Cashflow Management

A Data Visualization Case-Study

Presented By:

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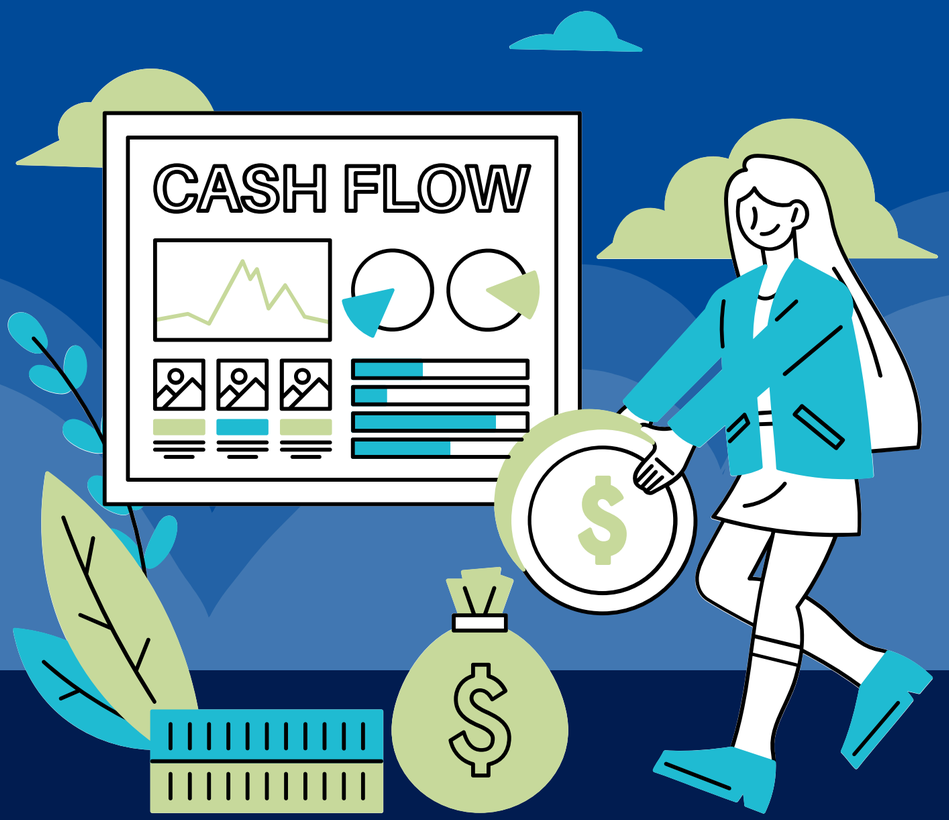
Problem Statement



The challenge of Cash flow, the movement of money in and out of businesses or individuals, is vital for effective financial management.

Businesses struggle with effectively monitoring cash inflows and outflows, leading to liquidity issues and inefficiencies in financial decision-making.

This project aims to help businesses make data-driven decisions, improve liquidity management, enhance operational efficiency, and ensure long-term financial stability.

Objectives

The objective of this project is to develop an interactive data visualization solution using Power BI to:

- Provide a complete view of cash inflows, outflows, and net cash flow.
- Enable cash flow forecasting and predictive analysis.
- Compare actual vs. budgeted cash flows and optimize working capital.
- Provide a blueprint of how a company can improve its cashflow.
- Ensure accessibility to ease cash flow management for everyone.

I. Data Collection and Dataset

Dataset Source: financial_loan.csv:
https://drive.google.com/drive/folders/1wjjTBUg2SHXJQwVNjI5vHLk6DjI2W7y7

- This dataset contains detailed records of bank loan transactions, as well as additional fields to support cash flow management analysis. The data includes both financial information about loans, and attributes that provide information regarding cash flow transactions.

- The dataset can be used for cash flow analysis, including inflow/outflow tracking, cash forecasting, and loan repayment analysis.

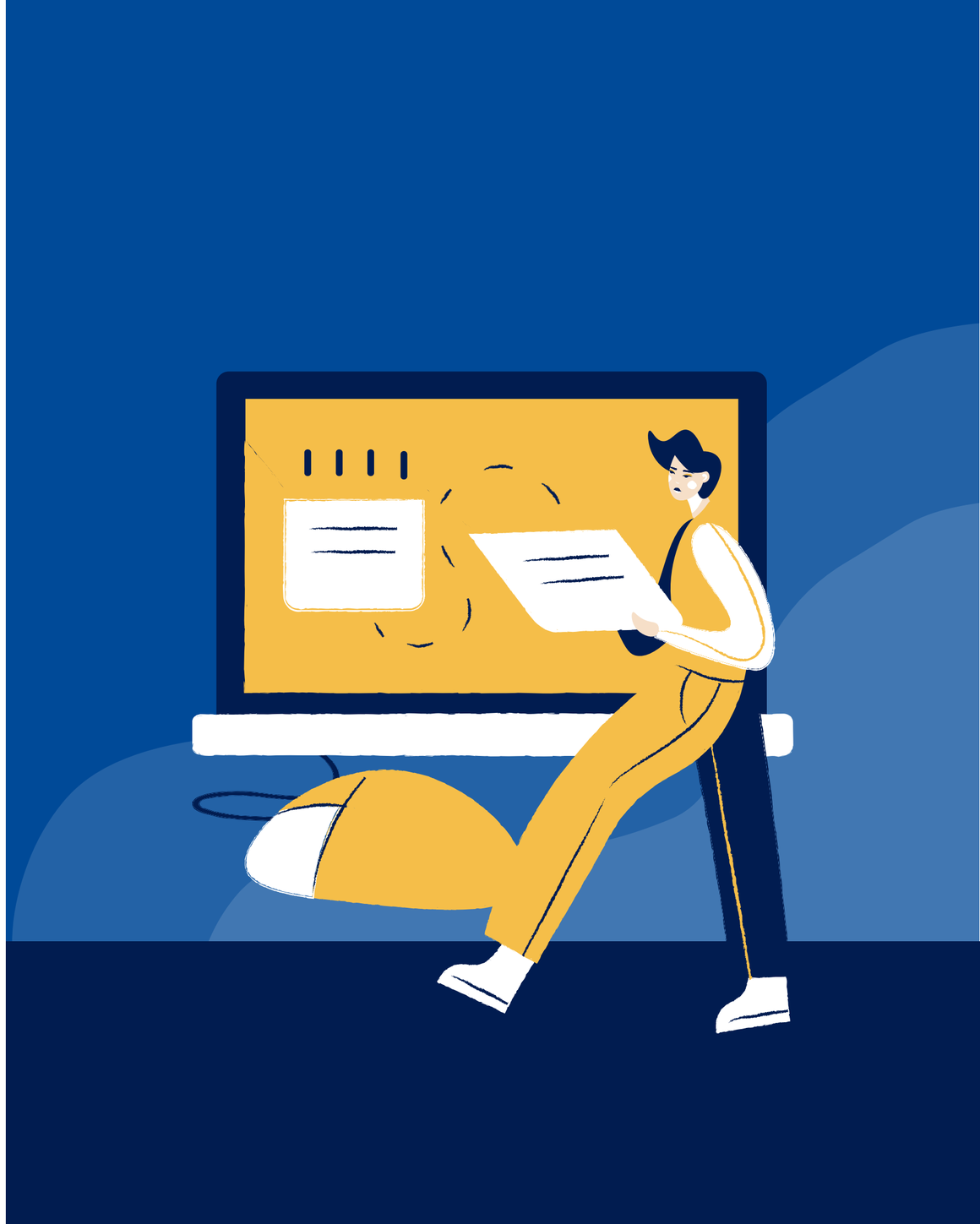
- It includes transaction timestamps, categories, payment methods, vendor names, and unique transaction IDs.

Hardware Used

- Laptop with a minimum of 8GB of RAM
- 256 GB of storage space.

Software Used

- Power BI Desktop (For Report Creation)
- Power BI Service (For Dashboard Generation)
- Canva (For Presentations)
- Rubiscape (For Data Visualizations)
    - MS Excel



Dataset Description

Number of Rows= 38,577
Number of Columns= 32
Region Covered: USA

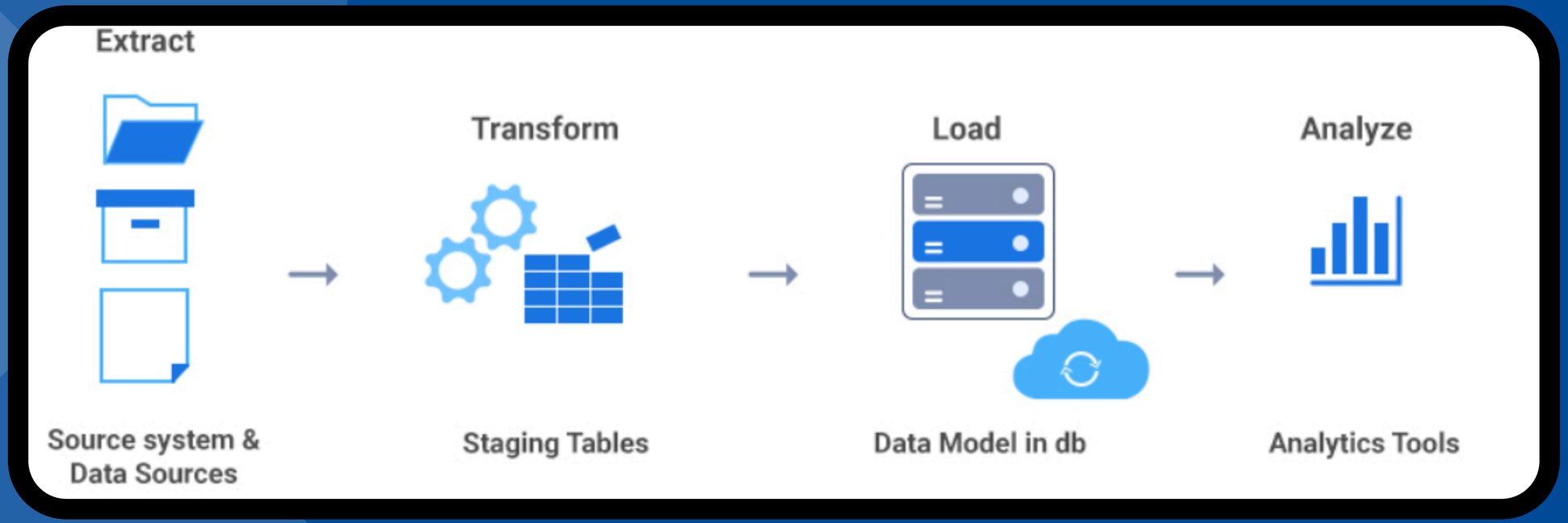
Data-Types: Date, Date-Time, Whole Number, String

- loan_amount: The principal amount of the loan issued.
- installment: Monthly installment amount to be paid by the borrower.
- issue_date: Date when the loan was issued.
- total_payment: Total amount the borrower is expected to pay, including interest.
- Additional fields related to loan terms, borrower details, and financial background.
- cash_inflow: Represents cash received by the bank (e.g., loan disbursements, payments).
- cash_outflow: Represents cash paid out by the bank (e.g., loan disbursements, repayments, fees).

Dataset Description

- date_time: Timestamp of each transaction, generated based on the loan issue date.
- category: Type of transaction (e.g., Loan Disbursement, Loan Repayment, Interest Payment).
- payment_method: Mode of payment (e.g., Bank Transfer, Cheque, Online Payment, Cash).
- vendor_name: Simulated vendor/customer names involved in the transaction.
- transaction_id: Unique identifier for each transaction.
- balance: The difference between the loan amount and the total payment, indicating cash flow position after each transaction.

II. Data Transformation



Date/Time Conversion :

- Objective: Convert string-formatted date columns to proper date/time formats.
- Columns: issue_date, last_credit_pull_date, last_payment_date, next_payment_date, date_time.
- Transformation: Convert these columns to date or datetime types.
- Purpose: Facilitates accurate time-series analysis and time intelligence calculations.

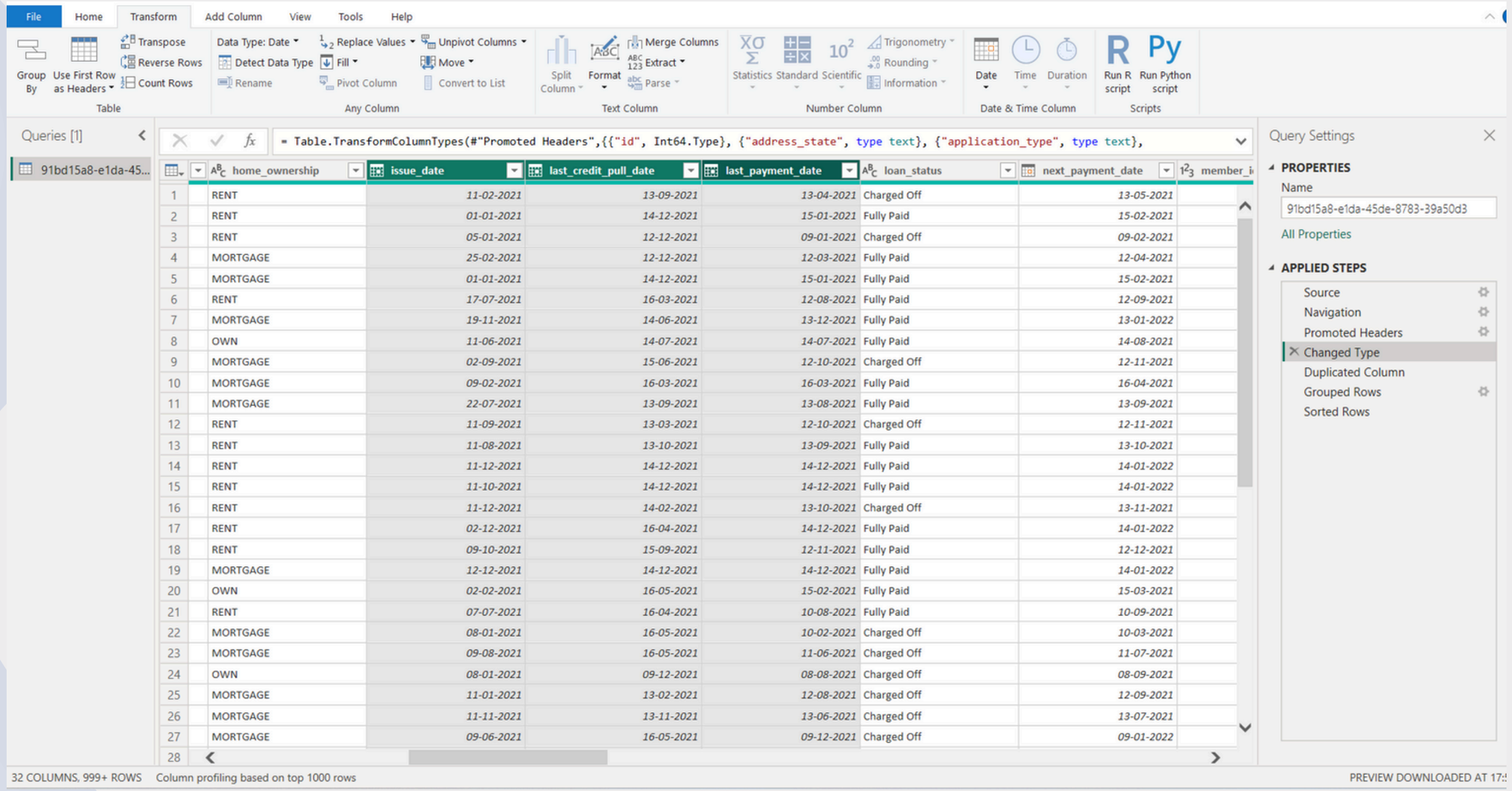


Figure.(1) Convert string-formatted date columns to proper date/time formats

1. **Handling Null Values:**

- Objective: Address missing values in the dataset.
- Columns: **emp_title.**
- Transformation: **Replace missing values** with a placeholder like **"Unknown"** or fill with a common value (**e.g., most frequent job title-mode).**
- Purpose: Ensures completeness of data and avoids inaccuracies in any aggregation or analysis involving this column.

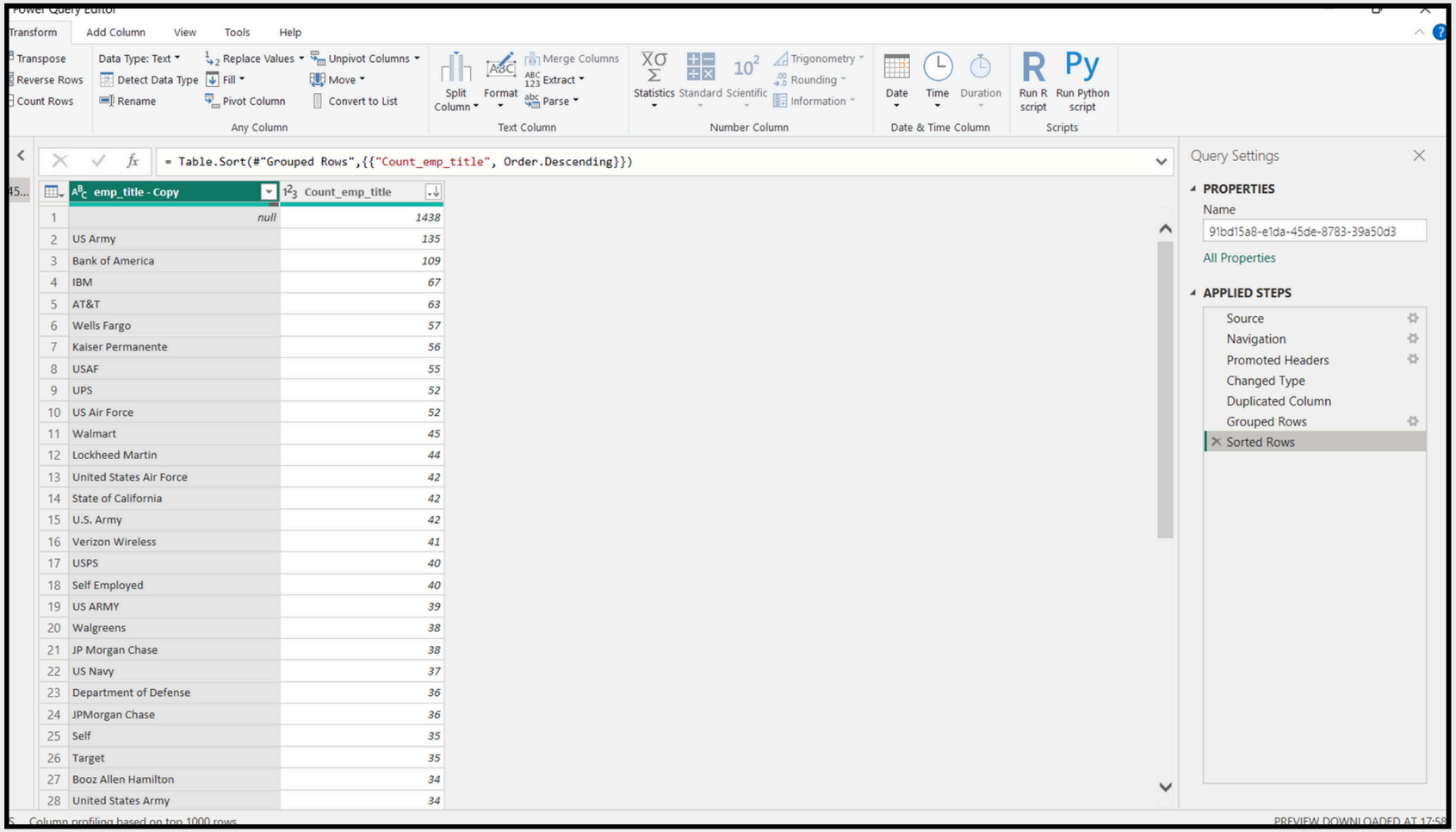


Figure.(2) Address missing values in the dataset

OBSERVATION : Us Army was the most frequent emp_title

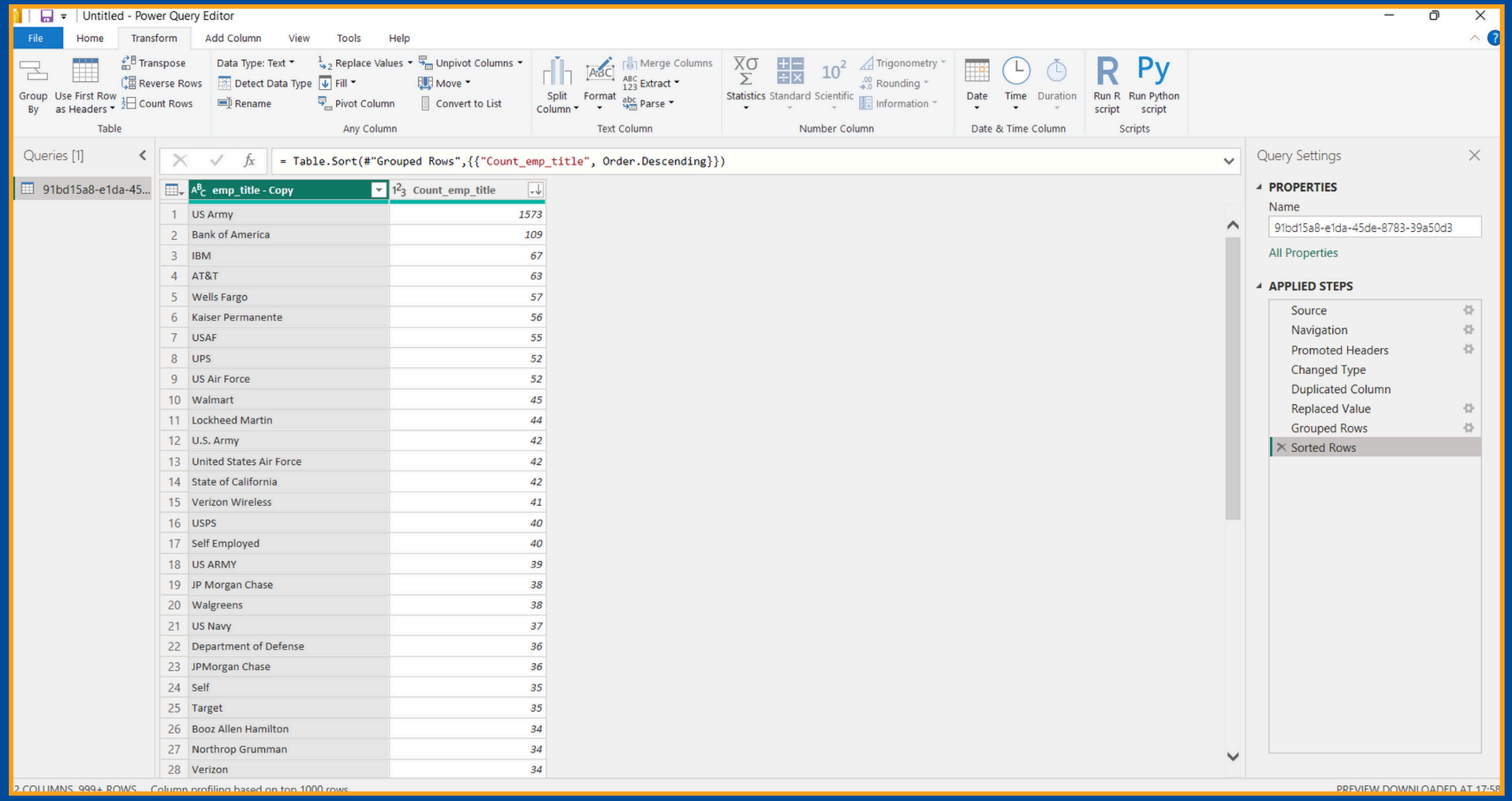
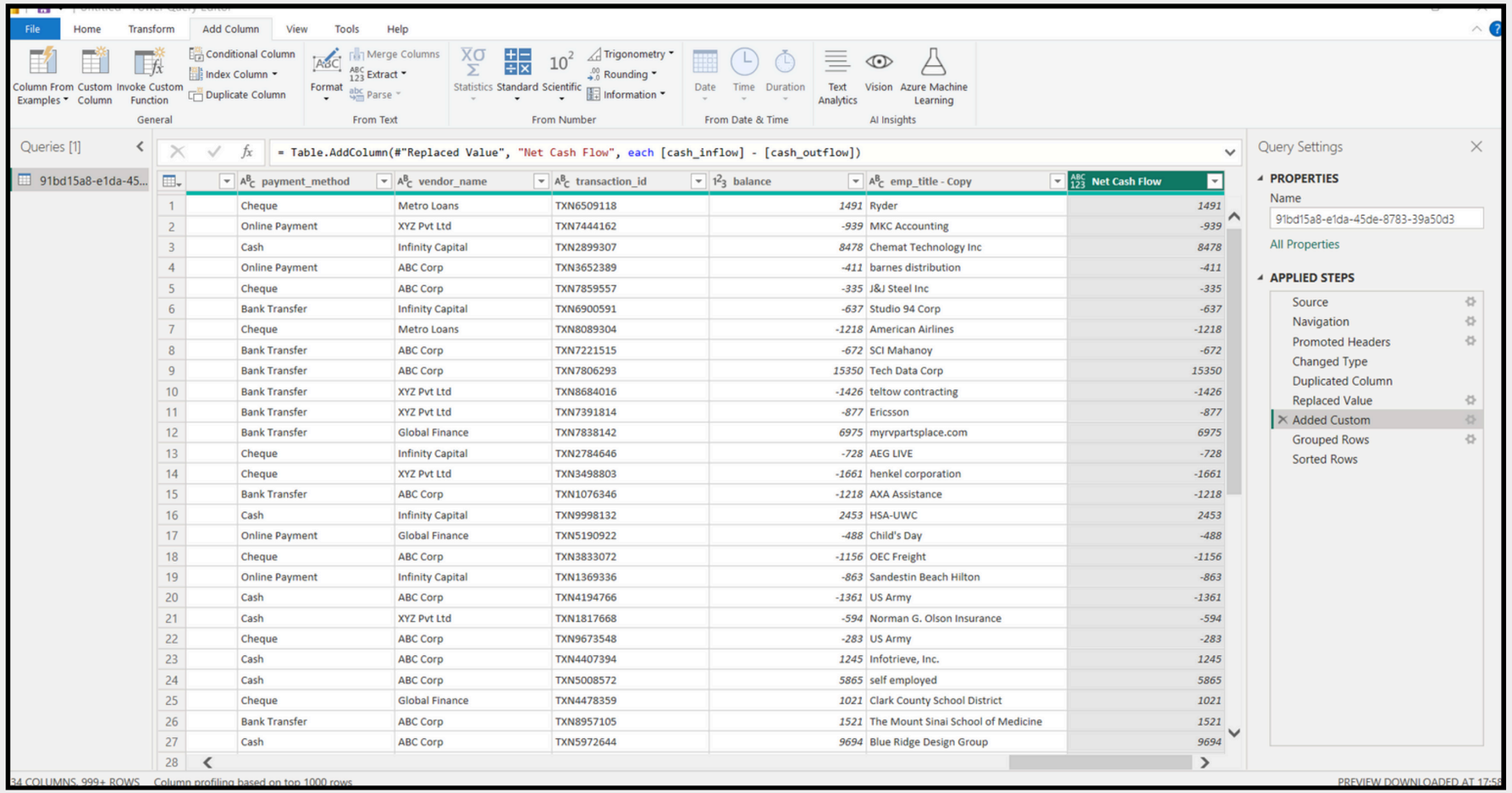


Figure.(3) Address missing values in the dataset and replacing it with most frequent value

2. Creation of Net Cash Flow:

- Objective: Calculate the **difference between cash inflows and outflows.**
- Columns Involved: cash_inflow, cash_outflow.
- Transformation: Create a new column called Net Cash Flow (Net Cash Flow = cash_inflow - cash_outflow).
- Purpose: Key metric to measure the **net movement of cash over time**, essential for cash flow analysis.



	payment_method	vendor_name	transaction_id	balance	emp_title - Copy	Net Cash Flow
1	Cheque	Metro Loans	TXN6509118	1491	Ryder	1491
2	Online Payment	XYZ Pvt Ltd	TXN7444162	-939	MKC Accounting	-939
3	Cash	Infinity Capital	TXN2899307	8478	Chemat Technology Inc	8478
4	Online Payment	ABC Corp	TXN3652389	-411	barnes distribution	-411
5	Cheque	ABC Corp	TXN7859557	-335	J&J Steel Inc	-335
6	Bank Transfer	Infinity Capital	TXN6900591	-637	Studio 94 Corp	-637
7	Cheque	Metro Loans	TXN8089304	-1218	American Airlines	-1218
8	Bank Transfer	ABC Corp	TXN7221515	-672	SCI Mahanoy	-672
9	Bank Transfer	ABC Corp	TXN7806293	15350	Tech Data Corp	15350
10	Bank Transfer	XYZ Pvt Ltd	TXN8684016	-1426	teltow contracting	-1426
11	Bank Transfer	XYZ Pvt Ltd	TXN7391814	-877	Ericsson	-877
12	Bank Transfer	Global Finance	TXN7838142	6975	myrvpartsplace.com	6975
13	Cheque	Infinity Capital	TXN2784646	-728	AEG LIVE	-728
14	Cheque	XYZ Pvt Ltd	TXN3498803	-1661	henkel corporation	-1661
15	Bank Transfer	ABC Corp	TXN1076346	-1218	AXA Assistance	-1218
16	Cash	Infinity Capital	TXN9998132	2453	HSA-UWC	2453
17	Online Payment	Global Finance	TXN5190922	-488	Child's Day	-488
18	Cheque	ABC Corp	TXN3833072	-1156	OEC Freight	-1156
19	Online Payment	Infinity Capital	TXN1369336	-863	Sandestin Beach Hilton	-863
20	Cash	ABC Corp	TXN4194766	-1361	US Army	-1361
21	Cash	XYZ Pvt Ltd	TXN1817668	-594	Norman G. Olson Insurance	-594
22	Cheque	ABC Corp	TXN9673548	-283	US Army	-283
23	Cash	ABC Corp	TXN4407394	1245	Infotrieve, Inc.	1245
24	Cash	ABC Corp	TXN5008572	5865	self employed	5865
25	Cheque	Global Finance	TXN4478359	1021	Clark County School District	1021
26	Bank Transfer	ABC Corp	TXN8957105	1521	The Mount Sinai School of Medicine	1521
27	Cash	ABC Corp	TXN5972644	9694	Blue Ridge Design Group	9694
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Figure.(4) Calculate the difference between cash inflows and outflows.

3. Cash Flow Status Categorization:

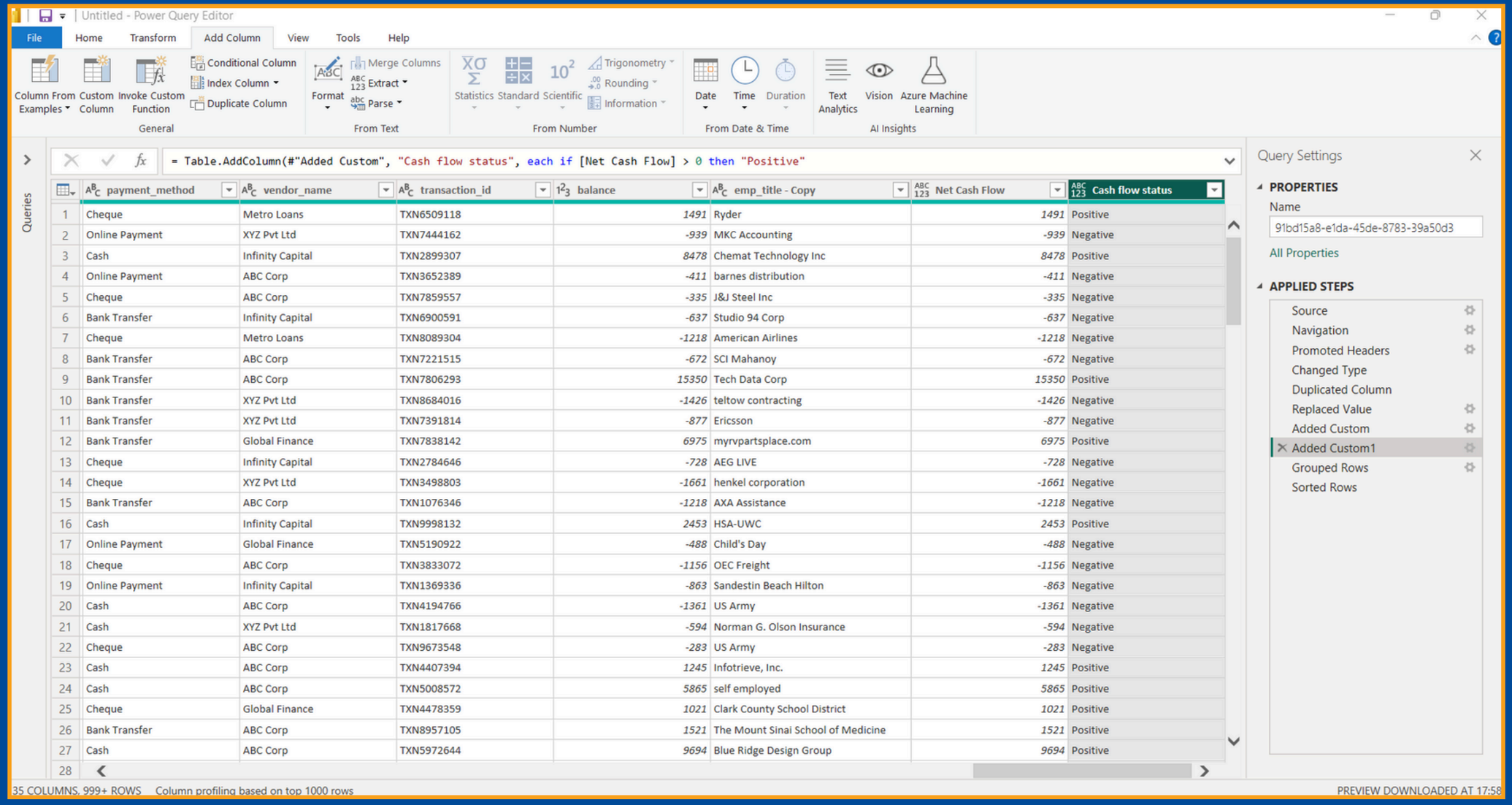
- **Objective:** Classify the cash flow as **positive, negative, or neutral.**
- Columns Involved: Net Cash Flow.
- Transformation: Create a new column Cash Flow Status with values "Positive," "Negative," or "Neutral" based on the net cash flow.
- Purpose: Helps in quickly identifying periods of cash surplus or deficit, enabling better decision-making.

Formula

```
= if [Net Cash Flow] > 0 then "Positive"
  else if [Net Cash Flow] < 0 then "Negative"
  else "Neutral"
```

This formula checks the value of Net Cash Flow:

- If it's greater than 0, the status is "Positive."
- If it's less than 0, the status is "Negative."
- If it's exactly 0, the status is "Neutral."



	payment_method	vendor_name	transaction_id	balance	emp_title - Copy	Net Cash Flow	Cash flow status
1	Cheque	Metro Loans	TXN6509118	1491	Ryder	1491	Positive
2	Online Payment	XYZ Pvt Ltd	TXN7444162	-939	MKC Accounting	-939	Negative
3	Cash	Infinity Capital	TXN2899307	8478	Chemat Technology Inc	8478	Positive
4	Online Payment	ABC Corp	TXN3652389	-411	barnes distribution	-411	Negative
5	Cheque	ABC Corp	TXN7859557	-335	J&J Steel Inc	-335	Negative
6	Bank Transfer	Infinity Capital	TXN6900591	-637	Studio 94 Corp	-637	Negative
7	Cheque	Metro Loans	TXN8089304	-1218	American Airlines	-1218	Negative
8	Bank Transfer	ABC Corp	TXN7221515	-672	SCI Mahanoy	-672	Negative
9	Bank Transfer	ABC Corp	TXN7806293	15350	Tech Data Corp	15350	Positive
10	Bank Transfer	XYZ Pvt Ltd	TXN8684016	-1426	teltow contracting	-1426	Negative
11	Bank Transfer	XYZ Pvt Ltd	TXN7391814	-877	Ericsson	-877	Negative
12	Bank Transfer	Global Finance	TXN7838142	6975	myrvpartsplace.com	6975	Positive
13	Cheque	Infinity Capital	TXN2784646	-728	AEG LIVE	-728	Negative
14	Cheque	XYZ Pvt Ltd	TXN3498803	-1661	henkel corporation	-1661	Negative
15	Bank Transfer	ABC Corp	TXN1076346	-1218	AXA Assistance	-1218	Negative
16	Cash	Infinity Capital	TXN9998132	2453	HSA-UWC	2453	Positive
17	Online Payment	Global Finance	TXN5190922	-488	Child's Day	-488	Negative
18	Cheque	ABC Corp	TXN3833072	-1156	OEC Freight	-1156	Negative
19	Online Payment	Infinity Capital	TXN1369336	-863	Sandestin Beach Hilton	-863	Negative
20	Cash	ABC Corp	TXN4194766	-1361	US Army	-1361	Negative
21	Cash	XYZ Pvt Ltd	TXN1817668	-594	Norman G. Olson Insurance	-594	Negative
22	Cheque	ABC Corp	TXN9673548	-283	US Army	-283	Negative
23	Cash	ABC Corp	TXN4407394	1245	Infotrieve, Inc.	1245	Positive
24	Cash	ABC Corp	TXN5008572	5865	self employed	5865	Positive
25	Cheque	Global Finance	TXN4478359	1021	Clark County School District	1021	Positive
26	Bank Transfer	ABC Corp	TXN8957105	1521	The Mount Sinai School of Medicine	1521	Positive
27	Cash	ABC Corp	TXN5972644	9694	Blue Ridge Design Group	9694	Positive
28							

Figure.(5) Classify the cash flow as positive, negative, or neutral.

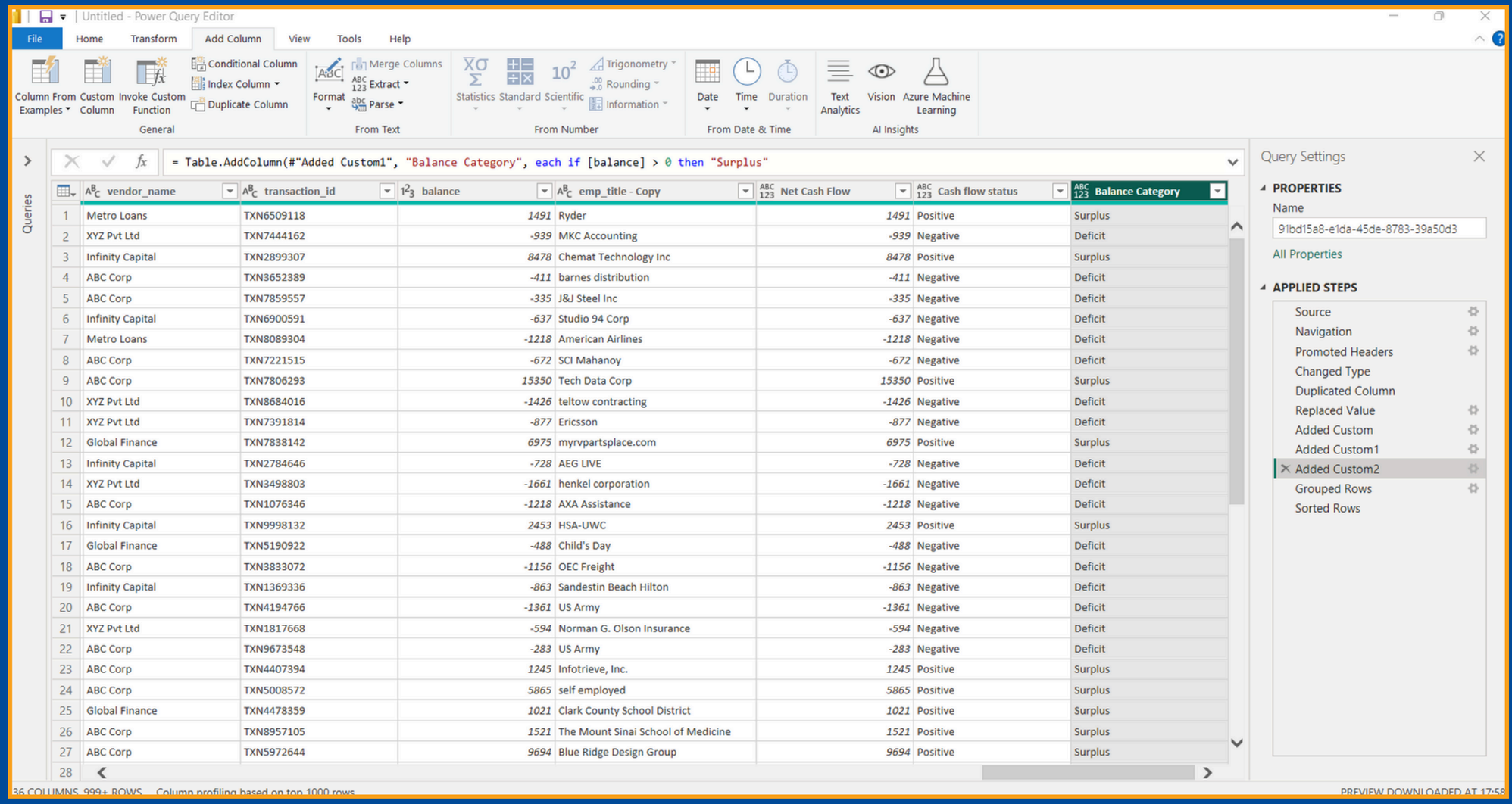
4. Balance Categorization:

- Objective: Categorize the financial balance as a surplus or deficit.
- Columns Involved: Balance.
- Transformation: Create a new column Balance Category with values "Surplus" or "Deficit" based on the balance amount.
- Purpose: Provides a quick snapshot of the financial health at any given time.

Formula:

Balance Category= if [balance] > 0 then "Surplus"
  else "Deficit"

This formula checks the value of the balance column:
If balance is greater than 0, the result is "Surplus."
If balance is less than or equal to 0, the result is "Deficit."



	vendor_name	transaction_id	balance	emp_title - Copy	Net Cash Flow	Cash flow status	Balance Category
1	Metro Loans	TXN6509118	1491	Ryder	1491	Positive	Surplus
2	XYZ Pvt Ltd	TXN7444162	-939	MKC Accounting	-939	Negative	Deficit
3	Infinity Capital	TXN2899307	8478	Chemat Technology Inc	8478	Positive	Surplus
4	ABC Corp	TXN3652389	-411	barnes distribution	-411	Negative	Deficit
5	ABC Corp	TXN7859557	-335	J&J Steel Inc	-335	Negative	Deficit
6	Infinity Capital	TXN6900591	-637	Studio 94 Corp	-637	Negative	Deficit
7	Metro Loans	TXN8089304	-1218	American Airlines	-1218	Negative	Deficit
8	ABC Corp	TXN7221515	-672	SCI Mahanoy	-672	Negative	Deficit
9	ABC Corp	TXN7806293	15350	Tech Data Corp	15350	Positive	Surplus
10	XYZ Pvt Ltd	TXN8684016	-1426	teltow contracting	-1426	Negative	Deficit
11	XYZ Pvt Ltd	TXN7391814	-877	Ericsson	-877	Negative	Deficit
12	Global Finance	TXN7838142	6975	myrvpartsplace.com	6975	Positive	Surplus
13	Infinity Capital	TXN2784646	-728	AEG LIVE	-728	Negative	Deficit
14	XYZ Pvt Ltd	TXN3498803	-1661	henkel corporation	-1661	Negative	Deficit
15	ABC Corp	TXN1076346	-1218	AXA Assistance	-1218	Negative	Deficit
16	Infinity Capital	TXN9998132	2453	HSA-UWC	2453	Positive	Surplus
17	Global Finance	TXN5190922	-488	Child's Day	-488	Negative	Deficit
18	ABC Corp	TXN3833072	-1156	OEC Freight	-1156	Negative	Deficit
19	Infinity Capital	TXN1369336	-863	Sandestin Beach Hilton	-863	Negative	Deficit
20	ABC Corp	TXN4194766	-1361	US Army	-1361	Negative	Deficit
21	XYZ Pvt Ltd	TXN1817668	-594	Norman G. Olson Insurance	-594	Negative	Deficit
22	ABC Corp	TXN9673548	-283	US Army	-283	Negative	Deficit
23	ABC Corp	TXN4407394	1245	Infotrieve, Inc.	1245	Positive	Surplus
24	ABC Corp	TXN5008572	5865	self employed	5865	Positive	Surplus
25	Global Finance	TXN4478359	1021	Clark County School District	1021	Positive	Surplus
26	ABC Corp	TXN8957105	1521	The Mount Sinai School of Medicine	1521	Positive	Surplus
27	ABC Corp	TXN5972644	9694	Blue Ridge Design Group	9694	Positive	Surplus
28							

Figure.(6) Categorize the financial balance as a surplus or deficit

5. Column Renaming and Reformatting:

- Objective: Ensure columns have clear, concise, and consistent names.
- Transformation: Rename columns as needed (e.g., id to Transaction ID, date_time to Transaction DateTime).
- Purpose: Improves readability and understanding of the dataset in reports and dashboards.

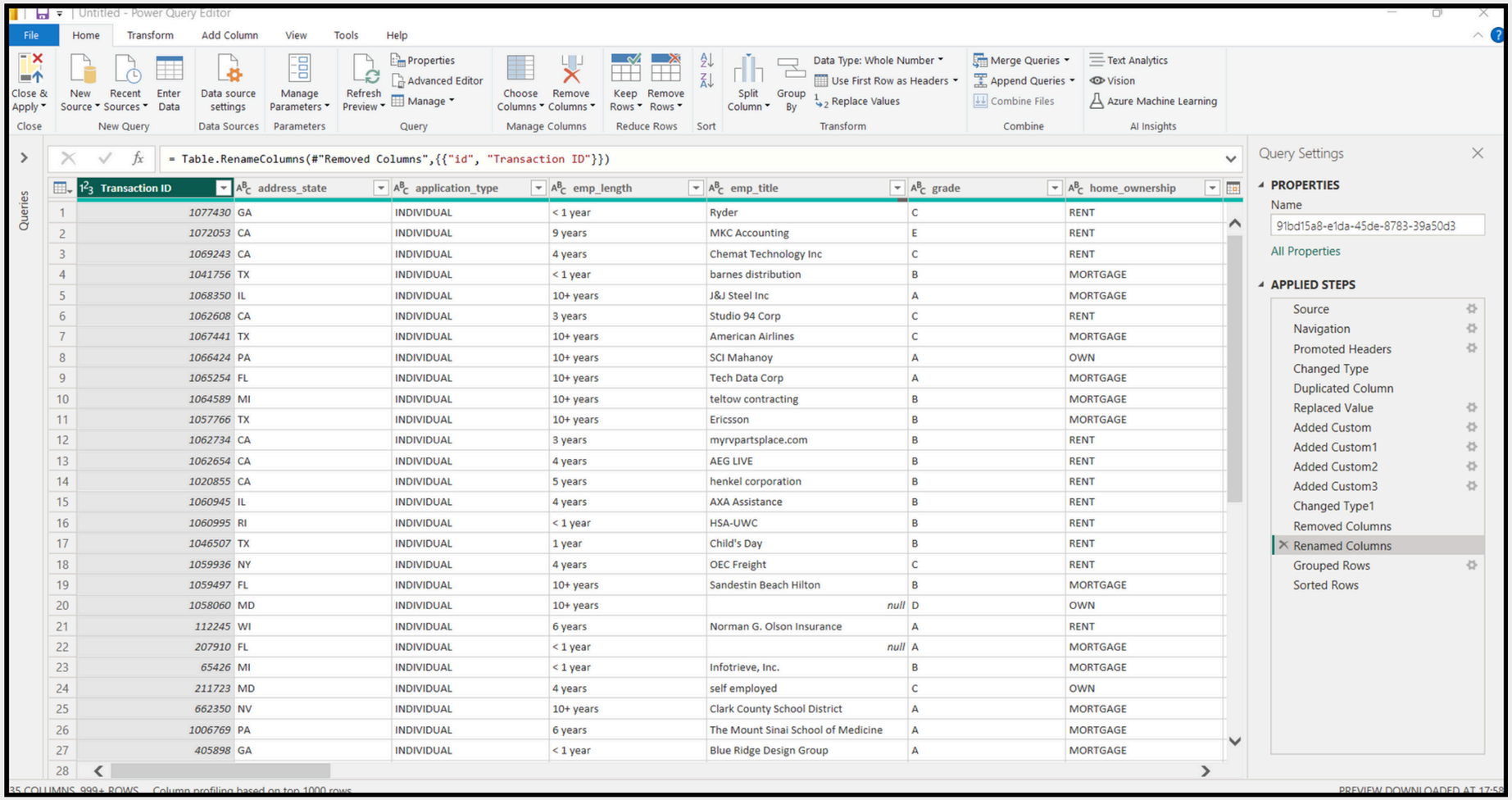


Figure.(7) Ensure columns have clear, concise, and consistent names

III. Insights

Liquidity Tracking: Make sure the company has enough cash to pay its bills by keeping track of extra cash and shortfalls.

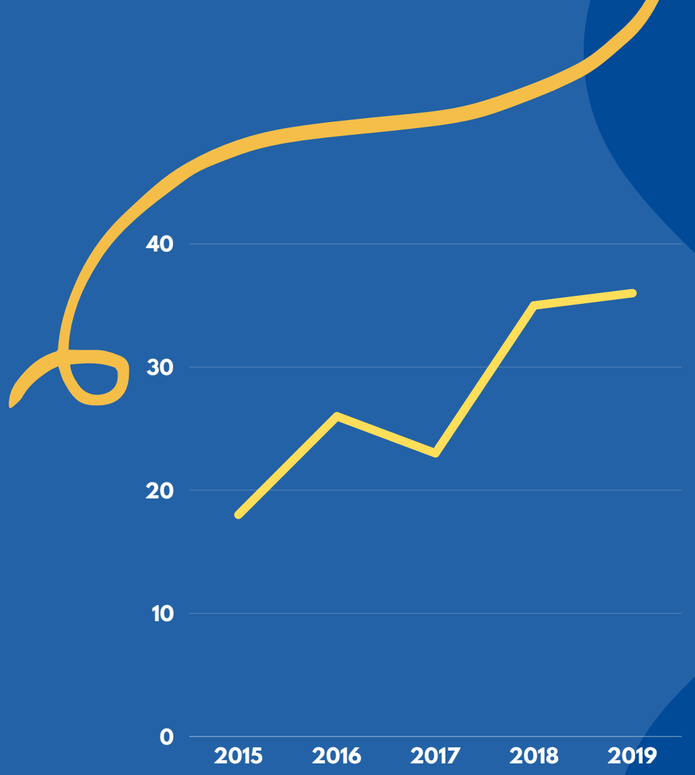
Operational Efficiency: Compare how well the company generates cash from its operations against how much cash is needed for loans and other financial activities.

Debt Management: Check if the company has enough cash flow to pay off its debts, helping to ensure financial security in the long run.

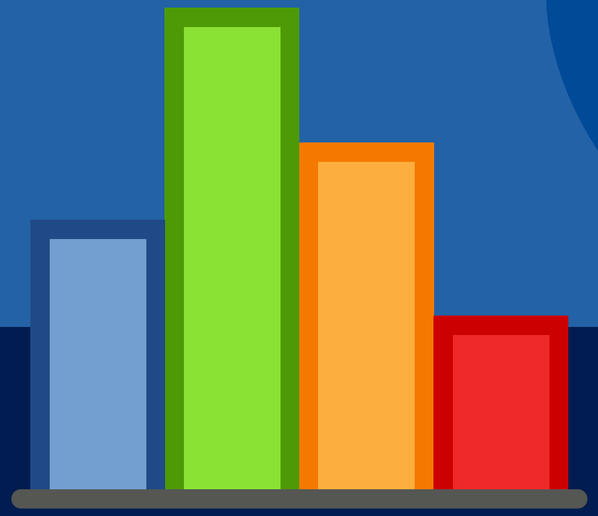
Seasonal Patterns: Identify any seasonal patterns in cash flow to prepare for times when cash is high or low.

Risk Management: Spot potential cash flow problems early and take action to avoid running out of cash.

Visualizations

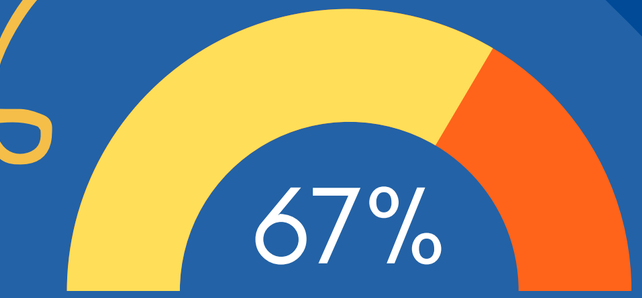


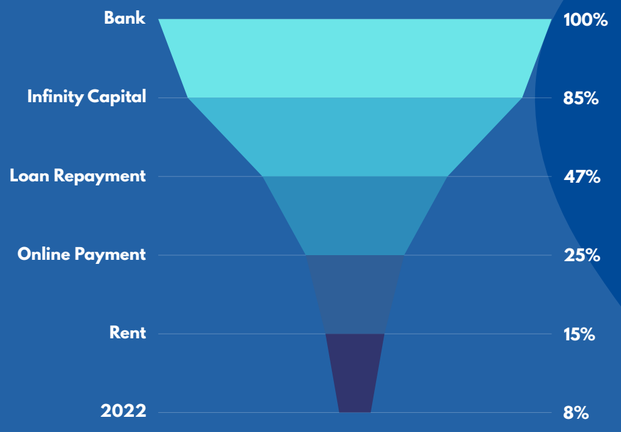
1. **Line or Area Chart:** Display net cash flow over time, with separate lines for cash inflows and outflows.
Insight: Track periods of cash surplus or deficit and identify any cyclical patterns. [Cash Flow Overview]



2. **Stacked Bar Chart:** Visualize cash flows by category (e.g., operational, financing) for each period.
Insight: Identify the primary sources and uses of cash, and ensure operational cash flow is healthy. [Cash Flow by Category]

Visualizations





Funnel Chart

3. **Gauge or KPI Visuals:** Display key cash flow ratios like the Cash Flow to Debt Ratio or Cash Flow Margin.
Insight: Monitor financial health and the company's ability to manage debt and maintain liquidity. [Cash Flow Ratios]

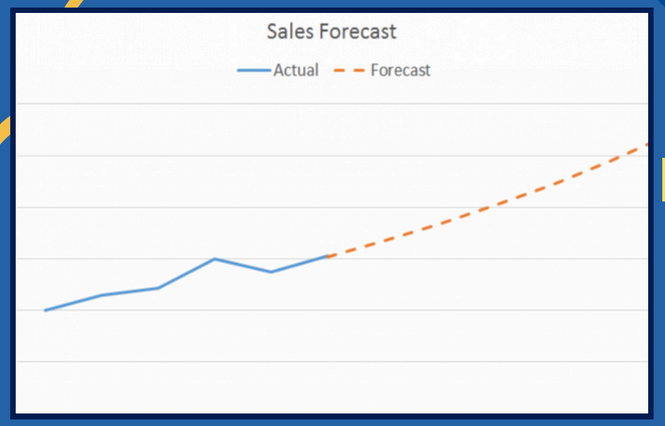
4. **Waterfall Chart:** Show the variance between actual and expected cash flows, breaking down the sources of variance.
Insight: Identify which factors contribute most to deviations from cash flow projections. [Cash Flow Variance Analysis]

Visualizations

5. **Map Visualization:** Show cash flow trends across different states or regions.
Insight: Identify regional performance and manage cash flow risks geographically. [Cash Flow by State or Region]

6. **Heatmap:** Highlight periods (months or quarters) with positive or negative net cash flow.
Insight: Quickly spot periods of cash stress or surplus and investigate the causes. [Monthly/Quarterly Cash Flow Analysis]

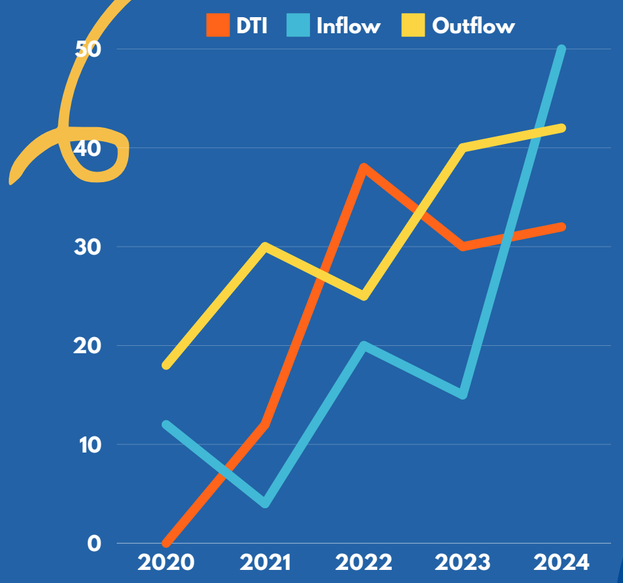
Visualizations



7. **Forecasting Line Chart:** Use historical data to predict future cash flows and identify potential liquidity issues.
Insight: Plan for future cash requirements and prepare for potential cash shortages. [Forecasting and Predictive Analysis]

8. **Dual-axis Chart:** Plot net cash flow on one axis and loan performance metrics (e.g., default rate, total payments) on the other.
Insight: Explore the relationship between cash flow and loan performance to understand how one impacts the other. [Cash Flow vs. Loan Performance]

Visualizations

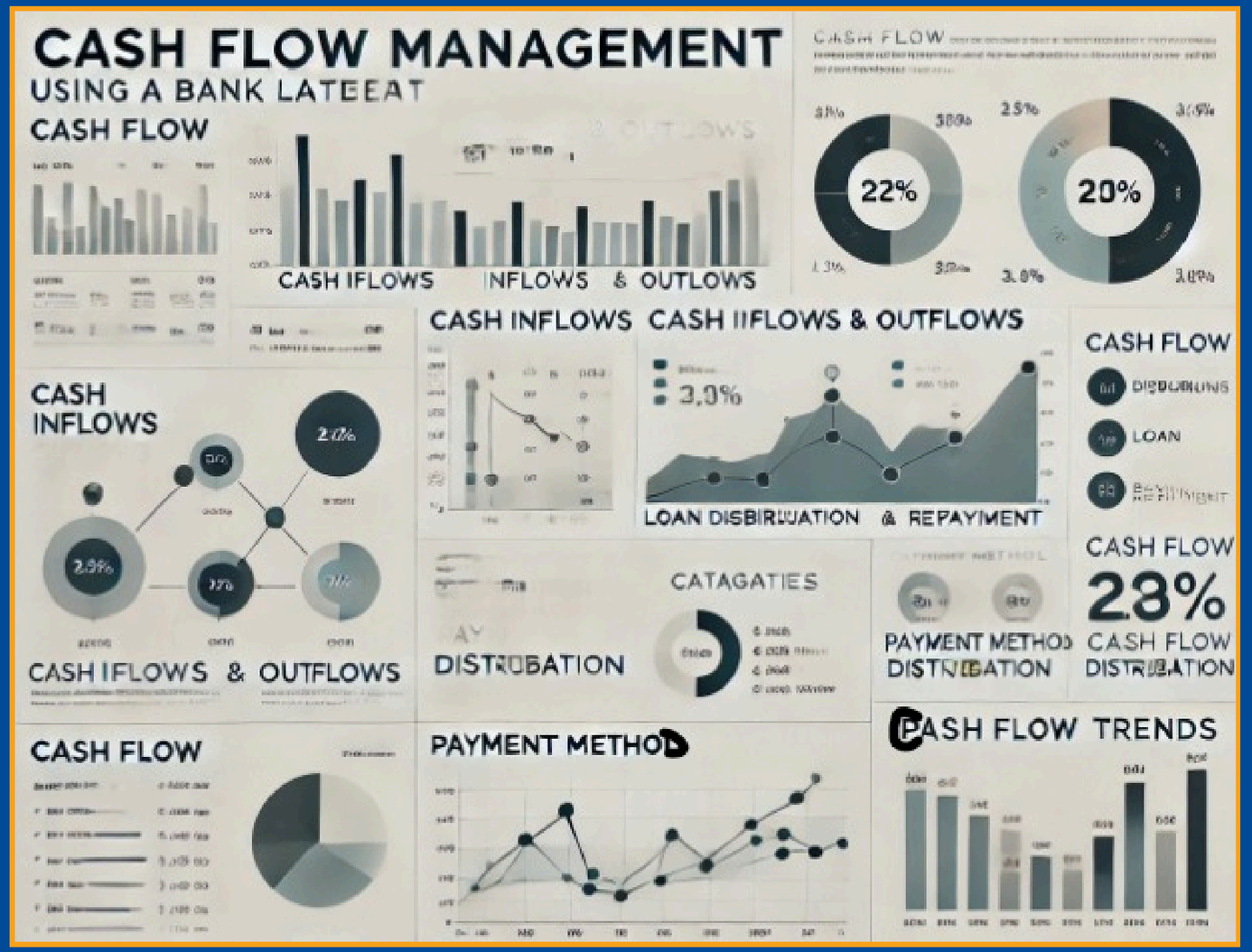


8. **Cumulative Line Chart:** Show the cumulative net cash flow over a specific period to understand overall liquidity trends.
Insight: Determine the long-term financial position and whether the company is accumulating or depleting cash reserves. [Cumulative Cash Flow]

9. **Scenario Slicers/Visuals:** Use slicers to simulate different cash flow scenarios (e.g., varying interest rates, loan defaults).
Insight: Understand potential outcomes and prepare strategies for different financial situations. [Scenario Analysis]

Cash Flow Management

Planned Dashboard Layout



Learning Outcomes

Understanding Cash Flow Dynamics:

- Gain insights into how cash inflows and outflows impact overall liquidity and the financial health of a bank.
- Learn to track, categorize, and analyze different types of transactions (e.g., disbursements, repayments, interest payments) through visualizations.

Predictive Analytics:

Learn to build and apply forecasting models to predict future cash flows, loan repayments, and potential liquidity shortfalls.

- Visualize predictive insights on dashboards to enable better financial planning and decision-making.

Learning Outcomes

Interactive Reporting & Dashboards:

- Learn to create interactive dashboards that allow stakeholders to drill down into specific data points, such as late repayments or high-risk loans.
- Understand how to build user-friendly dashboards that provide actionable insights at a glance for financial managers and decision-makers.

Operational Efficiency and Strategic Financial Planning:

- Identify operational inefficiencies in cash flow management, such as delayed payments or misaligned inflows/outflows, through data-driven insights and dashboard alerts.
- Support strategic financial planning by visualizing cash positions, forecasting future cash needs, and optimizing loan repayment schedules on a financial planning dashboard.

THANK YOU!