

BANK LOAN PERFORMANCE ANALYSIS

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1. Introduction

In the modern banking landscape, understanding the factors that influence loan performance is crucial. This project analyzes a dataset to explore the relationship between borrower details (such as employment length, income, and debt-to-income ratio) and loan characteristics (including loan amount, term, and interest rate). The goal is to identify patterns in loan statuses—such as fully paid, charged off, or late payments—to provide actionable insights for banking institutions. These insights aim to help optimize loan lending strategies, mitigate credit risk, and improve overall portfolio performance.

2. Dataset Overview

2.1 Dataset Dictionary

Field Name	Description
Id	Unique identifier for each loan
loan_amnt	The amount of money requested by the borrower
funded_amnt	The actual amount of money funded for the loan
term	The duration of the loan in months
int_rate	The interest rate of the loan
installment	The monthly payment owed by the borrower
grade	The loan grade assigned by the lending company
sub_grade	The loan subgrade assigned by the lending company
issue_date	The month in which the loan was funded
purpose	The reason provided by the borrower for the loan

Field Name	Description
Id	Unique identifier for each loan
member_id	Unique identifier for each borrower
emp_length	Employment length in years
home_ownership	Home ownership status reported by the borrower
annual_inc	Annual income reported by the borrower
verification_status	Indicates if the borrower's income was verified
Dti	Debt-to-income ratio of the borrower
delinq_2yrs	Number of past-due incidences in the borrower's credit file
last_pymnt_date	Month of the last payment received
total_pymnt	Total amount received in payments
out_prncp	Remaining outstanding principal amount of the loan

BankLoanProject

File Home Transform Add Column View Tools Help

Close & Apply New Query Recent Sources Enter Data Data source settings Manage Parameters Refresh Preview Properties Advanced Editor Manage Choose Columns Remove Columns Keep Rows Remove Rows Split Column Group By Data Type: Whole Number Use First Row as Headers Replace Values Merge Queries Append Queries Combine Files Text Analytics Vision Azure Machine Learning

Queries [2] BorrowerDetails LoanDetails

= Table.TransformColumnTypes(#"Promoted Headers",{{"member_id",Int64.Type}, {"loan_id",

	member_id	loan_id	emp_length	home_ownership	annual_inc
1	1296599	1077501	10+ years	RENT	
2	1314167	1077430	< 1 year	RENT	
3	1313524	1077175	10+ years	RENT	
4	1277178	1076863	10+ years	RENT	
5	1311748	1075358	1 year	RENT	
6	1311441	1075269	3 years	RENT	
7	1304742	1069639	8 years	RENT	
8	1288686	1072053	9 years	RENT	
9	1306957	1071795	4 years	OWN	
10	1306721	1071570	< 1 year	RENT	
11	1305201	1070078	5 years	OWN	
12	1305008	1069908	10+ years	OWN	
13	1298717	1064687	< 1 year	RENT	
14	1304956	1069866	3 years	RENT	
15	1303503	1069057	3 years	RENT	
16	1304871	1069759	< 1 year	RENT	
17	1299699	1065775	4 years	RENT	
18	1304884	1069971	10+ years	MORTGAGE	
19	1294539	1062474	1 year	MORTGAGE	
20	1304855	1069742	6 years	RENT	
21	1284848	1069740	3 years	RENT	

11 COLUMNS, 999+ ROWS Column profiling based on top 1000 rows

PREVIEW DOWNLOADED AT 2:05 PM

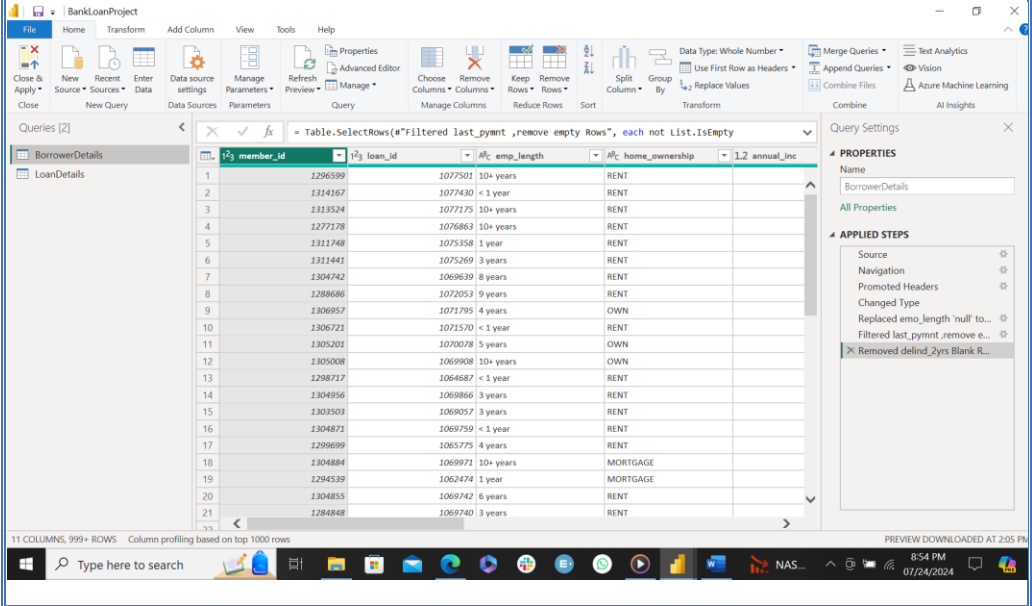
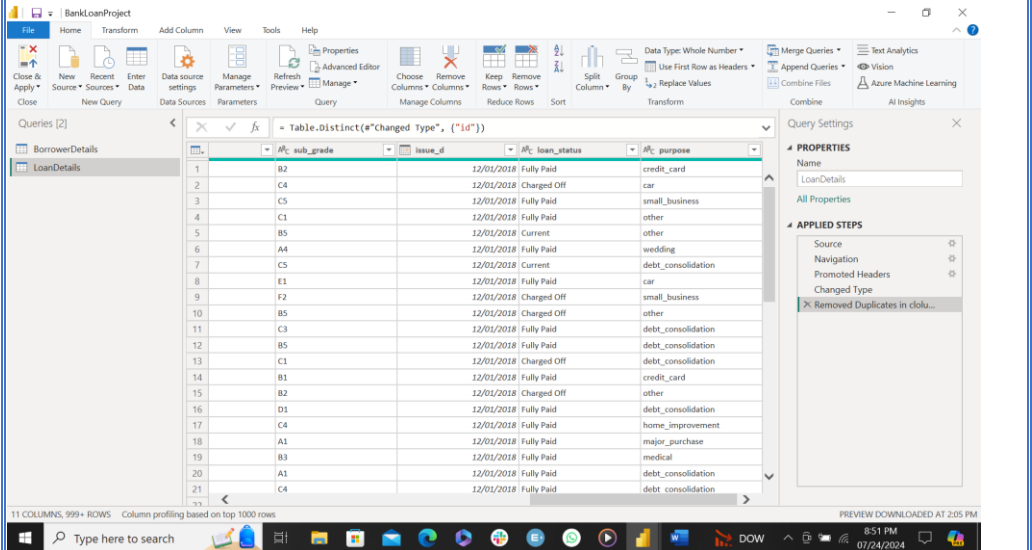
Query Settings

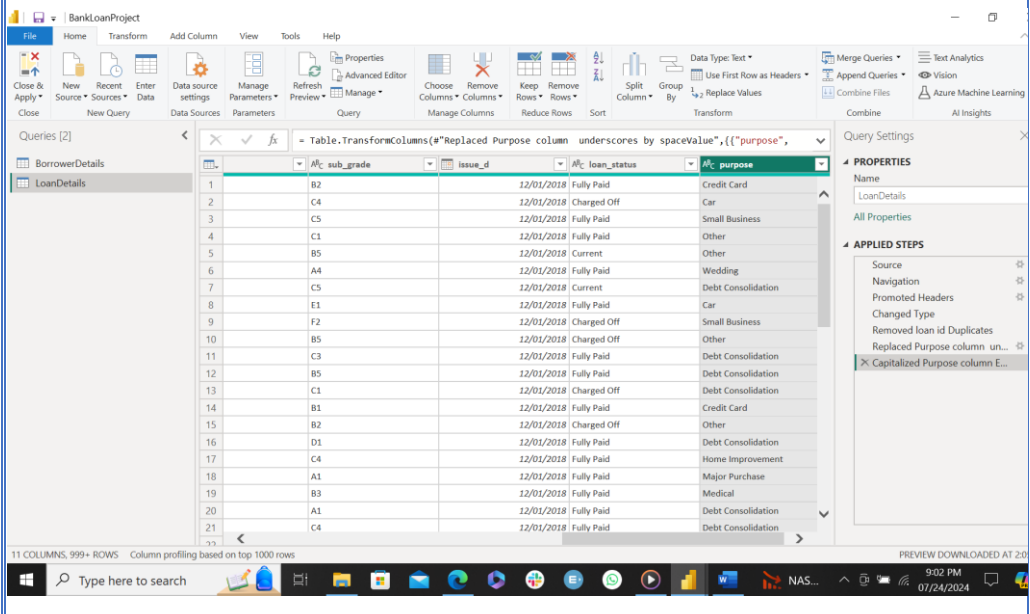
PROPERTIES
Name
BorrowerDetails
All Properties

APPLIED STEPS
Source
Navigation
Promoted Headers
X Changed Type

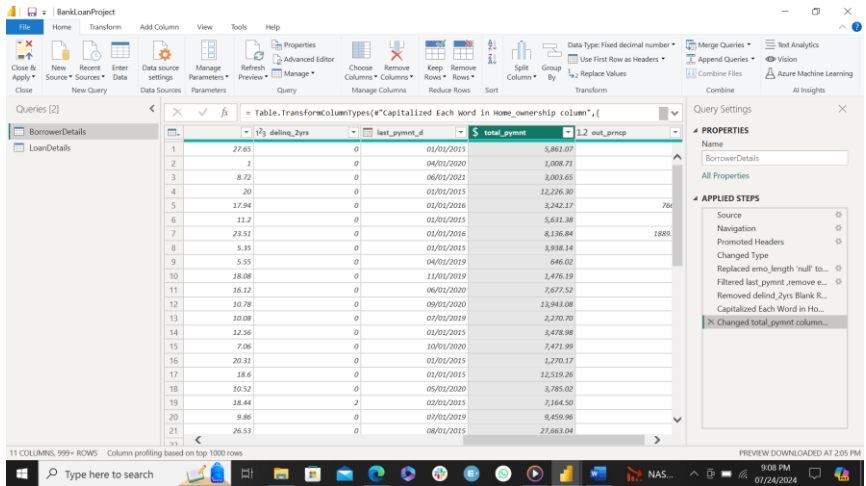
4. Data Preprocessing

4.1 Data Cleaning

Task	Description
Handling Missing Values	<p>Replaced missing values in emp_length with '0 year'. Removed rows with missing values in last_pymnt_d and delinq_2yrs.</p> 
Removing Duplicates	<p>Removed duplicate rows based on id in LoanDetails.</p> 

Task	Description
Dealing with Inconsistencies	<p>Replaced underscores with spaces in purpose. Formatted purpose and home_ownership to proper case.</p> 

4.2 Data Transformation

Task	Description
Column Transformation	<p>Changed total_pymnt to 'Fixed decimal number'. Rounded funded_amnt to two decimal places.</p> 

Task

Description

Renamed issue_d to issue_date.

Query Settings

Table.RenameColumns(*funded_amt Rounded Off 2 decimal places,{"issue_d", "issue_date"})

#C_grade	#C_sub_grade	issue_date	#C_loan_status	#C_purpose
1	B	12/01/2018	Fully Paid	Credit Card
2	C	12/01/2018	Charged Off	Car
3	C	12/01/2018	Fully Paid	Small Business
4	C	12/01/2018	Fully Paid	Other
5	B	12/01/2018	Current	Other
6	A	12/01/2018	Fully Paid	Wedding
7	C	12/01/2018	Current	Debt Consolidatic
8	E	12/01/2018	Fully Paid	Car
9	F	12/01/2018	Charged Off	Small Business
10	B	12/01/2018	Charged Off	Other
11	C	12/01/2018	Fully Paid	Debt Consolidatic
12	B	12/01/2018	Fully Paid	Debt Consolidatic
13	C	12/01/2018	Charged Off	Debt Consolidatic
14	B	12/01/2018	Fully Paid	Credit Card
15	B	12/01/2018	Charged Off	Other
16	D	12/01/2018	Fully Paid	Debt Consolidatic
17	C	12/01/2018	Fully Paid	Home Improveme
18	A	12/01/2018	Fully Paid	Major Purchase
19	B	12/01/2018	Fully Paid	Medical
20	A	12/01/2018	Fully Paid	Debt Consolidatic
21	C	12/01/2018	Fully Paid	Debt Consolidatic

Renamed last_pymnt_d to last_pymnt_date.

Query Settings

Table.RenameColumns(*Changed total_pymnt column data type,{"last_pymnt_d", "last_pymnt_date"})

#C_grade	#C_sub_grade	last_pymnt_date	#C_loan_status	#C_purpose
1	B	01/01/2015	5,861.07	
2	C	04/01/2020	1,008.71	
3	C	06/01/2021	3,003.65	
4	C	01/01/2015	12,226.30	
5	B	01/01/2016	3,242.17	
6	A	01/01/2015	5,631.38	
7	C	01/01/2016	8,136.84	
8	E	01/01/2015	3,938.14	
9	F	04/01/2019	646.02	
10	B	11/01/2019	1,476.19	
11	C	06/01/2020	7,677.52	
12	B	09/01/2020	13,943.08	
13	C	07/01/2019	2,270.70	
14	B	01/01/2015	3,478.98	
15	B	10/01/2020	7,471.99	
16	D	01/01/2015	1,270.17	
17	C	01/01/2015	12,519.26	
18	A	05/01/2020	3,785.02	
19	B	02/01/2015	7,164.50	
20	A	07/01/2019	9,459.96	
21	C	08/01/2015	27,663.04	

Column
Renaming

Task

Description

Create a new custom column named 'total_amount_paid'

The screenshot shows the Power Query Editor interface for a project named 'BankLoanProject'. The 'Queries' pane on the left lists 'BorrowerDetails' and 'LoanDetails'. The main area displays a table with columns: '_2yrs', 'last_pymnt_date', '\$ total_pymnt', '1,2 out_pncp', and '\$ total_amount_paid'. The formula bar shows the expression: `= Table.TransformColumnTypes(#"Added total_amount_paid column",{"total_amount_paid",`. The 'APPLIED STEPS' pane on the right shows the sequence of transformations, including 'Changed total_amount_paid col...'. The status bar at the bottom indicates '12 COLUMNS, 999+ ROWS' and 'Column profiling based on top 1000 rows'.

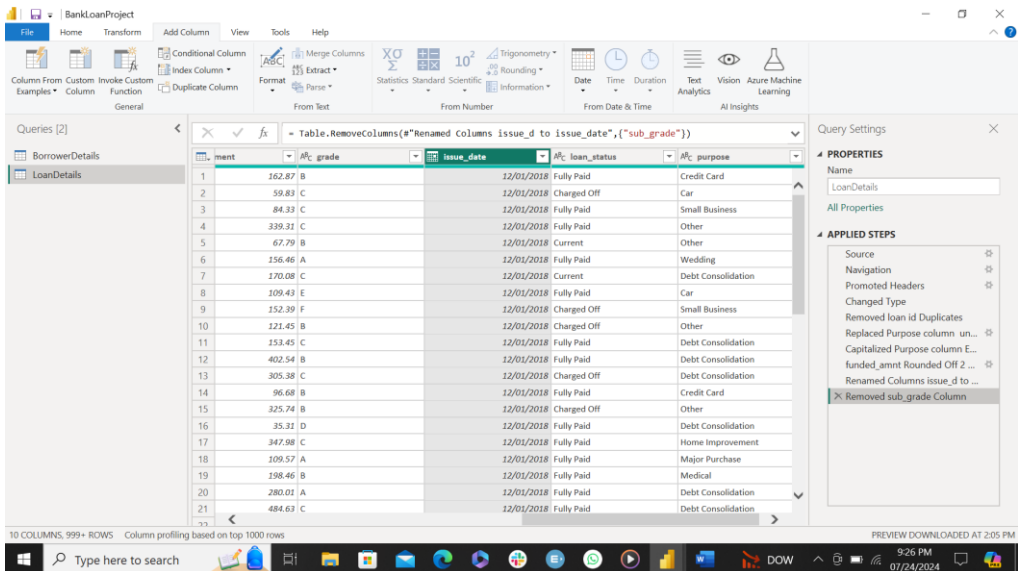
	_2yrs	last_pymnt_date	\$ total_pymnt	1,2 out_pncp	\$ total_amount_paid
1	0	01/01/2015	5,861.07	0	5,861.07
2	0	04/01/2020	1,008.71	0	1,008.71
3	0	06/01/2021	3,003.65	0	3,003.65
4	0	01/01/2015	12,226.30	0	12,226.30
5	0	01/01/2016	3,242.17	766.9	2,475.27
6	0	01/01/2015	5,631.38	0	5,631.38
7	0	01/01/2016	8,136.84	1889.15	6,247.69
8	0	01/01/2015	3,938.14	0	3,938.14
9	0	04/01/2019	646.02	0	646.02
10	0	11/01/2019	1,476.19	0	1,476.19
11	0	06/01/2020	7,677.52	0	7,677.52
12	0	09/01/2020	13,943.08	0	13,943.08
13	0	07/01/2019	2,270.70	0	2,270.70
14	0	01/01/2015	3,478.98	0	3,478.98
15	0	10/01/2020	7,471.99	0	7,471.99
16	0	01/01/2015	1,270.17	0	1,270.17
17	0	01/01/2015	12,519.26	0	12,519.26
18	0	05/01/2020	3,785.02	0	3,785.02
19	2	02/01/2015	7,164.50	0	7,164.50
20	0	07/01/2019	9,459.96	0	9,459.96
21	0	08/01/2015	27,663.04	0	27,663.04

Creating New Columns

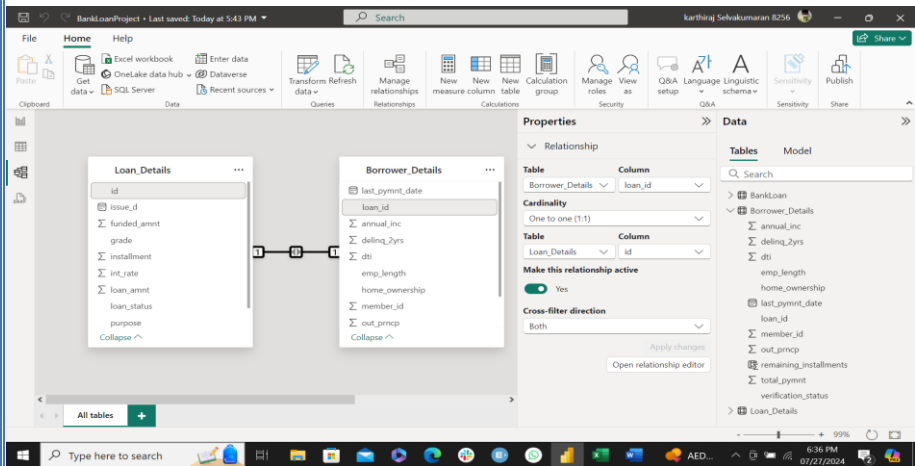
Add a new conditional column named 'delinquency_status'

The screenshot shows the Power Query Editor interface after adding a new conditional column. The formula bar shows the expression: `= Table.AddColumn(#"Changed total_amount_paid data type", "delinquency_status", each if`. The 'APPLIED STEPS' pane on the right shows the sequence of transformations, including 'Added Conditional Column d...'. The status bar at the bottom indicates '13 COLUMNS, 999+ ROWS' and 'Column profiling based on top 1000 rows'.

	mnt_date	\$ total_pymnt	1,2 out_pncp	\$ total_amount_paid	delinquency_status
1	01/01/2015	5,861.07	0	5,861.07	Not Delinquent
2	04/01/2020	1,008.71	0	1,008.71	Not Delinquent
3	06/01/2021	3,003.65	0	3,003.65	Not Delinquent
4	01/01/2015	12,226.30	0	12,226.30	Not Delinquent
5	01/01/2016	3,242.17	766.9	2,475.27	Not Delinquent
6	01/01/2015	5,631.38	0	5,631.38	Not Delinquent
7	01/01/2016	8,136.84	1889.15	6,247.69	Not Delinquent
8	01/01/2015	3,938.14	0	3,938.14	Not Delinquent
9	04/01/2019	646.02	0	646.02	Not Delinquent
10	11/01/2019	1,476.19	0	1,476.19	Not Delinquent
11	06/01/2020	7,677.52	0	7,677.52	Not Delinquent
12	09/01/2020	13,943.08	0	13,943.08	Not Delinquent
13	07/01/2019	2,270.70	0	2,270.70	Not Delinquent
14	01/01/2015	3,478.98	0	3,478.98	Not Delinquent
15	10/01/2020	7,471.99	0	7,471.99	Not Delinquent
16	01/01/2015	1,270.17	0	1,270.17	Not Delinquent
17	01/01/2015	12,519.26	0	12,519.26	Not Delinquent
18	05/01/2020	3,785.02	0	3,785.02	Not Delinquent
19	02/01/2015	7,164.50	0	7,164.50	Delinquent
20	07/01/2019	9,459.96	0	9,459.96	Not Delinquent
21	08/01/2015	27,663.04	0	27,663.04	Not Delinquent

Task	Description
Column Dropping	<p>Removed sub_grade column as it did not contribute significantly to the analysis.</p> 

5. Data Modeling

Task	Description
Establishing Relationships	<p>Linked LoanDetails and BorrowerDetails on id. Set cross-filter direction to "Both".</p> 

6. Creating Measures and Calculated Columns using DAX

Measure/Column

Description

remaining_installments

Calculates remaining installments using out_prncp / installment, rounded up using CEILING().

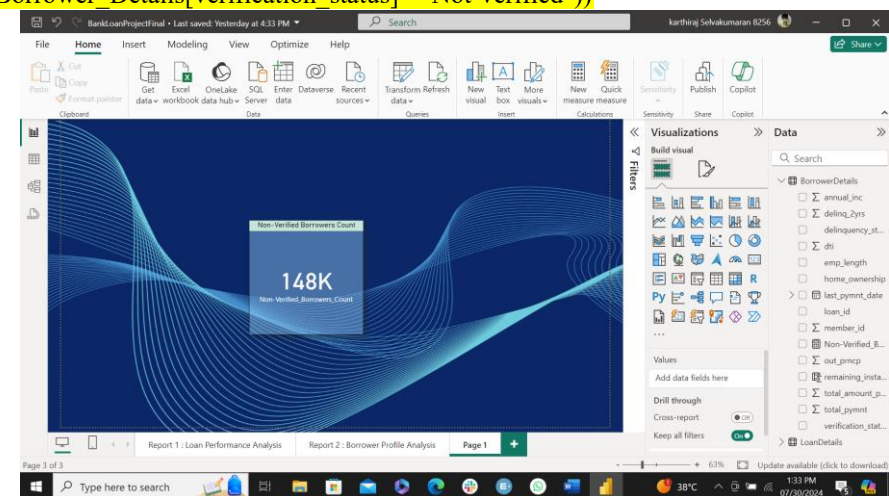
remaining installments =
CEILING(Borrower_Details[out_prncp]/RELATED(Loan_Details[installment]),1)

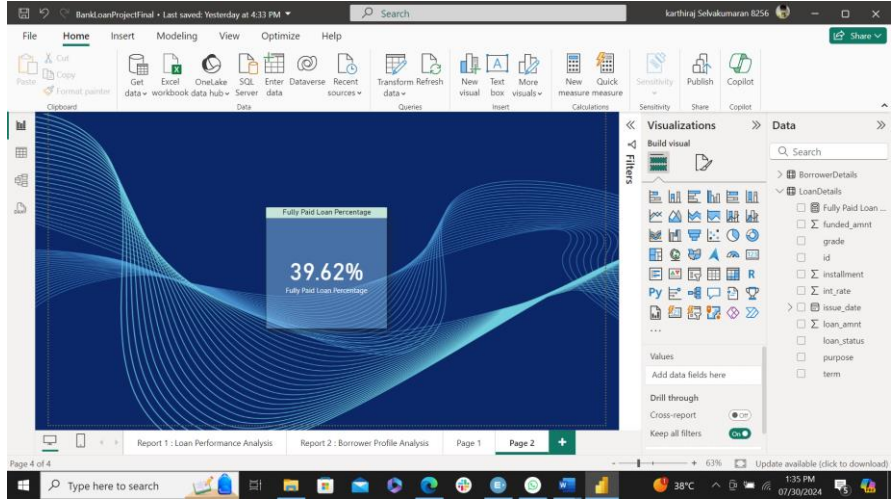
Table: Borrower_Details (1,000 rows) Columns: remaining_installments (7 distinct values)

Non-Verified Borrowers Count

Counts loans with 'Not Verified' status in verification_status.

Non-Verified_Borrowers_Count = COUNTROWS (FILTER (Borrower_Details, Borrower_Details[verification_status] = "Not Verified"))

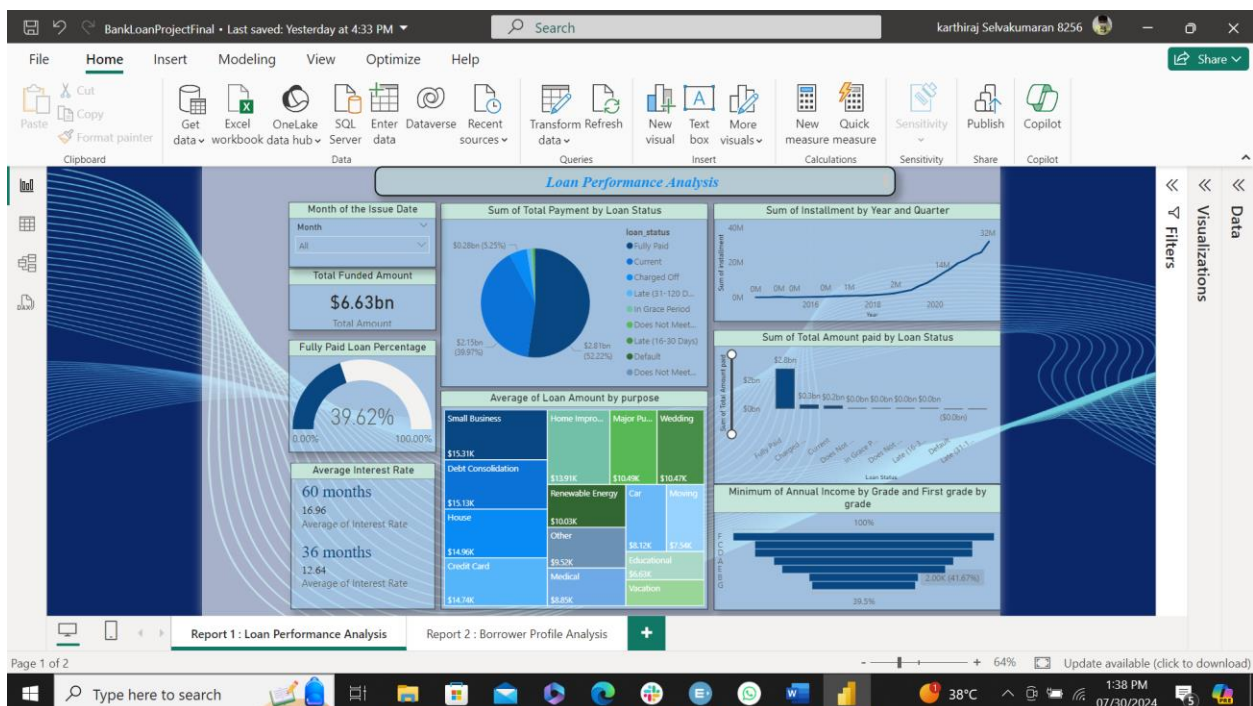


Measure/Column	Description
Fully Paid Loan Percentage	<p>Percentage of loans with "Fully Paid" status.</p> <p>Fully Paid Loan Percentage = DIVIDE (COUNTROWS (FILTER (Loan_Details, Loan_Details[loan_status] ="Fully Paid")), COUNTA(Loan_Details[loan_status]),0)</p> 

7. Creating Comprehensive Reports

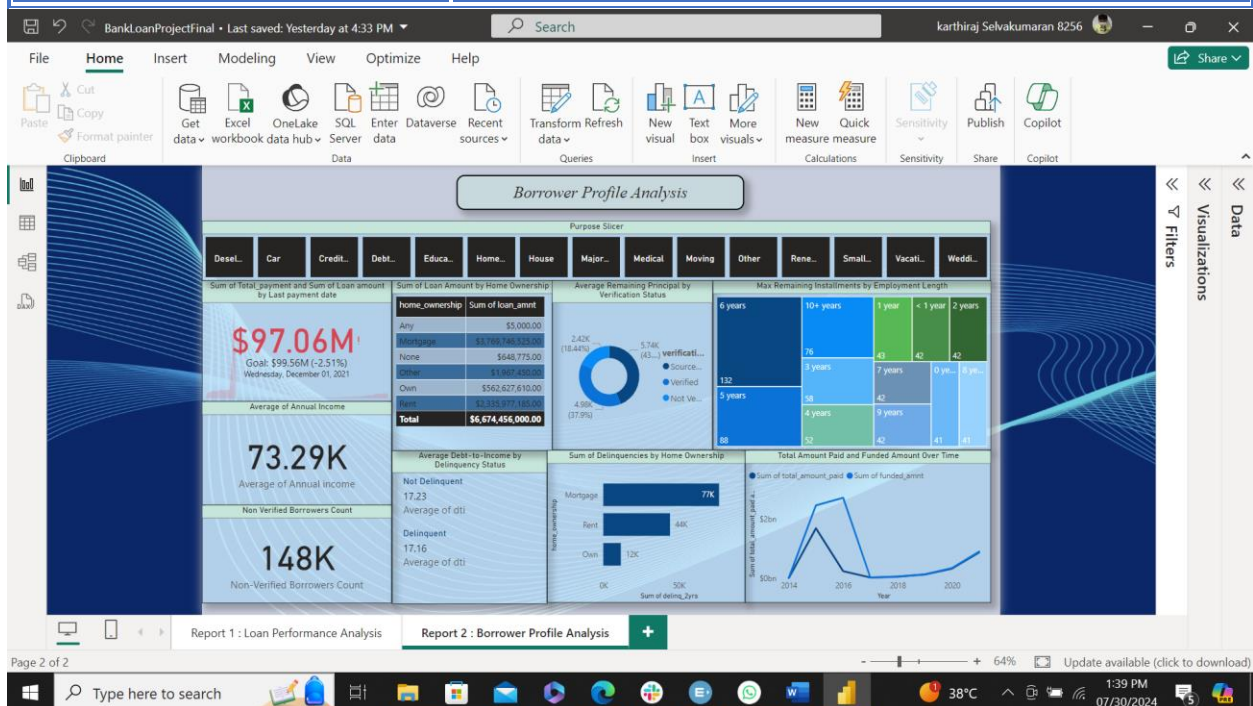
7.1 Report 1: Loan Performance Analysis

Visual	Purpose
Card Visual	Displays total funded amount.
Gauge Chart	Shows 'Fully Paid Loan Percentage'.
Multi-row Card	Shows average interest rate by loan term.
Pie Chart	Visualizes loan status distribution by total payments.
Treemap	Displays average loan amount by purpose.
Line Chart	Visualizes installments over time by year and quarter.
Column Chart	Shows maximum total amount paid by loan status.
Funnel Chart	Displays minimum annual income by grade.
Slicer	Allows filtering by the issue date.



7.2 Report 2: Borrower Profile Analysis

Visual	Purpose
KPI Visual	Shows the sum of total payment, trends, and loan amounts.
Card Visual	Displays average annual income.
Card Visual	Counts non-verified borrowers.
Multi-row Card	Shows average debt-to-income by delinquency status.
Table	Displays total loan amount by home ownership.
Donut Chart	Visualizes average remaining principal by verification status.
Bar Chart	Shows delinquencies by home ownership, filtered to show Mortgage, Rent, Own.
Treemap	Shows max remaining installments by employment length.
Line Chart	Visualizes total amount paid and funded amount over time.
Slicer	Allows filtering by loan purpose.



8. Publishing the Dashboard

1. Sign in to Power BI Service:

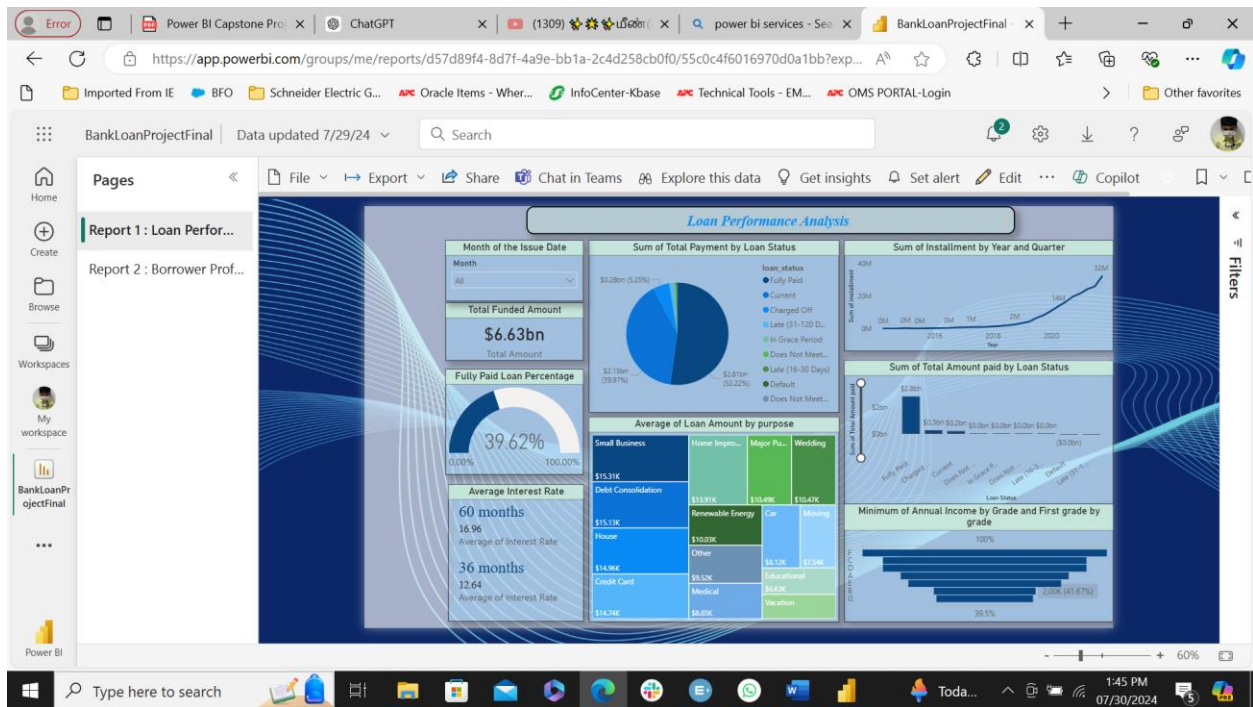
- Make sure you're signed into your Power BI account.

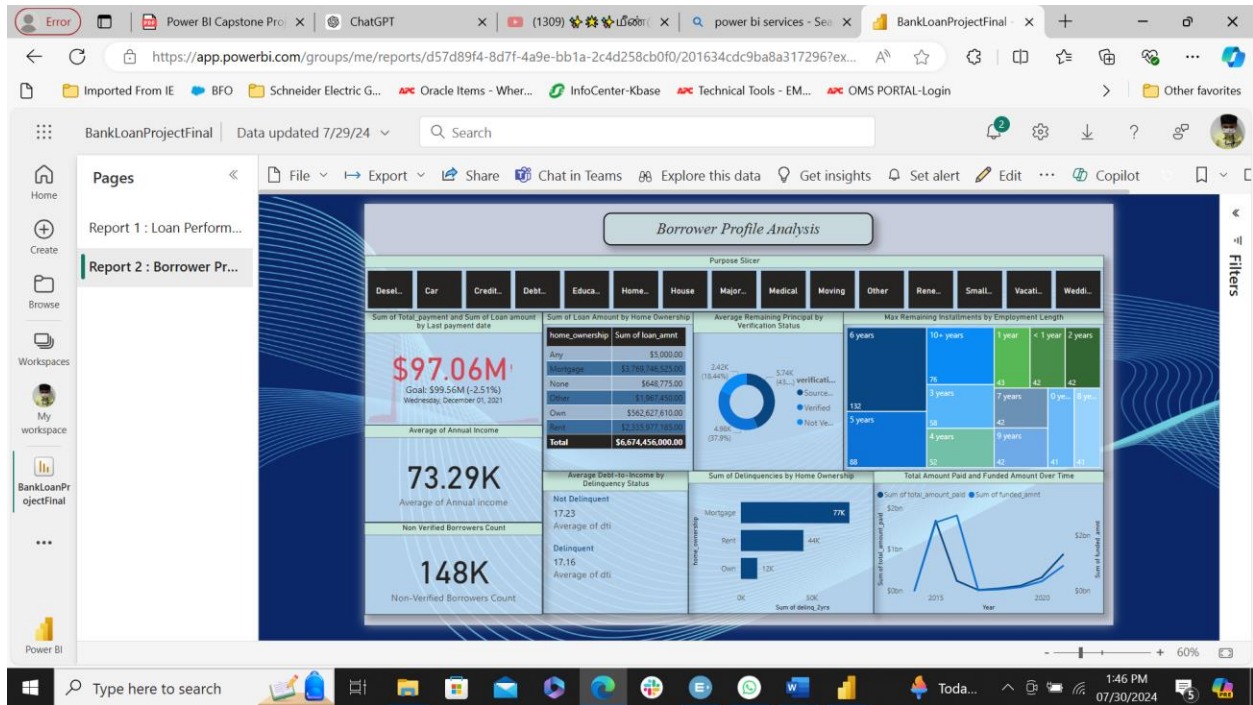
2. Publish the Report:

- Go to the Home tab and click Publish.
- Choose the workspace where you want to publish the report. If you don't have a specific workspace, you can publish it to "My Workspace".

3. Access the Dashboard Online:

- After publishing, go to the Power BI Service (app.powerbi.com) and navigate to the chosen workspace to view your report.





9. Conclusion

This comprehensive analysis of loan performance and borrower profiles provides valuable insights for banking institutions. The findings highlight key factors that influence loan outcomes, enabling banks to refine their lending strategies, improve risk management, and enhance overall portfolio performance.