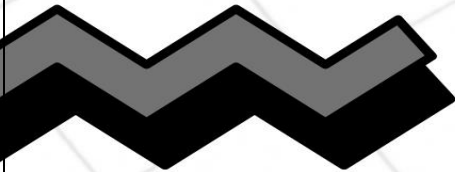




POWERBI CAPSTONE PROJECT - BANK LOAN PERFORMANCE ANALYSIS



IDENTIFY DATA INSIGHTS



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CHAPTER - I

INTRODUCTION:

The transfer of funds from one party to another with the commitment to repay it is known as a loan in the finance industry. In exchange for using the money, the borrower, also known as the recipient, incurs debt and typically has to pay interest.

Typically, the promissory note or equivalent paperwork proving the debt will include the principle amount borrowed, the interest rate the lender is charging, and the repayment date. A loan means that the borrower and the lender will temporarily reallocate the subject asset or assets.

The interest gives the lender a reason to proceed with the loan. Each of these duties and limitations in a legal loan is enforceable through contract, which also has the power to impose additional limitations on the borrower known as loan covenants. While the focus of this essay is on financial loans, practically any material object could be lent.

One of the primary functions of financial organizations like banks and credit card firms is to make loans. Bonds and other debt contracts are common sources of finance for other institutions.

Types:

Protected:

A secured loan is a type of debt where the borrower offers up an asset as security, such as a house or automobile.

Many people utilize a mortgage loan, which is a very popular kind of financing, to buy residential or commercial real estate. Until the mortgage is fully repaid, the lender, which is typically a financial institution, is granted security in the form of a lien on the property title. In the event that a borrower fails on a home loan, the bank is legally entitled to take possession of the property and sell it to recoup any outstanding debt.

In the same way, an auto loan may be backed by the vehicle itself. The loan term is somewhat shorter, frequently matching the vehicle's usable life. Auto loans come in two varieties: direct and indirect. A bank loans money to a customer directly when they get a direct vehicle loan. A car dealership (or a related business) serves as a middleman between the customer and the bank or other financial institution in an indirect auto loan.

Loans secured by securities, such as bonds, mutual funds, shares, etc., are examples of additional secured loan types. Customers can obtain a line of credit through this specific instrument, which is granted based on the quality of pledged securities. Customers who have pledged things are evaluated for the quantity and purity of gold before being granted gold loans. Corporate entities may also obtain secured loans by guaranteeing the company's assets, which may include the business itself. Generally speaking, secured loans have cheaper interest rates than unsecured loans. Before authorizing the loan, the lending institution typically hires individuals (on a contract or roll-call basis) to assess the quality of the pledged collateral.

Unsecured:

Financial loans that are not backed by the borrower's assets are known as unsecured loans. Financial institutions may provide them in a variety of forms or marketing bundles:

- Credit histories
- Individual loans
- Overdrafts at banks
- Credit lines or facilities
- Corporate debts, which could be secured or not
- Mutual-to-peer financing

Depending on the lender and the borrower, different interest rates may apply to these various forms. There might be legal regulations on these or not. In the UK, the Consumer Credit Act of 1974 may apply to them where they relate to persons.

Because an unsecured lender has significantly fewer possibilities for taking legal action against the borrower in the case of default, interest rates on unsecured loans are almost always higher than those on secured loans. This is because an unsecured lender is taking on greater risk than they would be with a secured loan. In order to enforce the judgment against the borrower's unencumbered assets—those not previously pledged to secured lenders—an unsecured lender must file a lawsuit against the borrower, win a monetary judgment for breach of contract, and then pursue judgment execution. When a court divides up the borrower's assets during insolvency proceedings, secured lenders typically have precedence over unsecured lenders. Therefore, a higher interest rate represents the added risk that the debt might not be recouped in the event of insolvency.

Demand:

Demand loans are short-term loans that typically do not have fixed dates for repayment. Instead, demand loans carry a floating interest rate, which varies according to the prime lending rate or other defined contract terms. Demand loans can be "called" for repayment by the lending institution at any time. Demand loans may be unsecured or secured.

Subsidized:

A subsidized loan is a loan on which the interest is reduced by an explicit or hidden subsidy. In the context of college loans in the United States, it refers to a loan on which no interest is accrued while a student remains enrolled in education.

Concessional:

A concessional loan, sometimes called a "soft loan", is granted on terms substantially more generous than market loans either through below-market interest rates, by grace periods, or a combination of both. Such loans may be made by foreign governments to developing countries or may be offered to employees of lending institutions as an employee benefit (sometimes called a perk).

Target markets**Personal:**

Finances, auto loans, credit cards, home equity lines of credit, installment loans, and payday loans are examples of common personal loans. An important factor in the underwriting and interest rates (APR) of these loans is the borrower's credit score. If you choose a longer payment term for your personal loan, you can lower the monthly payments, but you will also pay more interest altogether. Banks, alternative (non-bank) lenders, online lenders, and private lenders are all possible sources for a personal loan.

Commercial:

Loans to businesses are similar to the above but also include commercial mortgages and corporate bonds and government guaranteed loans Underwriting is not based upon credit score but rather credit rating.

Loan payment

The most typical loan payment type is the fully amortizing payment in which each monthly rate has the same value over time.

The fixed monthly payment P for a loan of L for n months and a monthly interest rate c is:

$$P = L \cdot \frac{c(1+c)^n}{(1+c)^n - 1}$$

CHAPTER - II

AREA OF STUDY:

Problem Statement:

In today's data-driven world, understanding how borrower details and loan characteristics impact loan performance is very important for banking institutions. This project seeks to delve deep into a lending loan dataset to uncover the relationship between borrower behavior (such as employment length, income, and debt-to-income ratio) and loan characteristics (including amount, term, and interest rate) to unearth critical insights into loan performance metrics. By examining patterns in loan statuses such as fully paid, charged off, or late payments, this analysis aims to empower banking institutions with actionable insights to optimize loan lending strategies, mitigate credit risk, and enhance overall portfolio performance.

Dataset **Download:** <https://drive.google.com/uc?export=download&id=1yNL9gfv-DID3cEW9o2GJvtJ9Bzbm37R7>

The dataset "bank loan.xlsx" contains two sheets: 1. LoanDetails: This sheet contains information about each loan. 2. BorrowerDetails: This sheet provides details about the borrowers.

Variable Declaration:

Table Name	Field Name	Description
LoanDetails	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_d	The month in which the loan was funded.
	purpose	The reason provided by the borrower for the loan.

Table Name	Field Name	Description
BorrowerDetails	id	Unique identifier for each loan.
	member_id	Unique identifier for each borrower.
	emp_length	Employment length in years.
	home_ownership	The status of home ownership reported by the borrower.
	annual_inc	The annual income reported by the borrower.
	verification_status	Indicates if the borrower's income was verified.
	dti	The debt-to-income ratio of the borrower.
	delinq_2yrs	The number of past-due incidences in the borrower's credit file.
	last_pymnt_d	The month of the last payment received.
	total_pymnt	The total amount received in payments.
	out_prncp	The remaining outstanding principal amount of the loan.

OBJECTIVES:

- 1) The Loan Performance Analysis report aims to provide insights into the performance of loans based on various factors such as loan amount, loan status, term, interest rate, and purpose.
- 2) The Borrower Profile Analysis report aims to provide insights into the characteristics of borrowers such as home ownership, annual income, employment length, verification status, debt-to-income ratio, and delinquency history.

CHAPTER - III

METHODOLOGY:

1) Importing Data

Import the "LoanDetails" and "BorrowerDetails" sheets from the "bank loan.xlsx" file into Power BI.

2) Transformation Using Power Query

Data Cleaning:

Handling Missing Values and Duplicates:

1. Replace missing values (null) in the 'emp_length' column of the "BorrowerDetails" table with '0 year'.
2. Remove rows with missing values in the 'last_pymnt_d' and 'delinq_2yrs' columns.
3. Remove duplicate rows in the 'id' column of the "LoanDetails" table.

Dealing with Inconsistencies:

4. Ensure words in the 'purpose' column are separated by spaces instead of underscores (e.g., "credit card" instead of "credit_card").
5. Format the 'purpose' and 'home_ownership' columns to proper case.

Data Transformation:

Column Transformation:

6. Change the data type of the 'total_pymnt' column to 'Fixed decimal number'.
7. Round off the numbers in the 'funded_amnt' column to 2 decimal places.

Column Renaming:

8. Rename the column 'issue_d' to 'issue_date'.
9. Rename the column 'last_pymnt_d' to 'last_pymnt_date'.

Creating New Columns:

10. Create a new custom column named 'total_amount_paid' to calculate the total amount paid by each borrower by subtracting 'out_prncp' from 'total_pymnt'.
11. Add a new conditional column named 'delinquency_status' to identify if the borrower has any delinquencies. If the number of delinquencies in 'delinq_2yrs' is greater than 0, the status should be "Delinquent", otherwise "Not Delinquent".

Column Dropping:

12. Remove the 'sub_grade' column as that does not significantly contribute to the analysis.

3) [Data Modeling:](#)

13. Identify the common column between both the tables and establish relationships between the two tables. Ensure the cross-filter direction is set to "Both". This step is crucial for enabling cross-table analysis and ensuring data integrity within the dataset.

4) [Creating Measures and Calculated Columns using DAX](#)

14. Create a new calculated column named 'remaining_installments' using DAX in the "BorrowerDetails" table to calculate the number of remaining installments by dividing the remaining principal amount ('out_prncp') by the monthly installment amount ('installment') and round up the result using the CEILING() function to account for any partial payments.
15. Create a measure named 'Non-Verified Borrowers Count' using DAX to count the number of loans that have been 'Not Verified'.
16. Create a measure named 'Fully Paid Loan Percentage' to calculate the percentage of fully paid loans. Divide the number of loans with a "Fully Paid" loan status by the total number of loans and then format this measure as Percentage.

Report 1: Loan Performance Analysis

The Loan Performance Analysis report aims to provide insights into the performance of loans based on various factors such as loan amount, loan status, term, interest rate, and purpose.

- 1) **Total Funded Amount:** Create a card visual to display the total funded amount.
- 2) **Fully Paid Loan Percentage:** Create a gauge chart to display the 'Fully Paid Loan Percentage' measure.
- 3) **Average Interest Rate by Term:** Create a multi-row card to show the average interest rate for each term.
- 4) **Loan Status Distribution:** Create a pie chart to visualize the sum of total payments by loan status.
- 5) **Loan Amount by Purpose:** Create a treemap to show the average loan amount by purpose.
- 6) **Installment Over Time:** Create a line chart to visualize the sum of installments by Year and Quarter of the issue date.

- 7) **Maximum Total Amount Paid by Loan Status:** Create a column chart to display the maximum total amount paid by loan status.
- 8) **Minimum Annual Income by Grade:** Create a funnel chart to show the minimum annual income by grade.
- 9) **Issue Date Slicer:** Add a slicer for the Month of the issue date to enable dynamic data exploration.

Report 2: Borrower Profile Analysis

The Borrower Profile Analysis report aims to provide insights into the characteristics of borrowers such as home ownership, annual income, employment length, verification status, debt-to-income ratio, and delinquency history.

- 1) **KPI Visual:** Create a KPI visual with the sum of total payment as the value, the year of last payment date as the trend axis, and the sum of loan amount as the target. Round off to 2 decimal points and format as \$ currency.
- 2) **Average of Annual Income:** Display the average of annual income using a card visual.
- 3) **Non-Verified Borrowers Count:** Display the count of non-verified borrowers using a card visual.
- 4) **Average Debt-to-Income by Delinquency Status:** Create a multi-row card to show the average debt-to-income ratio by delinquency status.
- 5) **Sum of Loan Amount by Home Ownership:** Create a table to show the total loan amount by home ownership.
- 6) **Average Remaining Principal by Verification Status:** Create a donut chart to display the average remaining outstanding principal by verification status.
- 7) **Sum of Delinquencies by Home Ownership:** Create a bar chart to show the total number of delinquencies in the past 2 years by home ownership and filter the visual to display only Mortgage, Rent, and Own.
- 8) **Max Remaining Installments by Employment Length:** Create a treemap to show the maximum remaining installments by employment length.
- 9) **Total Amount Paid and Funded Amount Over Time:** Create a line chart to display the sum of total amount paid and the sum of funded amount by the year of last payment date.
- 10) **Purpose Slicer:** Add a slicer for loan purpose to enable dynamic data exploration.

CHAPTER - IV

ANALYSIS AND DATA INSIGHTS:

1) COLLECTING OF DATA:

Import the "LoanDetails" and "BorrowerDetails" sheets from the "bank loan.xlsx" file into Power BI.

<https://drive.google.com/uc?export=download&id=1yNL9gfv-DID3cEW9o2GJvtJ9Bzbm37R7>

Navigator

Display Options

- bank loan.xlsx [2]
- BorrowerDetails
- LoanDetails

BorrowerDetails

member_id	loan_id	emp_length	home_ownership	annual_inc	verification_status	dti	delinq_12m	last_pymnt_d	total_pymnt	out_prncpl
1296599	1077501	10+ years	RENT	24000	Verified	27.65	0	1/1/2015	5861.071414	
1314167	1077430	< 1 year	RENT	30000	Source Verified	1	0	4/1/2020	1008.71	
1313524	1077175	10+ years	RENT	12252	Not Verified	8.72	0	6/1/2021	3003.653644	
1277178	1076863	10+ years	RENT	49200	Source Verified	20	0	1/1/2015	12226.30221	
1311748	1075358	1 year	RENT	80000	Source Verified	17.94	0	1/1/2016	3242.17	
1311441	1075269	3 years	RENT	36000	Source Verified	11.2	0	1/1/2015	5631.377753	
1304742	1069639	8 years	RENT	47004	Not Verified	23.51	0	1/1/2016	8136.84	
1288686	1072053	9 years	RENT	48000	Source Verified	5.35	0	1/1/2015	3938.144334	
1306957	1071795	4 years	OWN	40000	Source Verified	5.55	0	4/1/2019	646.02	
1306721	1071570	< 1 year	RENT	15000	Verified	18.08	0	11/1/2019	1476.19	
1305201	1070078	5 years	OWN	72000	Not Verified	16.12	0	6/1/2020	7677.52	
1305008	1069908	10+ years	OWN	75000	Source Verified	10.78	0	9/1/2020	13943.08	
1298717	1064687	< 1 year	RENT	30000	Source Verified	10.08	0	7/1/2019	2270.7	
1304956	1069866	3 years	RENT	15000	Source Verified	12.56	0	1/1/2015	3478.981915	
1303503	1069057	3 years	RENT	100000	Source Verified	7.06	0	10/1/2020	7471.99	
1304871	1069759	< 1 year	RENT	28000	Not Verified	20.31	0	1/1/2015	1270.171106	
1299699	1065775	4 years	RENT	42000	Not Verified	18.6	0	1/1/2015	12519.26045	
1304884	1069971	10+ years	MORTGAGE	110000	Not Verified	10.52	0	5/1/2020	3785.02	
1294539	1062474	1 year	MORTGAGE	84000	Verified	18.44	2	2/1/2015	7164.499852	
1304855	1069742	6 years	RENT	77385.19	Not Verified	9.86	0	7/1/2019	9459.96	
1284848	1069740	3 years	RENT	43370	Verified	26.53	0	8/1/2015	27663.04267	
1269083	1039153	10+ years	RENT	105000	Verified	13.22	0	9/1/2020	14025.4	
1304821	1069710	10+ years	OWN	50000	Source Verified	11.18	0	1/1/2015	11902.56157	
1304810	1069700	5 years	RENT	50000	Not Verified	16.01	0	10/1/2020	11536.31	

Load Transform Data Cancel

Figure 1.1

2) Transformation Using Power Query

1) Data Cleaning:

Handling Missing Values and Duplicates:

1. Replace missing values (null) in the 'emp_length' column of the "BorrowerDetails" table with '0 year'.

Figure 2.1.1 shows the Power Query Editor interface. The formula bar contains the following M code: `= Table.ReplaceValue(#"Changed Type",null,"0",Replacer.ReplaceValue,{"emp_length"})`. The table below represents the data shown in the editor.

	i23 member_id	i23 loan_id	A6 emp_length	A6 home_ownership	1.2 annual_inc	A6 verification
1	1296599	1077501	10+ years	RENT	24000	Verified
2	1314167	1077430	< 1 year	RENT	30000	Source Verif
3	1313524	1077175	10+ years	RENT	12252	Not Verified
4	1277178	1076863	10+ years	RENT	49200	Source Verif
5	1311748	1075358	1 year	RENT	80000	Source Verif
6	1311441	1075269	3 years	RENT	36000	Source Verif
7	1304742	1069639	8 years	RENT	47004	Not Verified
8	1288686	1072053	9 years	RENT	48000	Source Verif
9	1306957	1071795	4 years	OWN	40000	Source Verif
10	1306721	1071570	< 1 year	RENT	15000	Verified
11	1305201	1070078	5 years	OWN	72000	Not Verified
12	1305008	1069908	10+ years	OWN	75000	Source Verif
13	1298717	1064687	< 1 year	RENT	30000	Source Verif
14	1304956	1069866	3 years	RENT	15000	Source Verif
15	1303503	1069057	3 years	RENT	100000	Source Verif
16	1304871	1069759	< 1 year	RENT	28000	Not Verified
17	1299699	1065775	4 years	RENT	42000	Not Verified
18	1304884	1069971	10+ years	MORTGAGE	110000	Not Verified
19	1294539	1062474	1 year	MORTGAGE	84000	Verified
20	1304855	1069742	6 years	RENT	77385.19	Not Verified
21	1284848	1069740	3 years	RENT	43370	Verified
22	1269083	1039153	10+ years	RENT	105000	Verified
23	1304821	1069710	10+ years	OWN	50000	Source Verif

Figure 2.1.1

2. Remove rows with missing values in the 'last_pymnt_d' and 'delinq_2yrs' columns.

Figure 2.1.2.1 shows the Power Query Editor interface. The formula bar contains the following M code: `= Table.SelectRows(#"emp_length" - "null" Replaced with year 0", each ([delinq_2yrs] <> null and [delinq_2yrs] <> ""))`. The table below represents the data shown in the editor.

	i23 member_id	i23 loan_id	A6 emp_length	A6 home_ownership	1.2 annual_inc	A6 verification
1	1296599	1077501	10+ years	RENT	24000	Verified
2	1314167	1077430	< 1 year	RENT	30000	Source Verif
3	1313524	1077175	10+ years	RENT	12252	Not Verified
4	1277178	1076863	10+ years	RENT	49200	Source Verif
5	1311748	1075358	1 year	RENT	80000	Source Verif
6	1311441	1075269	3 years	RENT	36000	Source Verif
7	1304742	1069639	8 years	RENT	47004	Not Verified
8	1288686	1072053	9 years	RENT	48000	Source Verif
9	1306957	1071795	4 years	OWN	40000	Source Verif
10	1306721	1071570	< 1 year	RENT	15000	Verified
11	1305201	1070078	5 years	OWN	72000	Not Verified
12	1305008	1069908	10+ years	OWN	75000	Source Verif
13	1298717	1064687	< 1 year	RENT	30000	Source Verif
14	1304956	1069866	3 years	RENT	15000	Source Verif
15	1303503	1069057	3 years	RENT	100000	Source Verif
16	1304871	1069759	< 1 year	RENT	28000	Not Verified
17	1299699	1065775	4 years	RENT	42000	Not Verified
18	1304884	1069971	10+ years	MORTGAGE	110000	Not Verified
19	1294539	1062474	1 year	MORTGAGE	84000	Verified
20	1304855	1069742	6 years	RENT	77385.19	Not Verified
21	1284848	1069740	3 years	RENT	43370	Verified
22	1269083	1039153	10+ years	RENT	105000	Verified
23	1304821	1069710	10+ years	OWN	50000	Source Verif

Figure 2.1.2.1

Queries [2] ✕ ✓ fx

BorrowerDetails
LoanDetails

`= Table.SelectRows(#"delinq_2yrs" column - Removed empty rows", each ([last_pymnt_d] <> null and [last_pymnt_d] <> ""))`

	1.2 member_id	1.2 loan_id	1.2 emp_length	1.2 home_ownership	1.2 annual_inc	1.2 verification
1	1296599	1077501	10+ years	RENT	24000	Verified
2	1314167	1077430	< 1 year	RENT	30000	Source Verifi
3	1313524	1077175	10+ years	RENT	12252	Not Verified
4	1277178	1076863	10+ years	RENT	49200	Source Verifi
5	1311748	1075358	1 year	RENT	80000	Source Verifi
6	1311441	1075269	3 years	RENT	36000	Source Verifi
7	1304742	1069639	8 years	RENT	47004	Not Verified
8	1288686	1072053	9 years	RENT	48000	Source Verifi
9	1306957	1071795	4 years	OWN	40000	Source Verifi
10	1306721	1071570	< 1 year	RENT	15000	Verified
11	1305201	1070078	5 years	OWN	72000	Not Verified
12	1305008	1069908	10+ years	OWN	75000	Source Verifi
13	1298717	1064687	< 1 year	RENT	30000	Source Verifi
14	1304956	1069866	3 years	RENT	15000	Source Verifi
15	1303503	1069057	3 years	RENT	100000	Source Verifi
16	1304871	1069759	< 1 year	RENT	28000	Not Verified
17	1299699	1065775	4 years	RENT	42000	Not Verified
18	1304884	1069971	10+ years	MORTGAGE	110000	Not Verified
19	1294539	1062474	1 year	MORTGAGE	84000	Verified
20						

Query Settings ✕

PROPERTIES

Name
BorrowerDetails

All Properties

APPLIED STEPS

- Source
- Navigation
- Promoted Headers
- Changed Type
- 'emp_length' - "null" Replace...
- 'delinq_2yrs' column - Remov...
- 'last_pymnt_d' column - Rem...

Figure 2.1.2.2

3. Remove duplicate rows in the 'id' column of the "LoanDetails" table.

Queries [2] ✕ ✓ fx

BorrowerDetails
LoanDetails

`= Table.Distinct(#"Changed Type", {"id"})`

	1.2 id	1.2 loan_amnt	1.2 funded_amnt	1.2 term	1.2 int_rate	1.2 installment
1	1077501	5000	4975	36 months	10.65	
2	1077430	2500	2500	60 months	15.27	
3	1077175	2400	2400	36 months	15.96	
4	1076863	10000	10000	36 months	13.49	
5	1075358	3000	3000	60 months	12.69	
6	1075269	5000	5000	36 months	7.9	
7	1069639	7000	7000	60 months	15.96	
8	1072053	3000	3000	36 months	18.64	
9	1071795	5600	5600	60 months	21.28	
10	1071570	5375	5350	60 months	12.69	
11	1070078	6500	6500	60 months	14.65	
12	1069908	12000	12000	36 months	12.69	
13	1064687	9000	9000	36 months	13.49	
14	1069866	3000	3000	36 months	9.91	
15	1069057	10000	10000	36 months	10.65	
16	1069759	1000	1000	36 months	16.29	
17	1065775	10000	10000	36 months	15.27	
18	1069971	3600	3600	36 months	6.03	
19	1062474	6000	6000	36 months	11.71	
20						

Query Settings ✕

PROPERTIES

Name
LoanDetails

All Properties

APPLIED STEPS

- Source
- Navigation
- Promoted Headers
- Changed Type
- 'id' - column (Remove Duplica...

Figure 2.1.3

2) Dealing with Inconsistencies:

1. Ensure words in the 'purpose' column are separated by spaces instead of underscores (e.g., "credit card" instead of "credit_card").

Queries [2]

BorrowerDetails

LoanDetails

fx

= Table.ReplaceValue("#" "id" - column (Remove Duplicates),"_", " ", Replacer.ReplaceText,{"purpose"})

Table

id

grade

sub_grade

issue_d

loan_status

purpose

	grade	sub_grade	issue_d	loan_status	purpose	
1	162.87	B	B2	12/1/2018	Fully Paid	credit card
2	59.83	C	C4	12/1/2018	Charged Off	car
3	84.33	C	C5	12/1/2018	Fully Paid	small business
4	339.31	C	C1	12/1/2018	Fully Paid	other
5	67.79	B	B5	12/1/2018	Current	other
6	156.46	A	A4	12/1/2018	Fully Paid	wedding
7	170.08	C	C5	12/1/2018	Current	debt consolidation
8	109.43	E	E1	12/1/2018	Fully Paid	car
9	152.39	F	F2	12/1/2018	Charged Off	small business
10	121.45	B	B5	12/1/2018	Charged Off	other
11	153.45	C	C3	12/1/2018	Fully Paid	debt consolidation
12	402.54	B	B5	12/1/2018	Fully Paid	debt consolidation
13	305.38	C	C1	12/1/2018	Charged Off	debt consolidation
14	96.68	B	B1	12/1/2018	Fully Paid	credit card
15	325.74	B	B2	12/1/2018	Charged Off	other
16	35.31	D	D1	12/1/2018	Fully Paid	debt consolidation
17	347.98	C	C4	12/1/2018	Fully Paid	home improvement
18	109.57	A	A1	12/1/2018	Fully Paid	major purchase
19	198.46	B	B3	12/1/2018	Fully Paid	medical
20

Query Settings

PROPERTIES

Name

LoanDetails

All Properties

APPLIED STEPS

Source

Navigation

Promoted Headers

Changed Type

'id' - column (Remove Duplica...

X purpose column Inconsistent ...

Figure 2.2.1

2. Format the 'purpose' and 'home_ownership' columns to proper case.

Queries [2]

BorrowerDetails

LoanDetails

fx

= Table.TransformColumns(#"purpose column Inconsistent text - Replace "" "" to space",{{"purpose", Text.Proper, type text}})

Table

grade

sub_grade

issue_d

loan_status

purpose

1

162.87

B

B2

12/1/2018

Fully Paid

Credit Card

2

59.83

C

C4

12/1/2018

Charged Off

Car

3

84.33

C

C5

12/1/2018

Fully Paid

Small Business

4

339.31

C

C1

12/1/2018

Fully Paid

Other

5

67.79

B

B5

12/1/2018

Current

Other

6

156.46

A

A4

12/1/2018

Fully Paid

Wedding

7

170.08

C

C5

12/1/2018

Current

Debt Consolidation

8

109.43

E

E1

12/1/2018

Fully Paid

Car

9

152.39

F

F2

12/1/2018

Charged Off

Small Business

10

121.45

B

B5

12/1/2018

Charged Off

Other

11

153.45

C

C3

12/1/2018

Fully Paid

Debt Consolidation

12

402.54

B

B5

12/1/2018

Fully Paid

Debt Consolidation

13

305.38

C

C1

12/1/2018

Charged Off

Debt Consolidation

14

96.68

B

B1

12/1/2018

Fully Paid

Credit Card

15

325.74

B

B2

12/1/2018

Charged Off

Other

16

35.31

D

D1

12/1/2018

Fully Paid

Debt Consolidation

17

347.98

C

C4

12/1/2018

Fully Paid

Home Improvement

18

109.57

A

A1

12/1/2018

Fully Paid

Major Purchase

19

198.46

B

B3

12/1/2018

Fully Paid

Medical

20

...

...

...

...

...

...

Query Settings

PROPERTIES

Name

LoanDetails

All Properties

APPLIED STEPS

Source

Navigation

Promoted Headers

Changed Type

'id' - column (Remove Duplica...

purpose column Inconsistent ...

X Proper case used to purpose ...

Figure 2.2.2.1

Queries [2] ✕ ✓ f_x

BorrowerDetails

LoanDetails

Table.TransformColumns(#"last_pymnt_d" column - Removed empty rows,{{"home_ownership", Text.Proper, type text}})

	1.2 member_id	1.2 loan_id	1.2 emp_length	1.2 home_ownership	1.2 annual_inc	1.2 verification
1	1296599	1077501	10+ years	Rent	24000	Verified
2	1314167	1077430	< 1 year	Rent	30000	Source Verif
3	1313524	1077175	10+ years	Rent	12252	Not Verified
4	1277178	1076863	10+ years	Rent	49200	Source Verif
5	1311748	1075358	1 year	Rent	80000	Source Verif
6	1311441	1075269	3 years	Rent	36000	Source Verif
7	1304742	1069639	8 years	Rent	47004	Not Verified
8	1288686	1072053	9 years	Rent	48000	Source Verif
9	1306957	1071795	4 years	Own	40000	Source Verif
10	1306721	1071570	< 1 year	Rent	15000	Verified
11	1305201	1070078	5 years	Own	72000	Not Verified
12	1305008	1069908	10+ years	Own	75000	Source Verif
13	1298717	1064687	< 1 year	Rent	30000	Source Verif
14	1304956	1069866	3 years	Rent	15000	Source Verif
15	1303503	1069057	3 years	Rent	100000	Source Verif
16	1304871	1069759	< 1 year	Rent	28000	Not Verified
17	1299699	1065775	4 years	Rent	42000	Not Verified
18	1304884	1069971	10+ years	Mortgage	110000	Not Verified
19	1294539	1062474	1 year	Mortgage	84000	Verified
20						

Query Settings ✕

PROPERTIES

Name
BorrowerDetails

All Properties

APPLIED STEPS

Source ✕

Navigation ✕

Promoted Headers ✕

Changed Type ✕

'emp_length' - "null" Replace... ✕

'delinq_2yrs' column - Remov... ✕

'last_pymnt_d' column - Rem... ✕

✕ Proper case used to home_ow...

Figure 2.2.2.2

3) Data Transformation:

Column Transformation:

1. Change the data type of the 'total_pymnt' column to 'Fixed decimal number'.

Queries [2] ✕ ✓ f_x

BorrowerDetails

LoanDetails

Table.TransformColumnTypes(#"Proper case used to home_ownership column",{{"total_pymnt", Currency.Type}})

	1.2 status	1.2 dti	1.2 delinq_2yrs	1.2 last_pymnt_d	1.2 total_pymnt	1.2 out_prncp
1		27.65	0	1/1/2015	5,861.07	
2		1	0	4/1/2020	1,008.71	
3		8.72	0	6/1/2021	3,003.65	
4		20	0	1/1/2015	12,226.30	
5		17.94	0	1/1/2016	3,242.17	76
6		11.2	0	1/1/2015	5,631.38	
7		23.51	0	1/1/2016	8,136.84	1889
8		5.35	0	1/1/2015	3,938.14	
9		5.55	0	4/1/2019	646.02	
10		18.08	0	11/1/2019	1,476.19	
11		16.12	0	6/1/2020	7,677.52	
12		10.78	0	9/1/2020	13,943.08	
13		10.08	0	7/1/2019	2,270.70	
14		12.56	0	1/1/2015	3,478.98	
15		7.06	0	10/1/2020	7,471.99	
16		20.31	0	1/1/2015	1,270.17	
17		18.6	0	1/1/2015	12,519.26	
18		10.52	0	5/1/2020	3,785.02	
19		18.44	2	2/1/2015	7,164.50	
20						

Query Settings ✕

PROPERTIES

Name
BorrowerDetails

All Properties

APPLIED STEPS

Source ✕

Navigation ✕

Promoted Headers ✕

Changed Type ✕

'emp_length' - "null" Replace... ✕

'delinq_2yrs' column - Remov... ✕

'last_pymnt_d' column - Rem... ✕

Proper case used to home_ow... ✕

✕ total_pymnt column changed ...

Figure 2.3.1

2. Round off the numbers in the 'funded_amnt' column to 2 decimal places.

Queries [2] ✕ ✓ fx = Table.TransformColumnTypes(#"Proper case used to purpose column",{{"funded_amnt", Currency.Type}})

BorrowerDetails
LoanDetails

	1.3 id	1.3 loan_amnt	\$ funded_amnt	1.2 term	1.2 int_rate	1.2 installment
1	1077501	5000	4,975.00	36 months		10.65
2	1077430	2500	2,500.00	60 months		15.27
3	1077175	2400	2,400.00	36 months		15.96
4	1076863	10000	10,000.00	36 months		13.49
5	1075358	3000	3,000.00	60 months		12.69
6	1075269	5000	5,000.00	36 months		7.9
7	1069639	7000	7,000.00	60 months		15.96
8	1072053	3000	3,000.00	36 months		18.64
9	1071795	5600	5,600.00	60 months		21.28
10	1071570	5375	5,350.00	60 months		12.69
11	1070078	6500	6,500.00	60 months		14.65
12	1069908	12000	12,000.00	36 months		12.69
13	1064687	9000	9,000.00	36 months		13.49
14	1069866	3000	3,000.00	36 months		9.91
15	1069057	10000	10,000.00	36 months		10.65
16	1069759	1000	1,000.00	36 months		16.29
17	1065775	10000	10,000.00	36 months		15.27
18	1069971	3600	3,600.00	36 months		6.03
19	1062474	6000	6,000.00	36 months		11.71
20						

Query Settings ✕

PROPERTIES

Name
LoanDetails

All Properties

APPLIED STEPS

- Source
- Navigation
- Promoted Headers
- Changed Type
- 'id' - column (Remove Duplica...
- purpose column Inconsistent ...
- Proper case used to purpose ...
- funded_amnt column replace ...**

Figure 2.3.2

Column Renaming:

3. Rename the column 'issue_d' to 'issue_date'.

Queries [2] ✕ ✓ fx = Table.RenameColumns(#"funded_amnt column replace to round off 2 decimal number",{{"issue_d", "issue_date"}})

BorrowerDetails
LoanDetails

	ent	1.3 grade	1.3 sub_grade	issue_date	1.2 loan_status	1.2 purpose
1	162.87	B	B2	12/1/2018	Fully Paid	Credit Card
2	59.83	C	C4	12/1/2018	Charged Off	Car
3	84.33	C	C5	12/1/2018	Fully Paid	Small Business
4	339.31	C	C1	12/1/2018	Fully Paid	Other
5	67.79	B	B5	12/1/2018	Current	Other
6	156.46	A	A4	12/1/2018	Fully Paid	Wedding
7	170.08	C	C5	12/1/2018	Current	Debt Consolidation
8	109.43	E	E1	12/1/2018	Fully Paid	Car
9	152.39	F	F2	12/1/2018	Charged Off	Small Business
10	121.45	B	B5	12/1/2018	Charged Off	Other
11	153.45	C	C3	12/1/2018	Fully Paid	Debt Consolidation
12	402.54	B	B5	12/1/2018	Fully Paid	Debt Consolidation
13	305.38	C	C1	12/1/2018	Charged Off	Debt Consolidation
14	96.68	B	B1	12/1/2018	Fully Paid	Credit Card
15	325.74	B	B2	12/1/2018	Charged Off	Other
16	35.31	D	D1	12/1/2018	Fully Paid	Debt Consolidation
17	347.98	C	C4	12/1/2018	Fully Paid	Home Improvement
18	109.57	A	A1	12/1/2018	Fully Paid	Major Purchase
19	198.46	B	B3	12/1/2018	Fully Paid	Medical
20						

Query Settings ✕

PROPERTIES

Name
LoanDetails

All Properties

APPLIED STEPS

- Source
- Navigation
- Promoted Headers
- Changed Type
- 'id' - column (Remove Duplica...
- purpose column Inconsistent ...
- Proper case used to purpose ...
- funded_amnt column replace ...
- renamed the column 'issue_d...**

Figure 2.3.3

4. Rename the column 'last_pymnt_d' to 'last_pymnt_date'.

Query Settings

PROPERTIES

Name: BorrowerDetails

APPLIED STEPS

- Source
- Navigation
- Promoted Headers
- Changed Type
- 'emp_length' - "null" Replace...
- 'delinq_2yrs' column - Remov...
- 'last_pymnt_d' column - Rem...
- Proper case used to home_ow...
- total_pymnt column changed ...
- 'last_pymnt_d' column name ...**

	annual_inc	verification_status	dti	delinq_2yrs	last_pymnt_date	total_pymnt
1	24000	Verified	27.65	0	1/1/2015	
2	30000	Source Verified	1	0	4/1/2020	
3	12252	Not Verified	8.72	0	6/1/2021	
4	49200	Source Verified	20	0	1/1/2015	
5	80000	Source Verified	17.94	0	1/1/2016	
6	36000	Source Verified	11.2	0	1/1/2015	
7	47004	Not Verified	23.51	0	1/1/2016	
8	48000	Source Verified	5.35	0	1/1/2015	
9	40000	Source Verified	5.55	0	4/1/2019	
10	15000	Verified	18.08	0	11/1/2019	
11	72000	Not Verified	16.12	0	6/1/2020	
12	75000	Source Verified	10.78	0	9/1/2020	
13	30000	Source Verified	10.08	0	7/1/2019	
14	15000	Source Verified	12.56	0	1/1/2015	
15	100000	Source Verified	7.06	0	10/1/2020	
16	28000	Not Verified	20.31	0	1/1/2015	
17	42000	Not Verified	18.6	0	1/1/2015	
18	110000	Not Verified	10.52	0	5/1/2020	
19	84000	Verified	18.44	2	2/1/2015	

Figure 2.3.4

Creating New Columns:

5. Create a new custom column named 'total_amount_paid' to calculate the total amount paid by each borrower by subtracting 'out_prncp' from 'total_pymnt'.

Query Settings

PROPERTIES

Name: BorrowerDetails

APPLIED STEPS

- Source
- Navigation
- Promoted Headers
- Changed Type
- 'emp_length' - "null" Replace...
- 'delinq_2yrs' column - Remov...
- 'last_pymnt_d' column - Rem...
- Proper case used to home_ow...
- total_pymnt column changed ...
- 'last_pymnt_d' column name ...
- total_amount_paid column cr...**
- total_amount_paid column ch...

	delinq_2yrs	last_pymnt_date	total_pymnt	out_prncp	total_amount_paid	
1	27.65	0	1/1/2015	5,861.07	0	5861.0714
2	1	0	4/1/2020	1,008.71	0	1008.71
3	8.72	0	6/1/2021	3,003.65	0	3003.6536
4	20	0	1/1/2015	12,226.30	0	12226.3022
5	17.94	0	1/1/2016	3,242.17	766.9	2475.27
6	11.2	0	1/1/2015	5,631.38	0	5631.3778
7	23.51	0	1/1/2016	8,136.84	1889.15	6247.69
8	5.35	0	1/1/2015	3,938.14	0	3938.1443
9	5.55	0	4/1/2019	646.02	0	646.02
10	18.08	0	11/1/2019	1,476.19	0	1476.19
11	16.12	0	6/1/2020	7,677.52	0	7677.52
12	10.78	0	9/1/2020	13,943.08	0	13943.08
13	10.08	0	7/1/2019	2,270.70	0	2270.7
14	12.56	0	1/1/2015	3,478.98	0	3478.9819
15	7.06	0	10/1/2020	7,471.99	0	7471.99
16	20.31	0	1/1/2015	1,270.17	0	1270.1711
17	18.6	0	1/1/2015	12,519.26	0	12519.2604
18	10.52	0	5/1/2020	3,785.02	0	3785.02
19	18.44	2	2/1/2015	7,164.50	0	7164.4999

Figure 2.3.5

6. Add a new conditional column named 'delinquency_status' to identify if the borrower has any delinquencies. If the number of delinquencies in 'delinq_2yrs' is greater than 0, the status should be "Delinquent", otherwise "Not Delinquent".

Queries [2]

BorrowerDetails

LoanDetails

Figure 2.3.6

Column Dropping:

7. Remove the 'sub_grade' column as that does not significantly contribute to the analysis.

Queries [2]

BorrowerDetails

LoanDetails

×

✓

f_x

= Table.RemoveColumns(#"renamed the column ""issue_d"" to ""issue_date""",{"sub_grade"})

	1.2 installment	A ^B grade	issue_date	A ^B loan_status	A ^B purpose
1	10.65	162.87 B	12/1/2018	Fully Paid	Credit Card
2	15.27	59.83 C	12/1/2018	Charged Off	Car
3	15.96	84.33 C	12/1/2018	Fully Paid	Small Business
4	13.49	339.31 C	12/1/2018	Fully Paid	Other
5	12.69	67.79 B	12/1/2018	Current	Other
6	7.9	156.46 A	12/1/2018	Fully Paid	Wedding
7	15.96	170.08 C	12/1/2018	Current	Debt Consolidation
8	18.64	109.43 E	12/1/2018	Fully Paid	Car
9	21.28	152.39 F	12/1/2018	Charged Off	Small Business
10	12.69	121.45 B	12/1/2018	Charged Off	Other
11	14.65	153.45 C	12/1/2018	Fully Paid	Debt Consolidation
12	12.69	402.54 B	12/1/2018	Fully Paid	Debt Consolidation
13	13.49	305.38 C	12/1/2018	Charged Off	Debt Consolidation
14	9.91	96.68 B	12/1/2018	Fully Paid	Credit Card
15	10.65	325.74 B	12/1/2018	Charged Off	Other
16	16.29	35.31 D	12/1/2018	Fully Paid	Debt Consolidation
17	15.27	347.98 C	12/1/2018	Fully Paid	Home Improvement
18	6.03	109.57 A	12/1/2018	Fully Paid	Major Purchase
19	11.71	198.46 B	12/1/2018	Fully Paid	Medical
20					

Query Settings

PROPERTIES

Name

LoanDetails

All Properties

APPLIED STEPS

Source

Navigation

Promoted Headers

Changed Type

'id' - column (Remove Duplica...

purpose column Inconsistent ...

Proper case used to purpose ...

funded_amnt column replace ...

renamed the column "issue_d...

×

"sub grade" column removed

Figure 2.3.7

3) Data Modeling:

Identify the common column between both the tables and establish relationships between the two tables. Ensure the cross-filter direction is set to "Both". This step is crucial for enabling cross-table analysis and ensuring data integrity within the dataset.

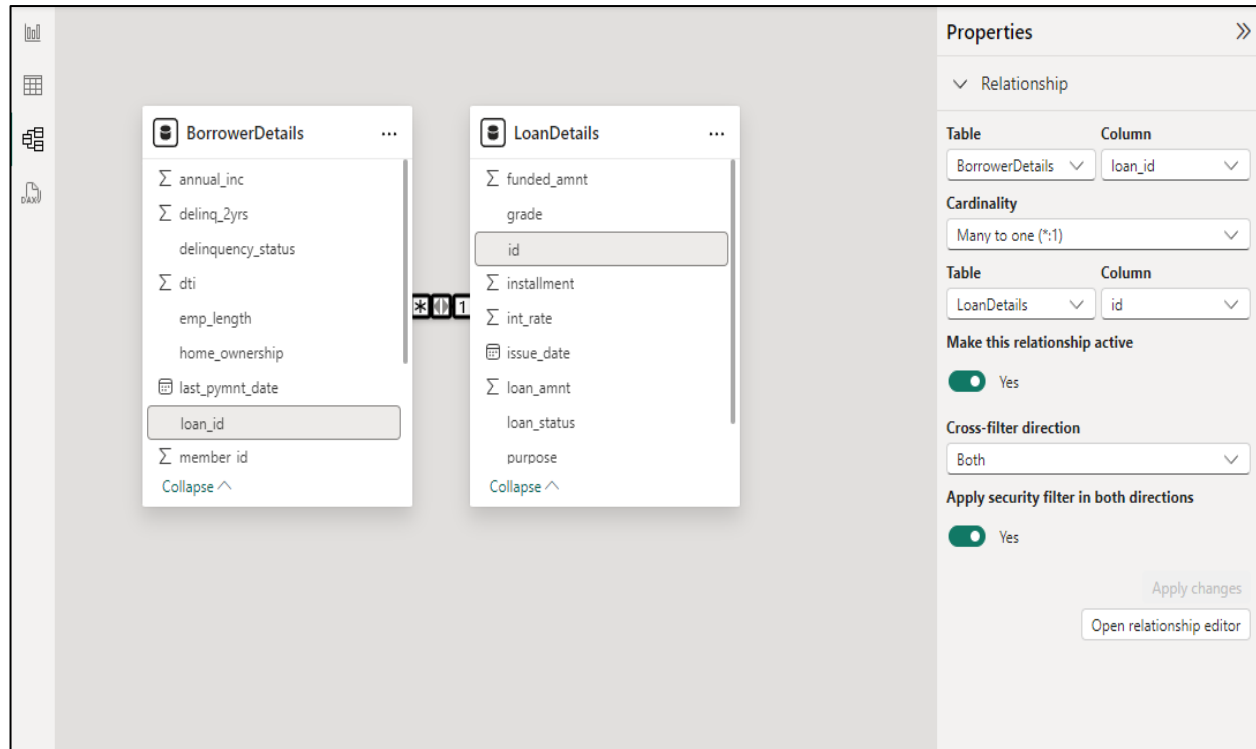


Figure 3.1

The relationship between the Loan Details table and the Borrower Details table exhibits a many-to-one cardinality, as identified in the provided **figure 3.1**. This relationship is a key aspect of data modeling.

4) Creating Measures and Calculated Columns using DAX:

1. Create a new calculated column named 'remaining_installments' using DAX in the "BorrowerDetails" table to calculate the number of remaining installments by dividing the remaining principal amount ('out_prncp') by the monthly installment amount ('installment') and round up the result using the CEILING() function to account for any partial payments.

	verification_status	dti	delinq_2yrs	last_pymnt_date	total_pymnt	out_prncp	total_amount_paid	delinquency_status	remaining_installment
300	Verified	0.01	0	Tuesday, December 1, 2015	\$11,121.26	28728.31	(\$17,607.05)	Not Delinquent	2872831
200	Source Verified	0.07	0	Friday, January 1, 2016	\$12,173.12	27450.37	(\$15,277.25)	Not Delinquent	392149
200	Source Verified	0.07	0	Friday, January 1, 2016	\$31,258.4	16579.14	\$14,679.26	Not Delinquent	236845
200	Verified	0.11	0	Tuesday, December 1, 2015	\$12,979.57	19085.86	(\$6,106.29)	Not Delinquent	173508
200	Verified	0.08	0	Friday, January 1, 2016	\$11,784.57	11660.19	\$124.38	Not Delinquent	145753
403	Verified	0.11	0	Friday, January 1, 2016	\$9,430.59	13948	(\$4,517.41)	Not Delinquent	126800
200	Not Verified	0.12	0	Friday, January 1, 2016	\$11,900.55	15003.84	(\$3,103.29)	Not Delinquent	125032
700	Source Verified	0.25	0	Tuesday, December 1, 2015	\$14,652.54	26917.66	(\$12,265.12)	Not Delinquent	107671
200	Source Verified	0.21	0	Friday, January 1, 2016	\$12,697.13	20792.42	(\$8,095.29)	Not Delinquent	99012
200	Verified	0.29	0	Friday, January 1, 2016	\$20,150.22	24225.24	(\$4,075.02)	Not Delinquent	83536
200	Source Verified	0.03	0	Friday, January 1, 2016	\$1,748.34	2223.95	(\$475.61)	Not Delinquent	74132
296	Source Verified	0.07	0	Friday, January 1, 2016	\$24,980.4	5154.69	\$19,825.71	Not Delinquent	73639
200	Verified	0.38	1	Saturday, August 1, 2015	\$11,185.95	27847.66	(\$16,661.71)	Delinquent	73284
200	Verified	0.4	1	Friday, January 1, 2016	\$10,835.22	29136.85	(\$18,301.63)	Delinquent	72843
200	Source Verified	0.13	0	Friday, January 1, 2016	\$7,437.9	9377.34	(\$1,939.44)	Not Delinquent	72134
200	Source Verified	0.11	0	Friday, January 1, 2016	\$6,821.68	7918.87	(\$1,097.19)	Not Delinquent	71990
200	Verified	0.27	0	Friday, January 1, 2016	\$8,186.6	18744.04	(\$10,557.44)	Not Delinquent	69423
200	Verified	0.19	0	Friday, January 1, 2016	\$16,402.32	12121.01	\$4,281.31	Not Delinquent	63795
360	Verified	0.16	0	Friday, January 1, 2016	\$8,220.2	10116.71	(\$1,896.51)	Not Delinquent	63230
200	Verified	0.32	0	Friday, January 1, 2016	\$28,444.5	19560.64	\$8,883.86	Not Delinquent	61127
200	Verified	0.25	0	Friday, January 1, 2016	\$17,780.39	15026.95	\$2,753.44	Not Delinquent	60108
777	Source Verified	0.25	0	Friday, January 1, 2016	\$8,644.24	14999.56	(\$6,355.32)	Not Delinquent	59999
28	Verified	0.36	0	Friday, January 1, 2016	\$9,070.65	21084.35	(\$12,013.7)	Not Delinquent	58568
282	Verified	0.26	0	Friday, January 1, 2016	\$11,815.32	15030.82	(\$3,215.5)	Not Delinquent	57811
200	Verified	0.09	1	Friday, January 1, 2016	\$31,226.6	5127.79	\$26,098.81	Delinquent	56976

Figure 4.1

DAX FUNCTION:

remaining_installment = CEILING(DIVIDE(BorrowerDetails[out_prncp],BorrowerDetails[dti]),1)

In essence, the DAX code determines how many installments are left for each borrower by considering their current outstanding principal, monthly installment amount, and any partial payments they have made.

2. Create a measure named 'Non-Verified Borrowers Count' using DAX to count the number of loans that have been 'Not Verified'.

1 Non-Verified_Borrowers_Count = CALCULATE(COUNT(BorrowerDetails[verification_status]),BorrowerDetails[verification_status]="Not Verified")

member_id	loan_id	emp_length	home_ownership	annual_inc	verification_status	dti	delinq_2yrs	last_pymnt_date	total_pymnt	out_prncp
34711302	32108139	10+ years	Mortgage	82300	Verified	0.01	0	Tuesday, December 1, 2015	\$11,121.26	2872
29803142	27310080	7 years	Mortgage	170000	Source Verified	0.07	0	Friday, January 1, 2016	\$12,173.12	2745
3127163	2604986	10+ years	Own	90000	Source Verified	0.07	0	Friday, January 1, 2016	\$31,258.4	1657
32458011	29924841	7 years	Mortgage	280000	Verified	0.11	0	Tuesday, December 1, 2015	\$12,979.57	1908
24776600	22453907	0	Mortgage	400000	Verified	0.08	0	Friday, January 1, 2016	\$11,784.57	1166
37106020	34442703	7 years	Mortgage	55403	Verified	0.11	0	Friday, January 1, 2016	\$9,430.59	13
31160545	28633388	7 years	Rent	380000	Not Verified	0.12	0	Friday, January 1, 2016	\$11,900.53	1500
21529082	19326311	5 years	Rent	118700	Source Verified	0.25	0	Tuesday, December 1, 2015	\$14,652.54	2691
24647133	22324543	5 years	Rent	870000	Source Verified	0.21	0	Friday, January 1, 2016	\$12,697.13	2079
14420278	12408157	4 years	Own	102000	Verified	0.29	0	Friday, January 1, 2016	\$20,150.22	2422
14410423	12398291	5 years	Mortgage	42000	Source Verified	0.03	0	Friday, January 1, 2016	\$1,748.34	222
1260527	1030924	5 years	Rent	99996	Source Verified	0.07	0	Friday, January 1, 2016	\$24,980.4	515
38369065	35673607	9 years	Rent	150000	Verified	0.38	1	Saturday, August 1, 2015	\$11,185.95	2784
38982251	36270883	10+ years	Mortgage	75000	Verified	0.4	1	Friday, January 1, 2016	\$10,835.22	2913
31216846	28693661	1 year	Rent	480000	Source Verified	0.13	0	Friday, January 1, 2016	\$7,437.9	937
11106921	9274789	10+ years	Mortgage	400000	Source Verified	0.11	0	Friday, January 1, 2016	\$6,821.68	791
32278582	29755328	2 years	Rent	110000	Verified	0.27	0	Friday, January 1, 2016	\$8,186.6	1874
5470392	4297960	2 years	Rent	300000	Verified	0.19	0	Friday, January 1, 2016	\$16,402.32	1212
11618190	9766191	10+ years	Rent	66560	Verified	0.16	0	Friday, January 1, 2016	\$8,220.2	1011
5475041	4302300	3 years	Mortgage	217000	Verified	0.32	0	Friday, January 1, 2016	\$28,444.5	1956
19675474	17562928	2 years	Rent	240000	Verified	0.25	0	Friday, January 1, 2016	\$17,780.39	1502
20818224	18645650	10+ years	Mortgage	4560077	Source Verified	0.25	0	Friday, January 1, 2016	\$8,644.24	1499
31787015	29253838	4 years	Mortgage	150122.8	Verified	0.36	0	Friday, January 1, 2016	\$9,070.65	2108
14589257	12577094	4 years	Own	46282	Verified	0.26	0	Friday, January 1, 2016	\$11,815.32	1503
1194971	972997	5 years	Rent	368000	Verified	0.09	1	Friday, January 1, 2016	\$31,226.6	512

Figure 4.2.1

DAX FUNCTION:

Non-Verified_Borrowers_Count=

CALCULATE(COUNT(BorrowerDetails[verification_status]),BorrowerDetails[verification_status]="Not Verified")

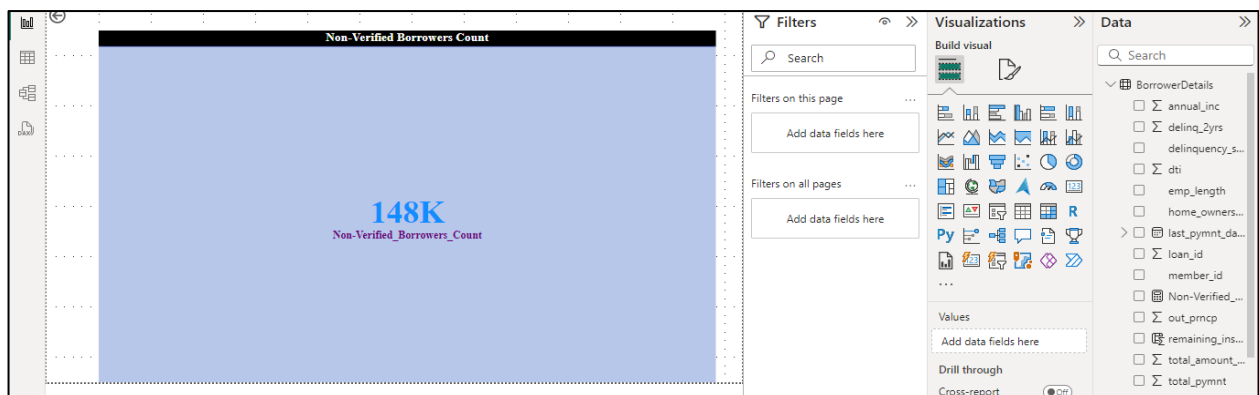


Figure 4.2.2

Applying this measure to your data will count the loans with the status "Not Verified." In this instance, the measure returns a total of 148,000, indicating that there are 148,000 loans that remain unverified.

3. Create a measure named 'Fully Paid Loan Percentage' to calculate the percentage of fully paid loans. Divide the number of loans with a "Fully Paid" loan status by the total number of loans and then format this measure as Percentage.

The screenshot shows the Power BI Desktop interface. At the top, the formula bar contains the DAX measure: `Fully Paid Loan Percentage = CALCULATE(COUNT(LoanDetails[loan_status]),LoanDetails[loan_status]="Fully Paid")/COUNT(LoanDetails[loan_status])*100`. Below the formula bar is a table with columns: `an_amnt`, `funded_amnt`, `term`, `int_rate`, `installment`, `grade`, `issue_date`, `loan_status`, and `purpose`. The table contains 30 rows of loan data. On the right side, the 'Data' pane shows the 'LoanDetails' table expanded, with the measure 'Fully Paid Loan Percentage' selected.

an_amnt	funded_amnt	term	int_rate	installment	grade	issue_date	loan_status	purpose
25000	\$19,080.0572	36 months	11.89	829.1	B	Monday, August 1, 2016	Fully Paid	Debt Consolidation
1000	\$0	36 months	16.08	35.2	F	Wednesday, July 1, 2015	Does not meet the credit policy. Status:Fully Paid	Debt Consolidation
7000	\$672,8038	36 months	10.71	228.22	B	Friday, May 1, 2015	Fully Paid	Credit Card
7000	\$0.0075	36 months	16.08	246.38	F	Wednesday, April 1, 2015	Does not meet the credit policy. Status:Charged Off	Debt Consolidation
25000	\$24,725	36 months	16.99	891.2	D	Sunday, August 1, 2021	Charged Off	Debt Consolidation
1200	\$1,200	36 months	13.11	40.5	C	Wednesday, March 1, 2017	Fully Paid	Debt Consolidation
10800	\$10,691.551	36 months	13.57	366.86	C	Tuesday, November 1, 2016	Fully Paid	Debt Consolidation
7200	\$7,200	36 months	19.05	264.11	D	Thursday, August 1, 2019	Fully Paid	Debt Consolidation
7500	\$557.0872	36 months	10.08	162.34	B	Wednesday, April 1, 2015	Fully Paid	Debt Consolidation
3000	\$2,988.2366	36 months	14.26	102.92	C	Thursday, September 1, 2016	Fully Paid	Credit Card
4000	\$3,900	36 months	7.88	125.13	A	Wednesday, February 1, 2017	Fully Paid	Credit Card
5600	\$5,525	36 months	14.96	194.02	D	Wednesday, February 1, 2017	Charged Off	Debt Consolidation
3200	\$3,200	36 months	9.88	103.08	B	Saturday, April 1, 2017	Fully Paid	Debt Consolidation
22400	\$22,400	36 months	16	787.53	D	Sunday, January 1, 2017	Does not meet the credit policy. Status:Fully Paid	Debt Consolidation
3575	\$2,975.0001	36 months	16.4	126.4	F	Sunday, March 1, 2015	Does not meet the credit policy. Status:Charged Off	Educational
7000	\$0	36 months	14.82	242.05	E	Wednesday, April 1, 2015	Does not meet the credit policy. Status:Charged Off	Debt Consolidation
4000	\$3,892.2589	36 months	11.14	131.22	B	Monday, August 1, 2016	Charged Off	Car
5000	\$0.0011	36 months	14.82	172.89	E	Monday, June 1, 2015	Does not meet the credit policy. Status:Charged Off	Debt Consolidation
5000	\$495.49	36 months	11.34	87.19	C	Friday, May 1, 2015	Fully Paid	Home Improvement
5100	\$1,012.0634	36 months	13.8	149.96	D	Tuesday, September 1, 2015	Does not meet the credit policy. Status:Fully Paid	Debt Consolidation
2525	\$2,375	36 months	12.21	84.12	B	Monday, February 1, 2016	Fully Paid	Debt Consolidation
10625	\$5,325.172	36 months	13.47	360.43	C	Tuesday, December 1, 2015	Fully Paid	Debt Consolidation
2800	\$2,700	60 months	11.49	61.57	B	Tuesday, August 1, 2017	Fully Paid	Debt Consolidation
7500	\$985,5293	36 months	13.24	253.58	D	Monday, June 1, 2015	Fully Paid	Debt Consolidation

Figure 4.3.1

DAX FUNCTION:

Fully Paid Loan Percentage =

`CALCULATE(COUNT(LoanDetails[loan_status]),LoanDetails[loan_status]="Fully Paid")/COUNT(LoanDetails[loan_status])*100`

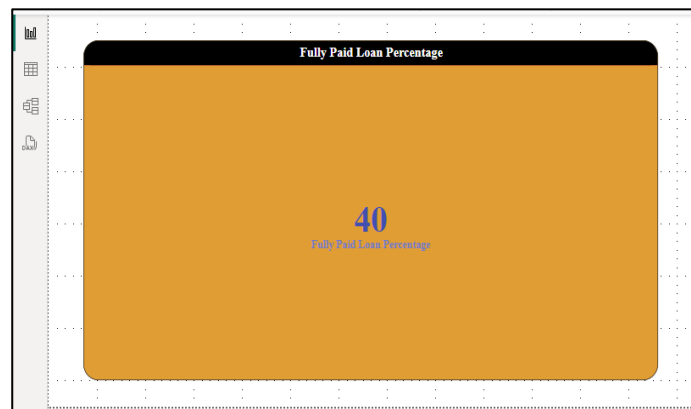


Figure 4.3.2

The 'Fully Paid Loan Percentage' measure tells you what fraction of your loans have been fully paid off. It works by taking the number of loans marked as "Fully Paid" and dividing it by the total number of loans, then expressing the result as a percentage. In this instance, it shows that 40% of the loans are fully paid.

5) Report 1: Loan Performance Analysis:

The Loan Performance Analysis report aims to provide insights into the performance of loans based on various factors such as loan amount, loan status, term, interest rate, and purpose.

1. **Total Funded Amount:** Create a card visual to display the total funded amount.



Figure 5.1

The card visual shows the total funded amount as \$6,630.19.

2. **Fully Paid Loan Percentage:** Create a gauge chart to display the 'Fully Paid Loan Percentage' measure.

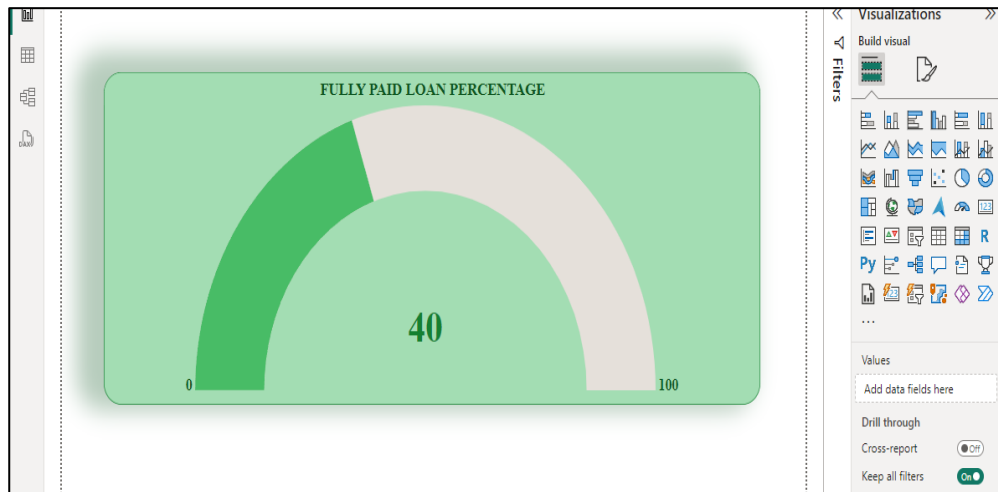


Figure 5.2

The gauge chart illustrates the 'Fully Paid Loan Percentage,' which stands at 40%.

3. **Average Interest Rate by Term:** Create a multi-row card to show the average interest rate for each term.

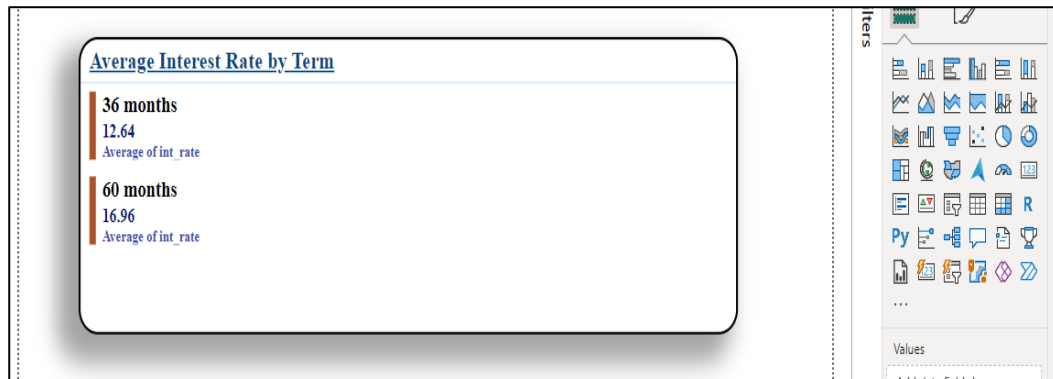


Figure 5.3

The average interest rates for loans with terms of 36 months and 60 months were found to be 12.64% and 16.96%, respectively.

4. **Loan Status Distribution:** Create a pie chart to visualize the sum of total payments by loan status.

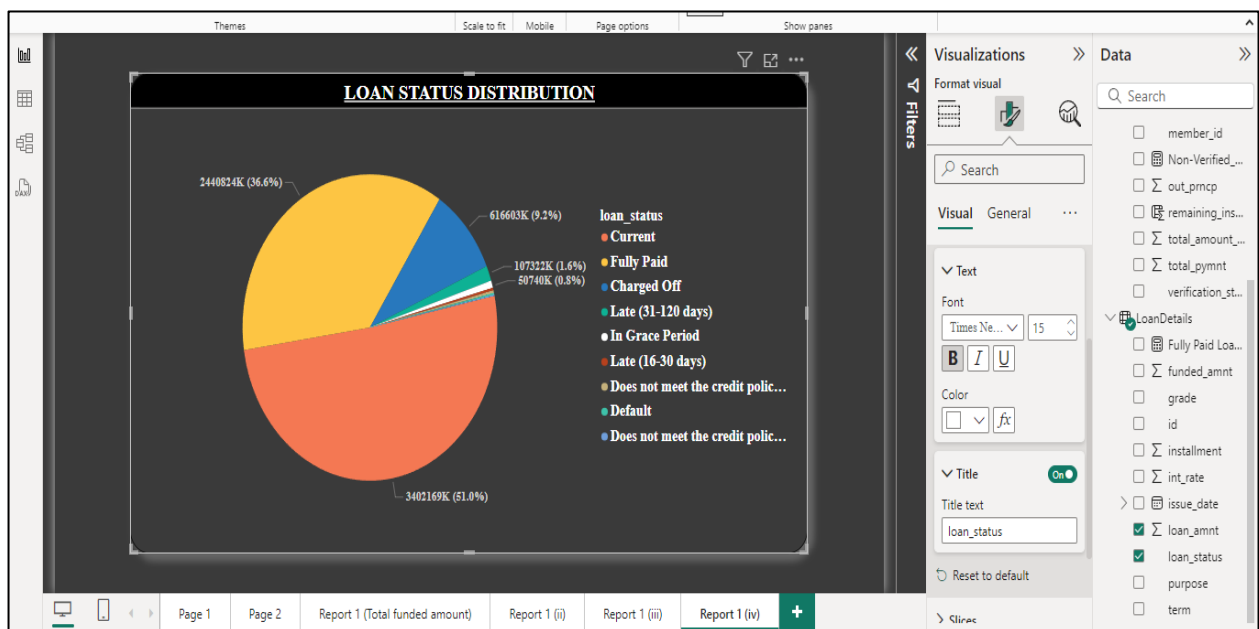


Figure 5.4

The pie chart shows the distribution of total payments by loan status. The majority of borrowers (51%) have current loans, followed by those who have fully paid their loans (36.6%). A smaller percentage of borrowers have charged-off loans (9.2%). The remaining borrowers are categorized as late (31-120 days), in grace period, late (16-30 days), do not meet the credit policy and are in default (3.2%).

- Loan Amount by Purpose:** Create a treemap to show the average loan amount by purpose.

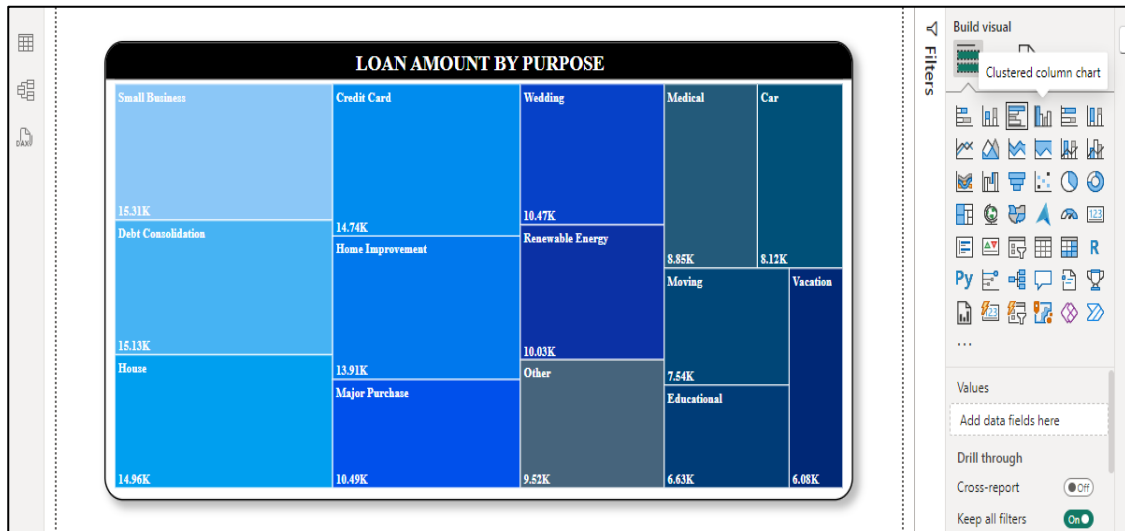


Figure 5.5

The treemap reveals that small business loans have the highest average loan amounts, followed by debt consolidation loans. Home loans, credit loans, and home improvement loans also hold significant average loan amounts. Other loan purposes, such as major purchases, weddings, renewable energy, other expenses, medical expenses, moving costs, educational expenses, car purchases, and vacations, generally have lower average loan amounts.

- Installment Over Time:** Create a line chart to visualize the sum of installments by Year and Quarter of the issue date.

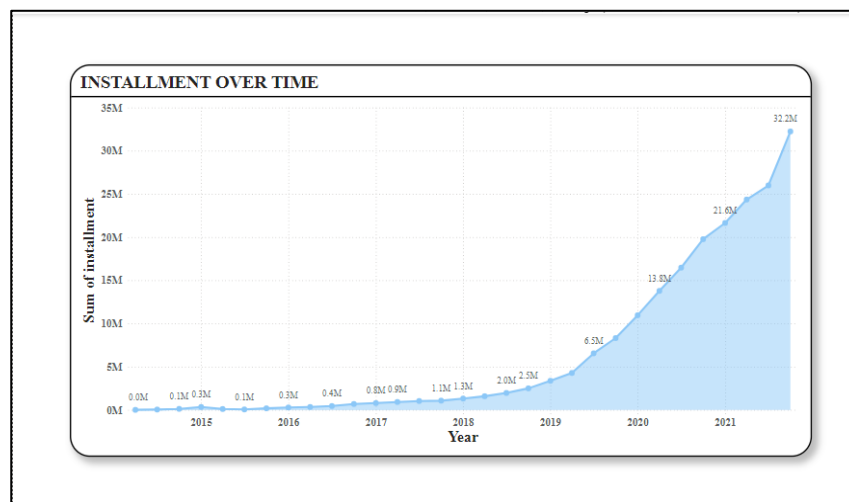


Figure 5.6

This line chart illustrates the trend in total installments paid over time. The chart reveals a clear upward trend, indicating that the total amount of installments has been increasing year by year.

7. **Maximum Total Amount Paid by Loan Status:** Create a column chart to display the maximum total amount paid by loan status.

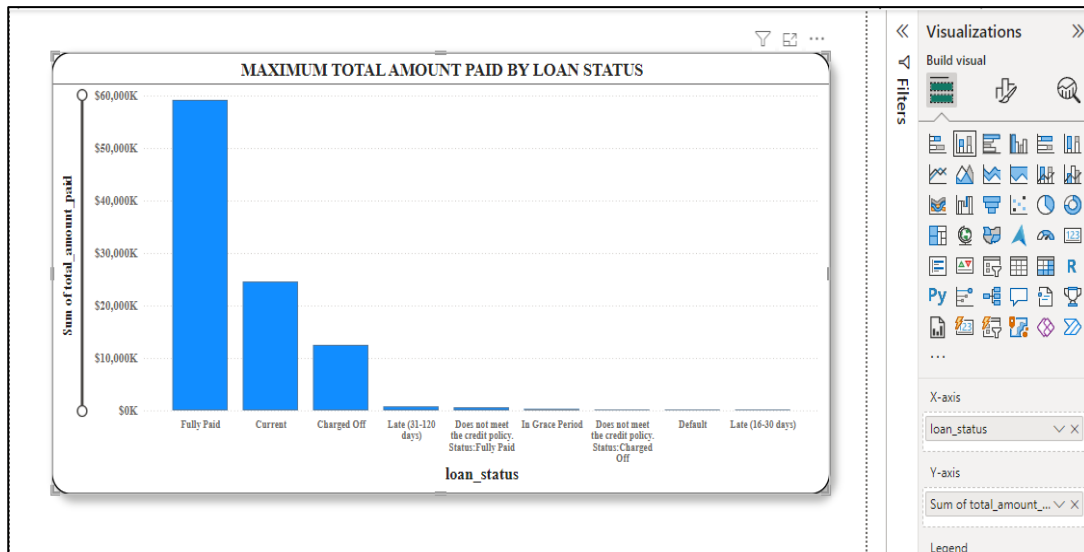


Figure 5.7

The bar chart indicates that the highest total amount of payments is associated with fully paid loans, followed by current loans. Charged-off loans represent a lower total amount of payments.

8. **Minimum Annual Income by Grade:** Create a funnel chart to show the minimum annual income by grade.

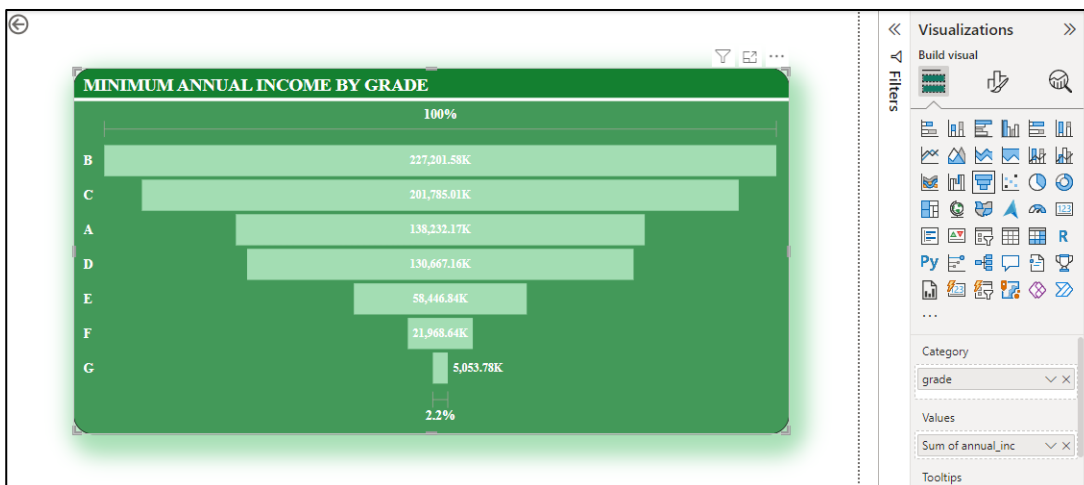
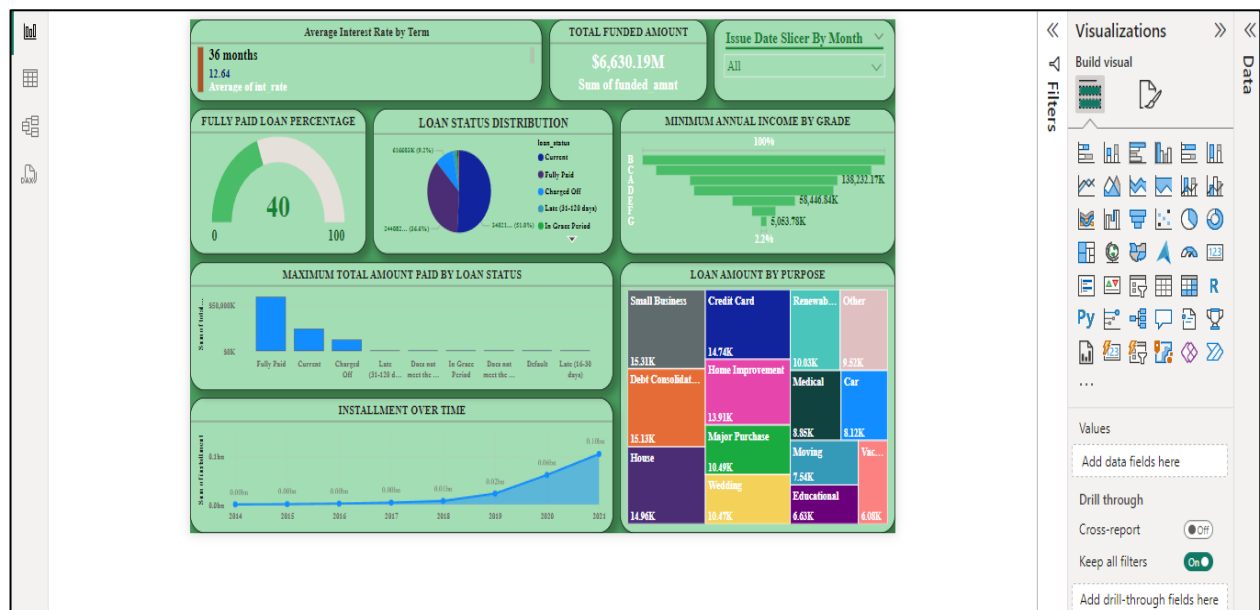
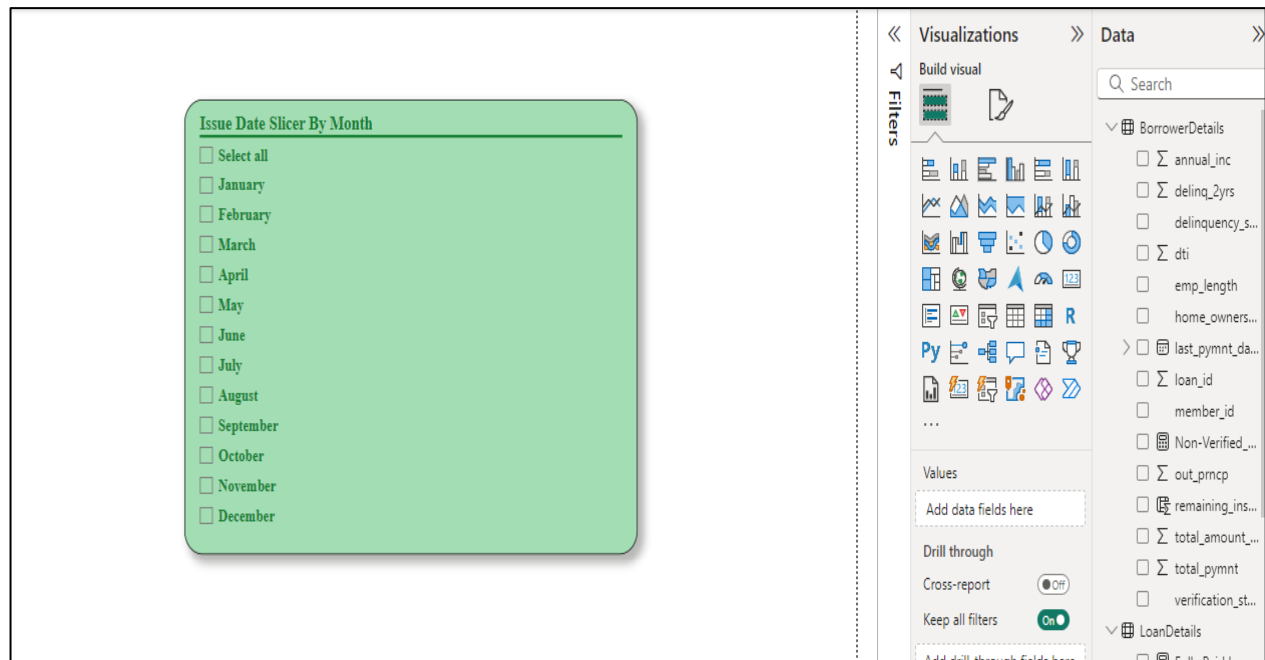


Figure 5.8

The funnel chart shows that borrowers with mostly grade B have the lowest average annual income, followed by those with second most grade C. As the grades increase from A to G, the average annual income generally rises.

9. **Issue Date Slicer:** Add a slicer for the Month of the issue date to enable dynamic data exploration.



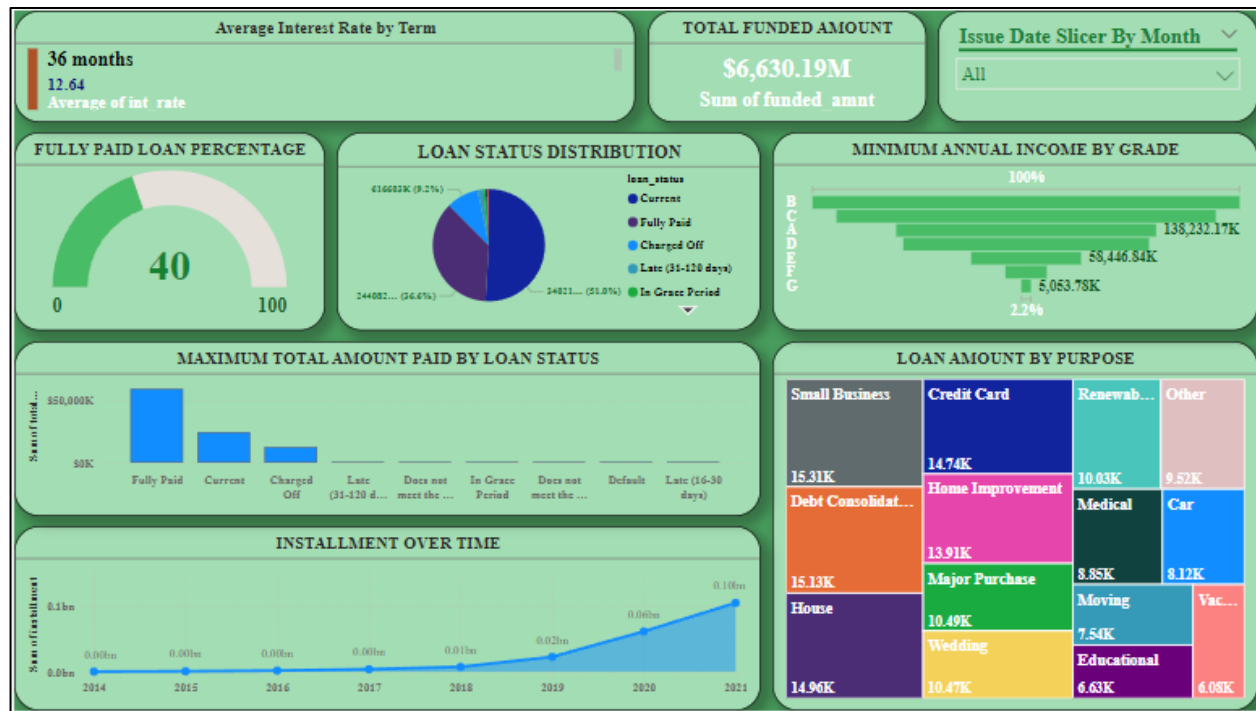


Figure 5.9

Key finding:

- **January:** The percentage of fully paid loans was significantly higher in January compared to other months.
- **March and June:** Home loans accounted for the majority of loan amounts in both March and June.
- **April:** The total amount paid by current and fully paid loans was relatively equal in April.
- **July:** Grace period loans constituted the largest portion of total payments in July.
- **September and December 2021:** The total installments paid in September and December 2021 were lower than in the previous year.
- **October:** The total funded amount was exceptionally high in October compared to other months.
- **November:** The percentage of fully paid loans in November was notably lower than in other months.

The chart illustrates the 'Fully Paid Loan Percentage,' which stands at 40%. The reveals that small business loans have the highest average loan amounts, followed by debt consolidation loans. Home loans, credit loans, and home improvement loans also hold significant average loan amounts. Other loan purposes, such as major purchases, weddings, renewable energy, other expenses, medical expenses, moving costs, educational expenses, car purchases, and vacations, generally have lower average loan amounts. The pie chart shows the distribution of total payments by loan status. The majority of borrowers (51%) have current loans, followed by those who have fully paid their loans (36.6%). A smaller percentage of borrowers have charged-off loans (9.2%). The remaining borrowers are categorized as late (31-120 days), in grace period, late (16-30 days), do not meet the credit policy and are in default (3.2%).

6) Report 2: Borrower Profile Analysis:

The Borrower Profile Analysis report aims to provide insights into the characteristics of borrowers such as home ownership, annual income, employment length, verification status, debt-to-income ratio, and delinquency history.

1. **KPI Visual:** Create a KPI visual with the sum of total payment as the value, the year of last payment date as the trend axis, and the sum of loan amount as the target. Round off to 2 decimal points and format as \$ currency.

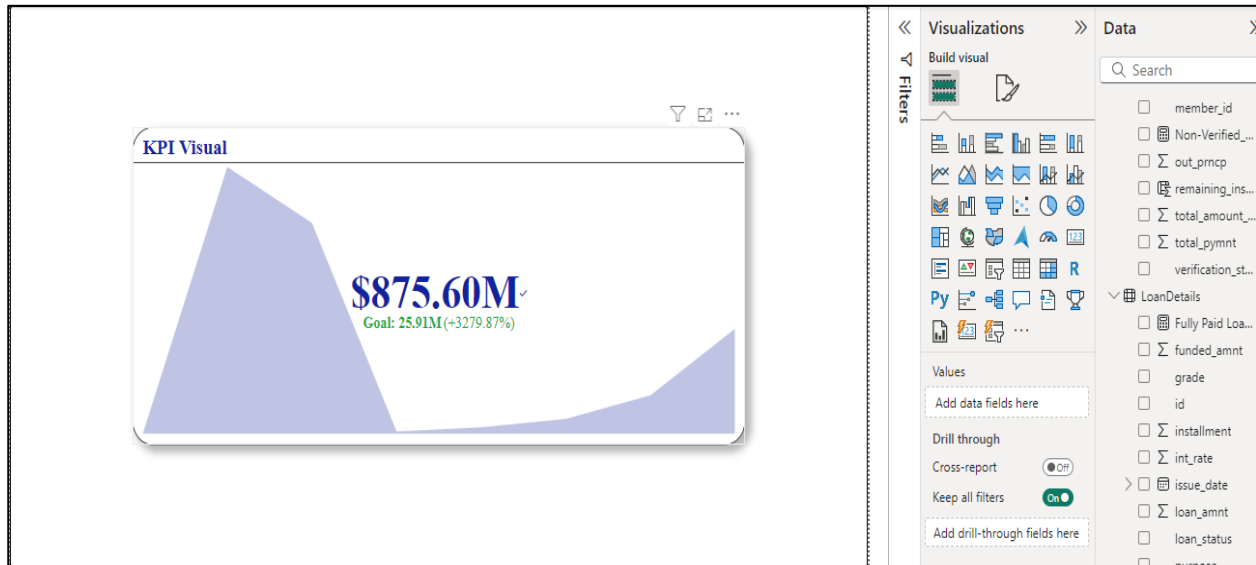


Figure 6.1

- **Performance Against Target:** When the total payments approach or surpass \$875.60M, it reflects robust repayment performance. Conversely, a significantly lower amount may indicate challenges in loan recovery.
- **Yearly Trends:** Analyzing years with varying payment levels can provide insights into external factors influencing repayment behaviors.
- **Achievement of Goal:** Setting a goal of \$25.91M, representing a 3279.87% increase, establishes a high standard. Meeting this goal would signify outstanding performance and substantial growth in repayments.

2. **Average of Annual Income:** Display the average of annual income using a card visual.

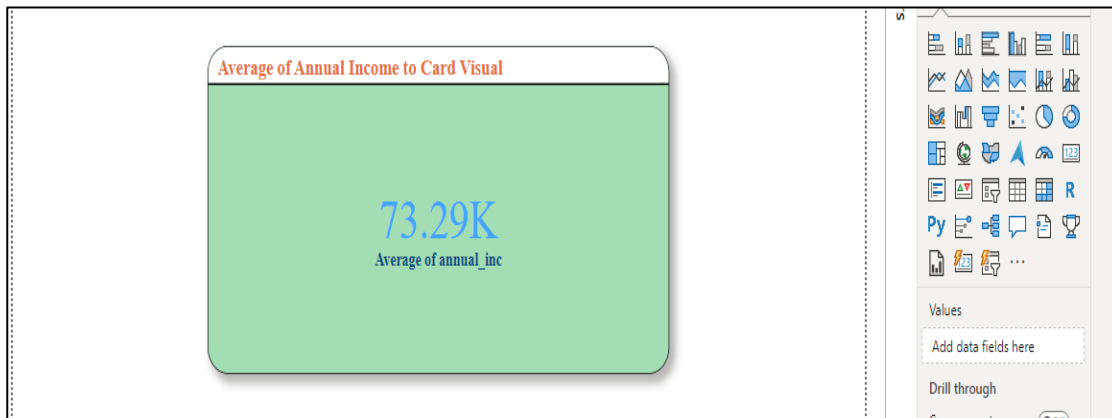


Figure 6.2

An average annual income of 73.29K provides a clear indicator of the financial status of the group being analyzed.

3. **Non-Verified Borrowers Count:** Display the count of non-verified borrowers using a card visual.

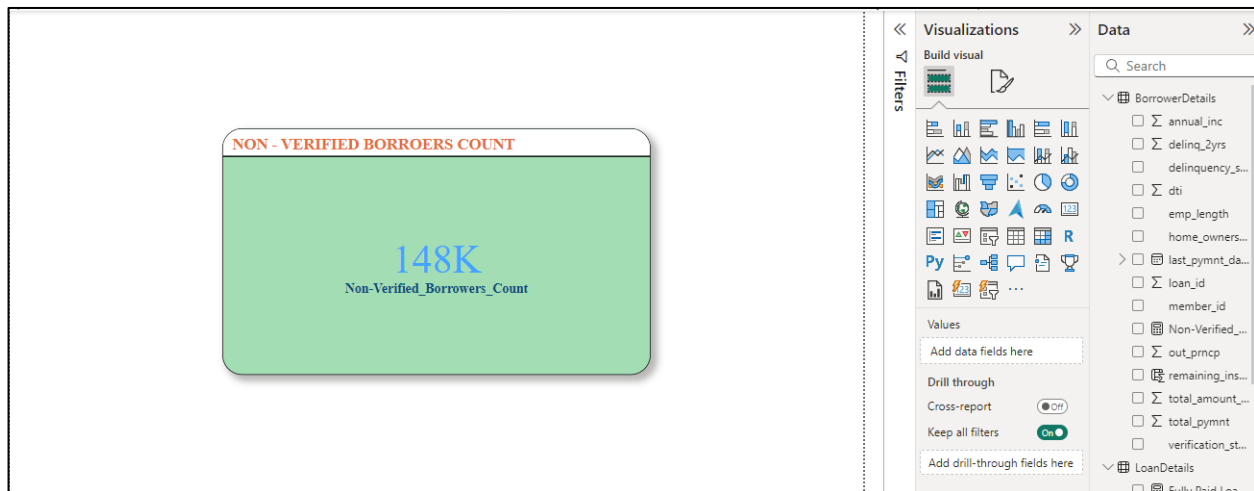


Figure 6.3

Having 148,000 non-verified borrowers represents a substantial part of the borrower base without verification, which could pose a significant risk for loan defaults.

4. **Average Debt-to-Income by Delinquency Status:** Create a multi-row card to show the average debt-to-income ratio by delinquency status.

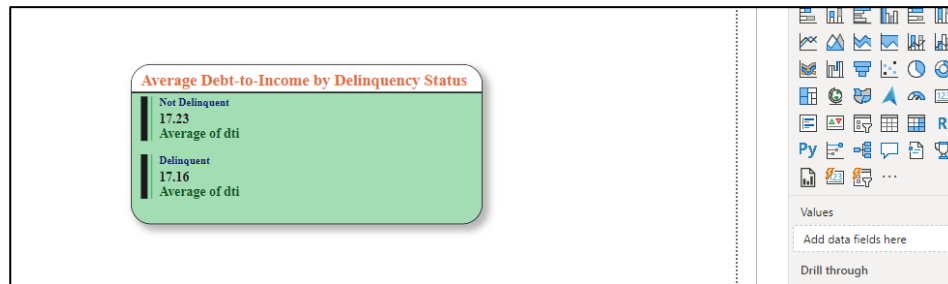


Figure 6.4

This setup makes it easy to see the average debt-to-income ratios for borrowers with delinquency status 17.16 and those without delinquency status 17.23.

5. **Sum of Loan Amount by Home Ownership:** Create a table to show the total loan amount by home ownership.

[< Back to report](#)

SUM OF LOAN AMOUNT BY HOME OWNERSHIP	
home_ownership	Sum of loan_amnt
Mortgage	73608220
Other	105150
Own	12907370
Rent	63881835
Total	6674456000

Figure 6.5

The above table shows that the majority of the loan amounts are associated with mortgages and renting, with significantly smaller amounts for other types of home ownership.

6. **Average Remaining Principal by Verification Status:** Create a donut chart to display the average remaining outstanding principal by verification status.

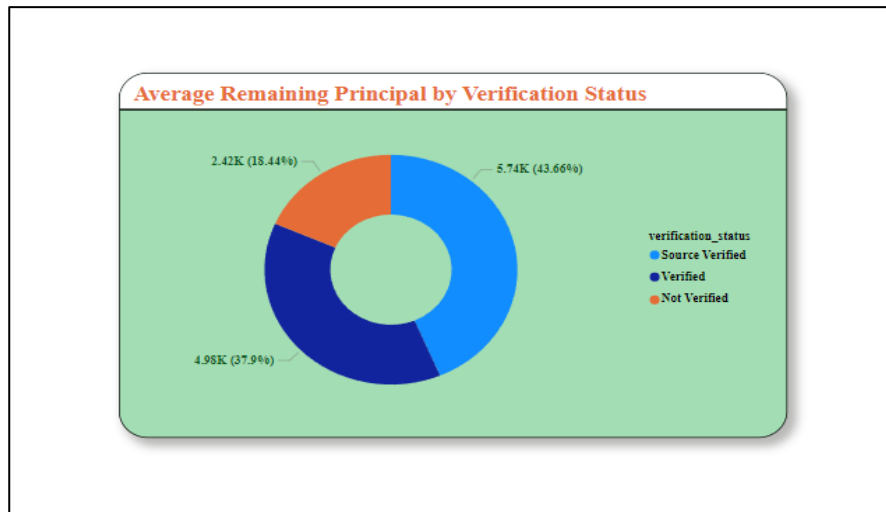


Figure 6.6

The donut chart illustrates the average remaining principal by verification status, showing that the majority is **source verified (43.66%)**, followed by **verified (37.9%)**, and then **not verified (18.44%)**.

7. **Sum of Delinquencies by Home Ownership:** Create a bar chart to show the total number of delinquencies in the past 2 years by home ownership and filter the visual to display only Mortgage, Rent, and Own.

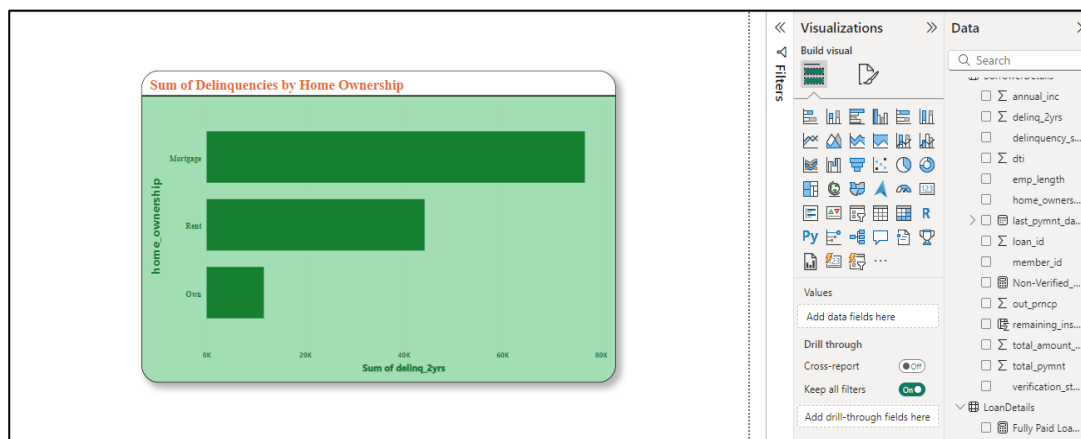


Figure 6.7

The bar chart above illustrates the sum of delinquencies by home ownership status. It shows that the majority of delinquencies are associated with mortgage holders, followed by those who rent, and the lowest number of delinquencies is among those who own their homes outright.

8. **Max Remaining Installments by Employment Length:** Create a treemap to show the maximum remaining installments by employment length.

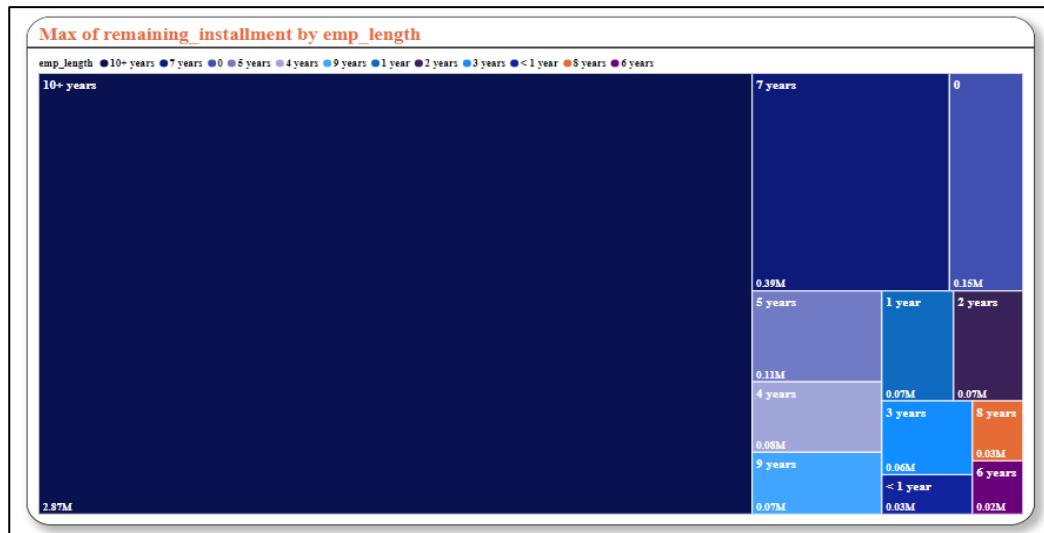


Figure 6.8

The treemap above illustrates the maximum remaining installment by employment length, with the majority being for those with **10+ years of employment**, followed by those with **less than 10 years**.

9. **Total Amount Paid and Funded Amount Over Time:** Create a line chart to display the sum of total amount paid and the sum of funded amount by the year of last payment date.

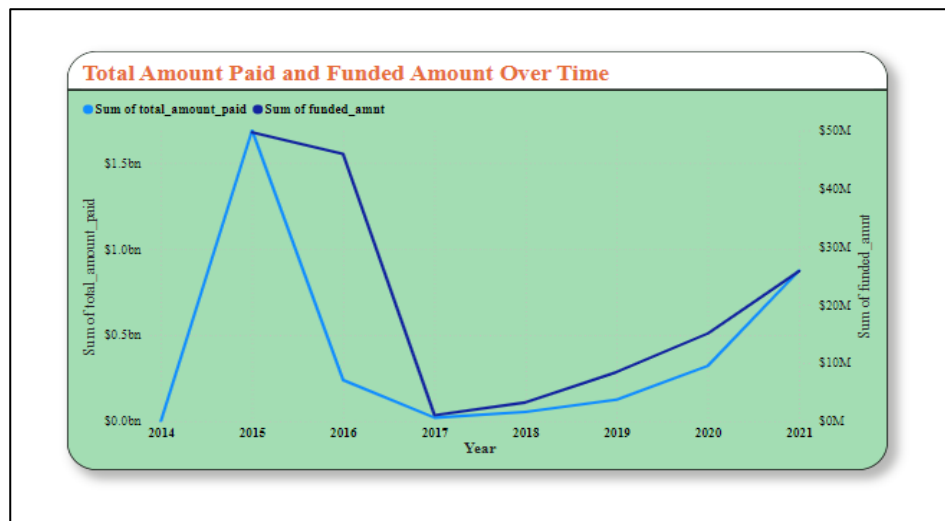


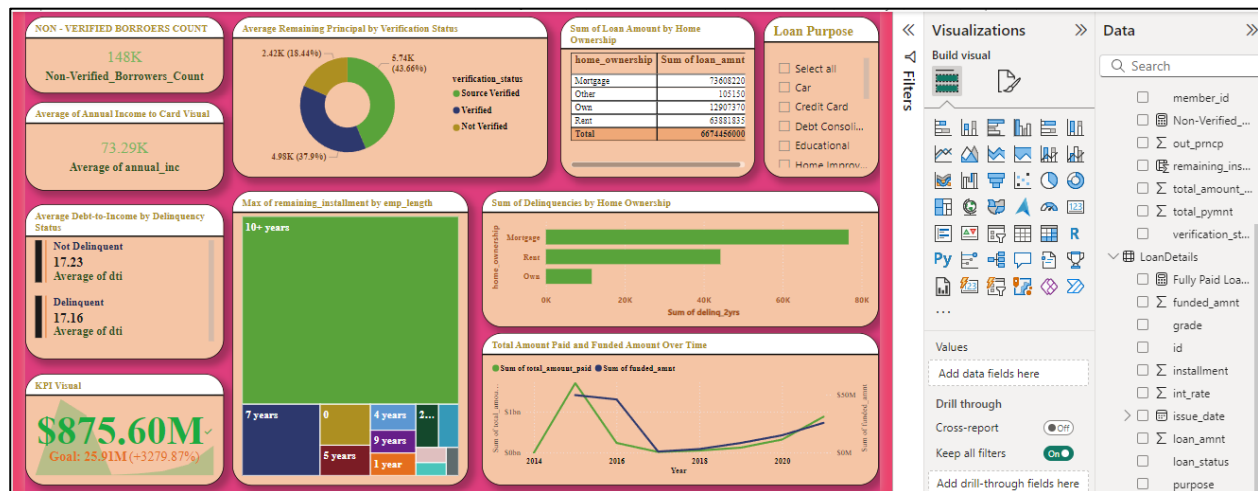
Figure 6.9

The line chart above indicates that both the sum of the total amount paid and the sum of the funded amount experienced an uncertain decrease in 2017. However, in the following years, there was a rapid increase in both metrics, highlighting a significant upward trend.

10. Purpose Slicer: Add a slicer for loan purpose to enable dynamic data exploration.

Loan Purpose

☐ Select all
☒ Car
☒ Credit Card
☒ Debt Consolidation
☒ Educational
☒ Home Improvement
☒ House
☒ Major Purchase
☒ Medical
☒ Moving
☒ Other
☒ Renewable Energy
☒ Small Business
☒ Vacation
☒ Wedding



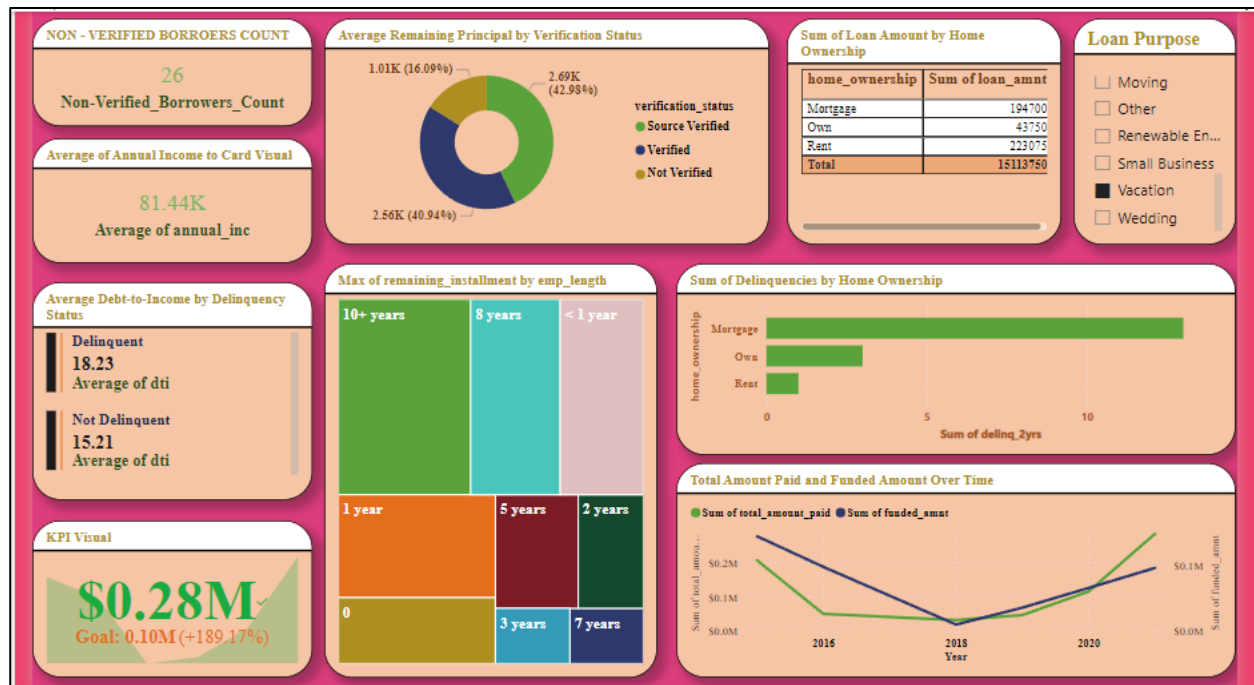


Figure 6.10

Key finding:

- **Car Loans:** The average annual income for individuals with car loans is \$77.32K.
- **Credit Card:** The KPI visual shows a loss of 6.4% compared to the target value.
- **Credit Consolidation:** The count of non-verified borrowers is 1,981, which is higher compared to other categories.
- **House Loans:** The KPI visual is 31.62% below the target value.
- **Moving Loans:** The percentage of source-verified loans for moving purposes is very high at 72.05%.
- **Small Business Ownership:** The majority of remaining installments by employee length is for 5 years.
- **Wedding Loans:** The maximum remaining installment by employee length is greater than 1 year.

Performance Against Target: When the total payments approach or surpass \$875.60M, it reflects robust repayment performance. Conversely, a significantly lower amount may indicate challenges in loan recovery. **Yearly Trends:** Analyzing years with varying payment levels can provide insights into external factors influencing repayment behaviors. **Achievement of Goal:** Setting a goal of \$25.91M, representing a 3279.87% increase, establishes a high standard. Meeting this goal would signify outstanding performance and substantial growth in repayments.

The line chart above indicates that both the sum of the total amount paid and the sum of the funded amount experienced an uncertain decrease in 2017. However, in the following years, there was a rapid increase in both metrics, highlighting a significant upward trend.

CHAPTER – V

INTERPRETATION:

Loan Performance Analysis:

In January, the percentage of fully paid loans was much higher than in other months. Home loans made up the majority of loan amounts in March and June. In April, the total amount paid by current and fully paid loans was almost equal. July saw the largest portion of total payments coming from grace period loans. The total installments paid in September and December 2021 were lower than the previous year. October had an exceptionally high total funded amount, while November had a notably lower percentage of fully paid loans.

In January, the percentage of fully paid loans was much higher than in other months. Home loans made up the majority of loan amounts in March and June. In April, the total amount paid by current and fully paid loans was almost equal. July saw the largest portion of total payments coming from grace period loans. The total installments paid in September and December 2021 were lower than the previous year. October had an exceptionally high total funded amount, while November had a notably lower percentage of fully paid loans. To improve performance, replicate successful strategies from January, focus on home loans in March and June, balance payments in April, review grace period terms in July, investigate declines in September and December, prepare for high demand in October, and offer support in November.

Borrower Profile Analysis:

For specific loan purposes, car loan borrowers have an average annual income of \$77.32K. Credit card KPIs show a 6.4% loss compared to the target. Credit consolidation has 1,981 non-verified borrowers, higher than other categories. House loan KPIs are 31.62% below the target. Moving loans have a high verification rate at 72.05%. Small business loans mostly have remaining installments for employees with a length of 5 years, and wedding loans have a maximum remaining installment period of over 1 year.

To improve loan performance, focus on addressing the 6.4% loss in credit card KPIs by identifying and mitigating key risk factors. Enhance verification processes for credit consolidation loans, as they have the highest number of non-verified borrowers (1,981). Prioritize strategies to boost house loan KPIs, which are significantly below target by 31.62%. Leverage the high verification rate of moving loans (72.05%) as a best practice model for other loan categories. For small business loans, consider offering flexible installment plans to accommodate the typical 5-year employee installment length. Lastly, ensure wedding loans have manageable repayment terms, given their maximum remaining installment period of over 1 year.