A Project Synopsis On

Bank Loan Analysis

POWER BI DASHBOARD

Submitted by

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Introduction

The **Bank Loan Analysis Project** aims to provide an in-depth analysis of a bank's loan data, identifying key patterns and insights that can help optimize loan approval processes, assess borrower profiles, and monitor loan performance. The project uses **MS SQL Server** for data management and query processing and **Power BI** for visualizing key metrics and trends. By leveraging these tools, the project seeks to deliver actionable insights that support data-driven decision-making.

The project is structured into two main parts:

1. **Data management and querying** in SQL Server.
2. **Data visualization and reporting** using Power BI.

Methodology

The project follows a systematic approach involving data import, query execution, and visualization, detailed below:

Data Import and Database Creation:

- **MS SQL Server** was used to import the dataset into a structured database. The dataset includes loan application details, borrower information, loan status, repayment data, and more.
- A dedicated database was created, followed by the creation of tables that store relevant information, including loan amounts, borrower financial ratios, and interest rates.

Data Cleaning and Transformation:

- Before performing the analysis, the raw data was cleaned to handle missing values, incorrect entries, and outliers.
- **SQL Queries** were executed to normalize the dataset and create new metrics such as Month-to-Date (MTD) and Month-over-Month (MoM) changes, debt-to-income (DTI) ratios, and other relevant financial indicators.

Query Writing in SQL Server:

- SQL queries were designed to extract key metrics such as the **total loan applications**, **funded amounts**, and **repayment data**. The queries were optimized for performance, ensuring faster execution for larger datasets.
- Complex SQL functions such as **GROUP BY**, **CTE (Common Table Expressions)**, **PARTITION**, and **JOIN** were used to aggregate data and create insights.
- These queries were cross-referenced with Power BI, Tableau, and Excel to validate the results and ensure accuracy across platforms.

Data Visualization in Power BI:

- **Power BI** was used to create dynamic, interactive dashboards that provide real-time insights into loan performance metrics.
- The data was connected directly to SQL Server, enabling live data updates and seamless integration.
- Key metrics such as **Total Loan Applications**, **Funded Amounts**, **Average Interest Rates**, and **DTI Ratios** were displayed through a variety of visualizations (line charts, bar charts, maps, and tree maps).
- **DAX (Data Analysis Expressions)** functions in Power BI were utilized to create complex calculations, including time-based metrics and financial ratios.

Key Features of the Analysis

3.1 Summary Dashboard – Key Performance Indicators (KPIs):

The Summary Dashboard displays the most critical metrics for bank loan performance:

- **Total Loan Applications**: Monitors the number of loan applications received during a specified time frame. This includes both Month-to-Date (MTD) and Month-over-Month (MoM) analysis.
- **Total Funded Amount**: Tracks the total value of funds disbursed as loans, including MTD and MoM trends.
- **Total Amount Received**: Provides a view of the total repayments made by borrowers, helping assess the bank's cash flow.
- **Average Interest Rate**: Averages the interest rates across all loans, monitoring monthly fluctuations to assess the bank's lending portfolio.
- **Average Debt-to-Income (DTI) Ratio**: Evaluates the borrowers' financial health by tracking their DTI ratio, with monthly trends available for further analysis.

3.2 Good Loan vs. Bad Loan KPIs:

The dashboard distinguishes between **Good Loans** (those likely to be repaid) and **Bad Loans** (those at risk of default) based on criteria like:

- **Good Loan Application Percentage**: Measures the proportion of good loans out of total applications.
- **Funded Amount**: Total funds disbursed for good and bad loans.
- **Total Received Amount**: Repayment data for both good and bad loans, helping evaluate recovery trends.

3.3 Loan Status Grid View:

The **Loan Status Grid View** provides a consolidated table of all loan data, categorized by the current loan status (e.g., approved, funded, repaid, defaulted). This grid enables the bank to:

- Track real-time metrics like **Total Applications**, **Funded Amounts**, and **Repayments**.
- Assess key financial ratios like the **DTI Ratio** and **Interest Rates** for each loan category.

Overview Dashboard – Trend Analysis

The Overview Dashboard provides in-depth insights into loan trends, allowing decision-makers to analyze:

- **Monthly Lending Trends (Line Chart)**: Tracks the number of loans issued over time, highlighting any seasonality or long-term growth in loan applications.
- **Regional Analysis (Filled Map)**: Shows lending activity across different regions, revealing regional disparities or areas of high demand.
- **Loan Term Analysis (Donut Chart)**: Displays the distribution of loans across different repayment terms, allowing the bank to assess customer preferences for loan durations.
- **Employee Length Analysis (Bar Chart)**: Breaks down loan performance based on borrowers' employment history, showing how job stability impacts loan approval rates and performance.
- **Home Ownership Analysis (Tree Map)**: Provides insights into the relationship between home ownership and loan performance, showing how property ownership affects lending risks.

Detailed Dashboard – Comprehensive Loan Insights

The Detailed Dashboard provides a granular view of individual loan data:

- **Loan Purpose Breakdown**: Offers a breakdown of loans by purpose (e.g., home improvement, debt consolidation), helping the bank understand the primary motivations behind loan applications.
- **Loan Performance Metrics**: Displays loan-related KPIs such as repayment amounts, interest rates, and borrower DTI, enabling in-depth performance monitoring.
- This dashboard acts as a centralized interface for loan officers and management to review detailed loan data and make informed decisions.

Learning Outcomes

The project provided a valuable learning experience in the following areas:

- **Database Management**: Developed skills in creating and managing databases using **MS SQL Server**. Learned how to execute complex queries and optimize database performance.
- **Data Cleaning and Processing**: Gained hands-on experience in cleaning and transforming raw data using SQL and Power BI's **Power Query**.
- **Data Visualization**: Acquired expertise in using **Power BI** to create dynamic visualizations, including KPIs, line charts, bar charts, and maps. Applied **DAX functions** to generate calculated metrics and enhance data analysis.
- **Cross-Platform Integration**: Enhanced understanding of how data can be processed in SQL Server and visualized in Power BI, Tableau, and Excel.
- **Time Intelligence**: Utilized **time-based calculations** like Month-to-Date (MTD) and Month-over-Month (MoM) to provide real-time insights into loan data.

Tools and Technologies Used

- **MS SQL Server**: Database management and query execution.
- **SQL Server Management Studio (SSMS)**: Query development and performance optimization.
- **Power BI**: Data visualization and dashboard creation.
- **MS Excel**: Comparison and validation of data metrics alongside Power BI and SQL.
- **DAX Functions**: Used within Power BI for complex calculations, including time intelligence, filtering, and financial metrics.
- **Software Versions**:
    - **MS SQL Server**: Version 19.0
    - **Power BI**: June 2023 Release
    - **MS Office/Excel**: Version 2021

Conclusion

This **Bank Loan Analysis Project** provides a comprehensive framework for analyzing and visualizing critical loan data. By leveraging **MS SQL Server** for data processing and **Power BI** for real-time insights, the project enhances the bank's ability to monitor loan applications, repayments, and borrower profiles. The dashboards provide decision-makers with the tools to track key metrics, identify lending trends, and make informed business decisions.

This analysis supports the bank in optimizing its loan portfolio management, improving risk assessment, and enhancing customer insights, ultimately contributing to better financial decision-making.