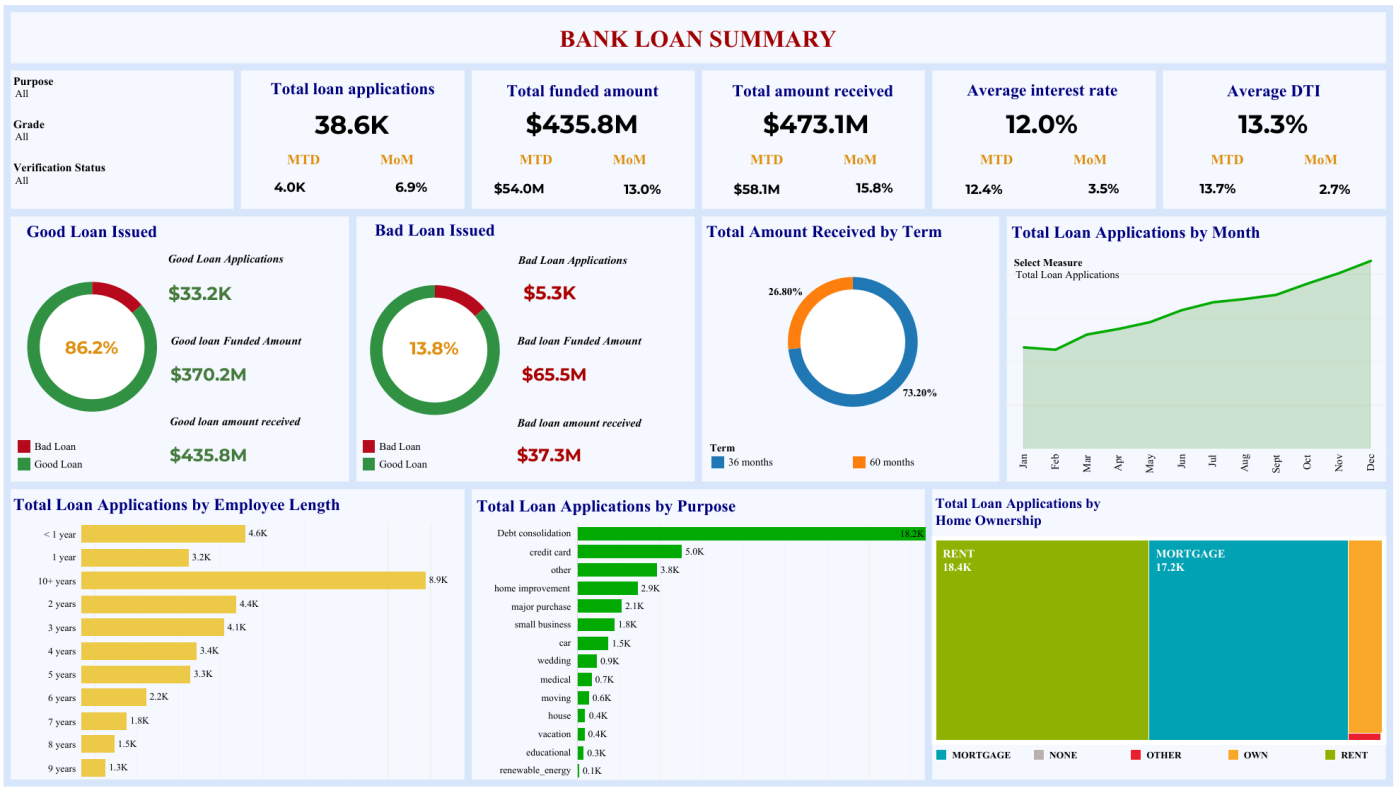
All dashboards include filters to view results by loan **grade**, **purpose**, or Term
Example:

```
SELECT
    purpose AS PURPOSE,
    COUNT(id) AS Total_Loan_Applications,
    SUM(loan_amount) AS Total_Funded_Amount,
    SUM(total_payment) AS Total_Amount_Received
FROM bank_loan_data
WHERE grade = 'A'
GROUP BY purpose
ORDER BY purpose
```

Dashboard Visualization

Loan Insights Dashboard

This section presents the **final Tableau dashboard** created from the SQL analysis.
The dashboard provides a clear and interactive visualization of key metrics, including:



Conclusion

The **Bank Loan Analysis Project** effectively integrates **SQL-based data analysis** with **Tableau visualization** to provide a comprehensive overview of a bank's lending operations. The **Bank Loan Summary Dashboard** summarizes key metrics, trends, and borrower attributes, enabling a clear understanding of how different factors influence lending outcomes.

The analysis revealed that most loans were short-term and primarily issued for debt consolidation, with borrowers having longer employment history showing better repayment patterns. The distinction between good and bad loans further emphasizes the role of risk management in lending decisions.

In conclusion, this project showcases how combining structured data analysis with visual storytelling can turn complex financial data into actionable insights. It highlights the growing importance of **data literacy and visualization** in improving financial transparency and decision-making across the banking sector.

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