Bank Loan Data Analysis with SQL

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06/11/2024

Data source: Data tutorials

Problem Statements

Dashboard for Bank Lending Activities and Performance Indicators

-Provide insights into key loan-related metrics and track changes over time.

-Facilitate data-driven decisions, monitor loan portfolio health, and identify trends to inform strategy.

What are we going to do?

1.Bank Loan Report Summary using SQL

2.Bank Loan Report Overview using SQL

3.Bank Loan Report Details using SQL

Bank Loan Report Summary

- The Bank Loan Report provides a comprehensive overview of key performance indicators (KPIs) related to the bank's loan portfolio.

Bank Loan Report Summary

1. Top Summary Metrics:

- Displays the overall metrics, including:
  - **Total Loan Applications**: 38.6K
  - **Total Funded Amount**: $435.8M
  - **Total Amount Received**: $473.1M
  - **Average Interest Rate**: 12.0%
  - **Average Debt-to-Income (DTI)**: 13.3%
- Each metric also includes **Month-to-Date (MTD)** and **Month-over-Month (MOM)** changes, providing a clear view of performance trends.

Bank Loan Report Summary

2. Good Loan vs. Bad Loan Breakdown:

- **Good Loan Issued**:
  - Represents loans classified as 'good,' with 86.2% of the applications approved in this category.
  - Metrics include:
    - **Applications**: 33.2K
    - **Total Funded Amount**: $370.2M
    - **Amount Received**: $435.8M

Bank Loan Report Summary

2. Good Loan vs. Bad Loan Breakdown:

- **Bad Loan Issued**:
- Represents loans classified as 'bad.'
- Metrics include:
  - **Applications**: 5.3K
  - **Total Funded Amount**: $65.5M
  - **Amount Received**: $37.3M

Bank Loan Report Summary

3.Loan Status Breakdown:

- A detailed table categorizes loans based on their current status:
  - **Charged Off**: Total amount received $37.3M
  - **Current**: Total amount received $24.2M
  - **Fully Paid**: Total amount received $411.6M
  - **Grand Total**: Total amount received $473.1M
- Each status category includes additional metrics like total funded amount, number of applications, and average interest rate.

Bank Loan Report Summary

3.Loan Status Breakdown:

- A detailed table categorizes loans based on their current status:
  - **Charged Off**: Total amount received $37.3M
  - **Current**: Total amount received $24.2M
  - **Fully Paid**: Total amount received $411.6M
  - **Grand Total**: Total amount received $473.1M
- Each status category includes additional metrics like total funded amount, number of applications, and average interest rate.

2.Bank Loan Report - Overview

- This Overview dashboard provides an in-depth analysis of loan application metrics with multiple perspectives, including time, geography, loan term, employee length, and home ownership status. It helps understand patterns in loan applications across different factors.

2.Bank Loan Report - Overview

1.Top Summary Metrics:

- Similar to the Summary section, this part displays essential KPIs:
  - **Total Loan Applications**: 38.6K
  - **Total Funded Amount**: $435.8M
  - **Total Amount Received**: $473.1M
  - **Average Interest Rate**: 12.0%
  - **Average DTI (Debt-to-Income Ratio)**: 13.3%
- Month-to-Date (MTD) and Month-over-Month (MOM) changes are shown for each metric, allowing for quick comparison with recent periods

2.Bank Loan Report - Overview

2.Total Loan Applications by Month:

- A line chart displays the trend of loan applications over the year, illustrating any monthly fluctuations or growth patterns.

3.Total Loan Applications by State:

- A map highlights the distribution of loan applications across different U.S. states, providing geographical insights into demand and loan uptake.

4.Total Loan Applications by Term:

- A pie chart breaks down the loan applications by term duration:
  - **36 months**: 73.2%
  - **60 months**: 26.8%
- These calculations aids in understanding the preference for shorter versus longer-term loans.

2.Bank Loan Report - Overview

5. Total Loan Applications by Employee Length:

- A bar chart categorizes loan applications by the applicant's employment length, with categories ranging from under 1 year to over 10 years.
- The highest number of applications are from individuals with 10+ years of employment, indicating a potential preference for borrowers with stable job histories.

6.Total Loan Applications by Loan Purpose:

- A bar chart shows the distribution of loan applications based on their intended purpose, such as debt consolidation, credit card refinancing, and home improvement.
- Debt consolidation is the most common reason for loan applications.

2.Bank Loan Report - Overview

7. Total Loan Applications by Home Ownership:

- A stacked bar chart illustrates the breakdown of applications based on home ownership status, including **Rent** (18,439 applications) and **Mortgage** (17,198 applications), which highlights the correlation between housing status and loan applications

2.Bank Loan Report - Overview

"The SQL-based calculation of loan report indicators provides stakeholders with the ability to quickly gain insights into various factors affecting loan applications. This supports targeted strategies for different customer segments and tailored loan products."

3.Bank Loan Report - Details

‘The Details section offers a granular view of individual loan applications by displaying comprehensive data for each entry. This level of detail facilitates in-depth analysis and auditing, enabling stakeholders to examine specific loan characteristics and performance effectively’

3.Bank Loan Report - Details

1. Top Summary Metrics:

- Similar to the other sections, this part displays overall metrics such as:
  - **Total Loan Applications**: 38.6K
  - **Total Funded Amount**: $435.8M
  - **Total Amount Received**: $473.1M
  - **Average Interest Rate**: 12.0%
  - **Average Debt-to-Income (DTI)**: 13.3%
- Month-to-Date (MTD) and Month-over-Month (MOM) changes are shown to provide context.

3.Bank Loan Report - Details

2.Detailed Loan Data Table:

- This table includes the following columns for each loan application:
  - **Id**: Unique identifier for each loan.
  - **Purpose**: Reason for the loan (e.g., credit card, debt consolidation, home improvement).
  - **Home Ownership**: Applicant's housing status (e.g., Mortgage, Rent, Own).
  - **Grade & Sub Grade**: Risk grades assigned to the loan, indicating credit quality.
  - **Issue Date**: Date the loan was issued.
  - **Interest Rate (Int Rate)**: The rate applied to the loan.
  - **Loan Amount**: The total funded amount for each loan.
  - **Installment**: Monthly payment required to service the loan.
  - **Total Payment**: Total payment amount over the life of the loan.

3.Bank Loan Report Dashboard - Details

3.Filters:

- Filters are available on the left side to refine the data displayed:
  - **Select Measure**: Allows users to switch between different measures, such as Total Loan Applications.
  - **Grade**: Filter loans by credit grade.
  - **Verification Status**: Filter by the verification status of the loan.
  - **Purpose**: Filter loans based on their purpose, such as credit card consolidation or home improvement.

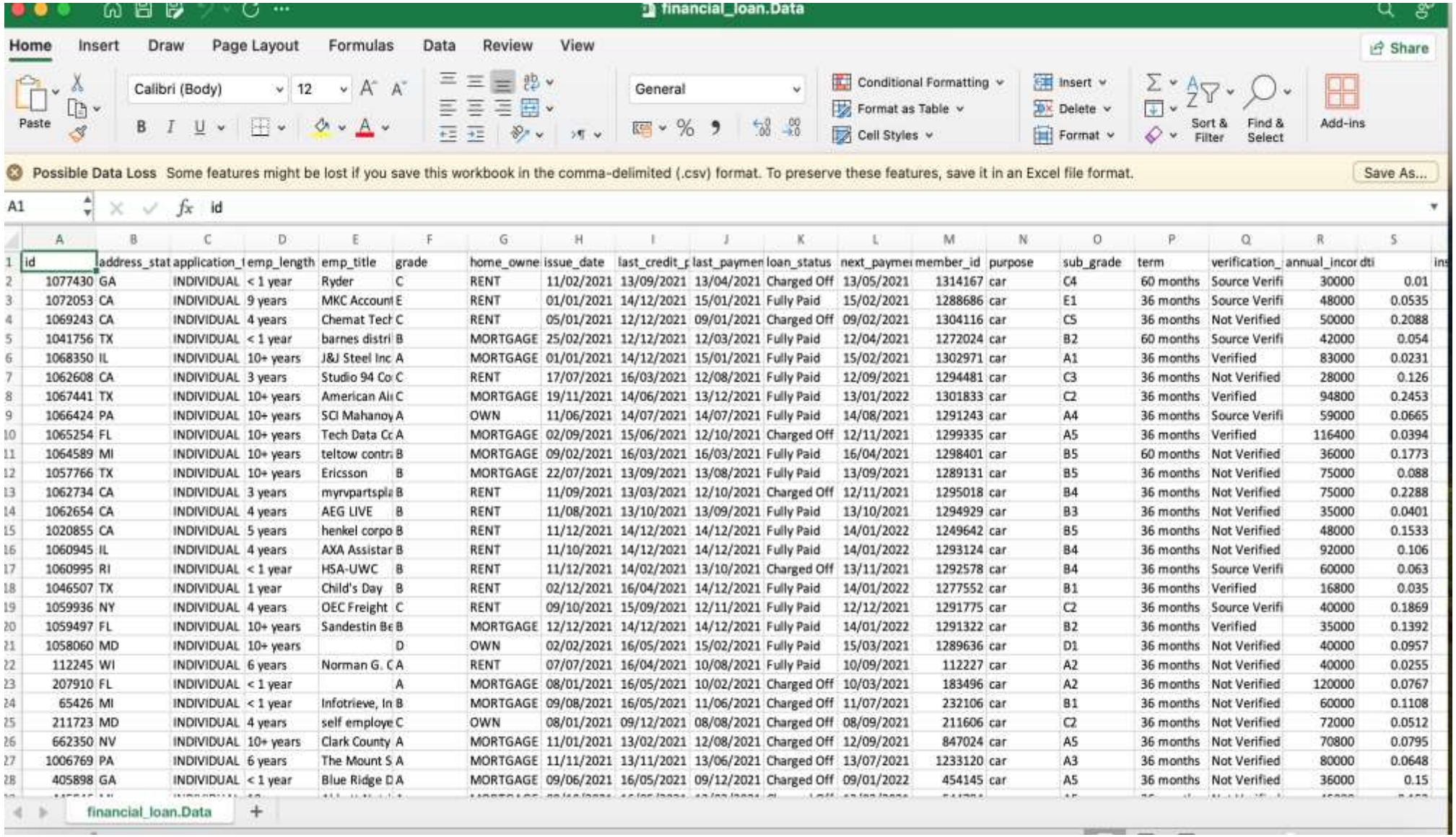
3.Bank Loan Report - Details

‘The Details section uses SQL queries to provide a granular view of individual loan applications, displaying comprehensive data for each entry. This detailed SQL-based analysis supports in-depth examination and auditing, allowing stakeholders to effectively evaluate specific loan characteristics and performance’.

Bank Loan Creation Walkthrough

The following slides provide a step-by-step guide, with screenshots, demonstrating the process I followed to create the Bank Loan Report using SQL in the BigQuery sandbox.

Our Data



id	address_stat	application_t	emp_length	emp_title	grade	home_owne	issue_date	last_credit_p	last_paymen	loan_status	next_payme	member_id	purpose	sub_grade	term	verification_	annual_incor	dti
1077430	GA	INDIVIDUAL	< 1 year	Ryder	C	RENT	11/02/2021	13/09/2021	13/04/2021	Charged Off	13/05/2021	1314167	car	C4	60 months	Source Verifi	30000	0.01
1072053	CA	INDIVIDUAL	9 years	MKC Account	E	RENT	01/01/2021	14/12/2021	15/01/2021	Fully Paid	15/02/2021	1288686	car	E1	36 months	Source Verifi	48000	0.0535
1069243	CA	INDIVIDUAL	4 years	Chemat Tech	C	RENT	05/01/2021	12/12/2021	09/01/2021	Charged Off	09/02/2021	1304116	car	C5	36 months	Not Verified	50000	0.2088
1041756	TX	INDIVIDUAL	< 1 year	barnes distri	B	MORTGAGE	25/02/2021	12/12/2021	12/03/2021	Fully Paid	12/04/2021	1272024	car	B2	60 months	Source Verifi	42000	0.054
1068350	IL	INDIVIDUAL	10+ years	J&J Steel Inc	A	MORTGAGE	01/01/2021	14/12/2021	15/01/2021	Fully Paid	15/02/2021	1302971	car	A1	36 months	Verified	83000	0.0231
1062608	CA	INDIVIDUAL	3 years	Studio 94 Co	C	RENT	17/07/2021	16/03/2021	12/08/2021	Fully Paid	12/09/2021	1294481	car	C3	36 months	Not Verified	28000	0.126
1067441	TX	INDIVIDUAL	10+ years	American Ai	C	MORTGAGE	19/11/2021	14/06/2021	13/12/2021	Fully Paid	13/01/2022	1301833	car	C2	36 months	Verified	94800	0.2453
1066424	PA	INDIVIDUAL	10+ years	SCI Mahanoy	A	OWN	11/06/2021	14/07/2021	14/07/2021	Fully Paid	14/08/2021	1291243	car	A4	36 months	Source Verifi	59000	0.0665
1065254	FL	INDIVIDUAL	10+ years	Tech Data Cc	A	MORTGAGE	02/09/2021	15/06/2021	12/10/2021	Charged Off	12/11/2021	1299335	car	A5	36 months	Verified	116400	0.0394
1064589	MI	INDIVIDUAL	10+ years	teltow contr	B	MORTGAGE	09/02/2021	16/03/2021	16/03/2021	Fully Paid	16/04/2021	1298401	car	B5	60 months	Not Verified	36000	0.1773
1057766	TX	INDIVIDUAL	10+ years	Ericsson	B	MORTGAGE	22/07/2021	13/09/2021	13/08/2021	Fully Paid	13/09/2021	1289131	car	B5	36 months	Not Verified	75000	0.088
1062734	CA	INDIVIDUAL	3 years	myrvpartspla	B	RENT	11/09/2021	13/03/2021	12/10/2021	Charged Off	12/11/2021	1295018	car	B4	36 months	Not Verified	75000	0.2288
1062654	CA	INDIVIDUAL	4 years	AEG LIVE	B	RENT	11/08/2021	13/10/2021	13/09/2021	Fully Paid	13/10/2021	1294929	car	B3	36 months	Not Verified	35000	0.0401
1020855	CA	INDIVIDUAL	5 years	henkel corpo	B	RENT	11/12/2021	14/12/2021	14/12/2021	Fully Paid	14/01/2022	1249642	car	B5	36 months	Not Verified	48000	0.1533
1060945	IL	INDIVIDUAL	4 years	AXA Assistar	B	RENT	11/10/2021	14/12/2021	14/12/2021	Fully Paid	14/01/2022	1293124	car	B4	36 months	Not Verified	92000	0.106
1060995	RI	INDIVIDUAL	< 1 year	HSA-UWC	B	RENT	11/12/2021	14/02/2021	13/10/2021	Charged Off	13/11/2021	1292578	car	B4	36 months	Source Verifi	60000	0.063
1046507	TX	INDIVIDUAL	1 year	Child's Day	B	RENT	02/12/2021	16/04/2021	14/12/2021	Fully Paid	14/01/2022	1277552	car	B1	36 months	Verified	16800	0.035
1059936	NY	INDIVIDUAL	4 years	OEC Freight	C	RENT	09/10/2021	15/09/2021	12/11/2021	Fully Paid	12/12/2021	1291775	car	C2	36 months	Source Verifi	40000	0.1869
1059497	FL	INDIVIDUAL	10+ years	Sandestin Be	B	MORTGAGE	12/12/2021	14/12/2021	14/12/2021	Fully Paid	14/01/2022	1291322	car	B2	36 months	Verified	35000	0.1392
1058060	MD	INDIVIDUAL	10+ years		D	OWN	02/02/2021	16/05/2021	15/02/2021	Fully Paid	15/03/2021	1289636	car	D1	36 months	Not Verified	40000	0.0957
112245	WI	INDIVIDUAL	6 years	Norman G. C	A	RENT	07/07/2021	16/04/2021	10/08/2021	Fully Paid	10/09/2021	112227	car	A2	36 months	Not Verified	40000	0.0255
207910	FL	INDIVIDUAL	< 1 year		A	MORTGAGE	08/01/2021	16/05/2021	10/02/2021	Charged Off	10/03/2021	183496	car	A2	36 months	Not Verified	120000	0.0767
65426	MI	INDIVIDUAL	< 1 year	Infotrieve, In	B	MORTGAGE	09/08/2021	16/05/2021	11/06/2021	Charged Off	11/07/2021	232106	car	B1	36 months	Not Verified	60000	0.1108
211723	MD	INDIVIDUAL	4 years	self employe	C	OWN	08/01/2021	09/12/2021	08/08/2021	Charged Off	08/09/2021	211606	car	C2	36 months	Not Verified	72000	0.0512
662350	NV	INDIVIDUAL	10+ years	Clark County	A	MORTGAGE	11/01/2021	13/02/2021	12/08/2021	Charged Off	12/09/2021	847024	car	A5	36 months	Not Verified	70800	0.0795
1006769	PA	INDIVIDUAL	6 years	The Mount S	A	MORTGAGE	11/11/2021	13/11/2021	13/06/2021	Charged Off	13/07/2021	1233120	car	A3	36 months	Not Verified	80000	0.0648
405898	GA	INDIVIDUAL	< 1 year	Blue Ridge D	A	MORTGAGE	09/06/2021	16/05/2021	09/12/2021	Charged Off	09/01/2022	454145	car	A5	36 months	Not Verified	36000	0.15

PMTD Loan Applications

```sql
SELECT COUNT(id) AS totalLoan_APP FROM `LoanPf.BankLoan`
SELECT COUNT(id) AS totalLoan_APP
FROM `LoanPf.BankLoan`
WHERE EXTRACT(MONTH FROM issue_date) = 12
AND EXTRACT(YEAR FROM issue_date) = 2021;
SELECT COUNT(id) AS PtotalLoan_APP
FROM `LoanPf.BankLoan`
WHERE EXTRACT(MONTH FROM issue_date) = 11
AND EXTRACT(YEAR FROM issue_date) = 2021;
```

Press Option+F1 for Accessibility Options

Query results

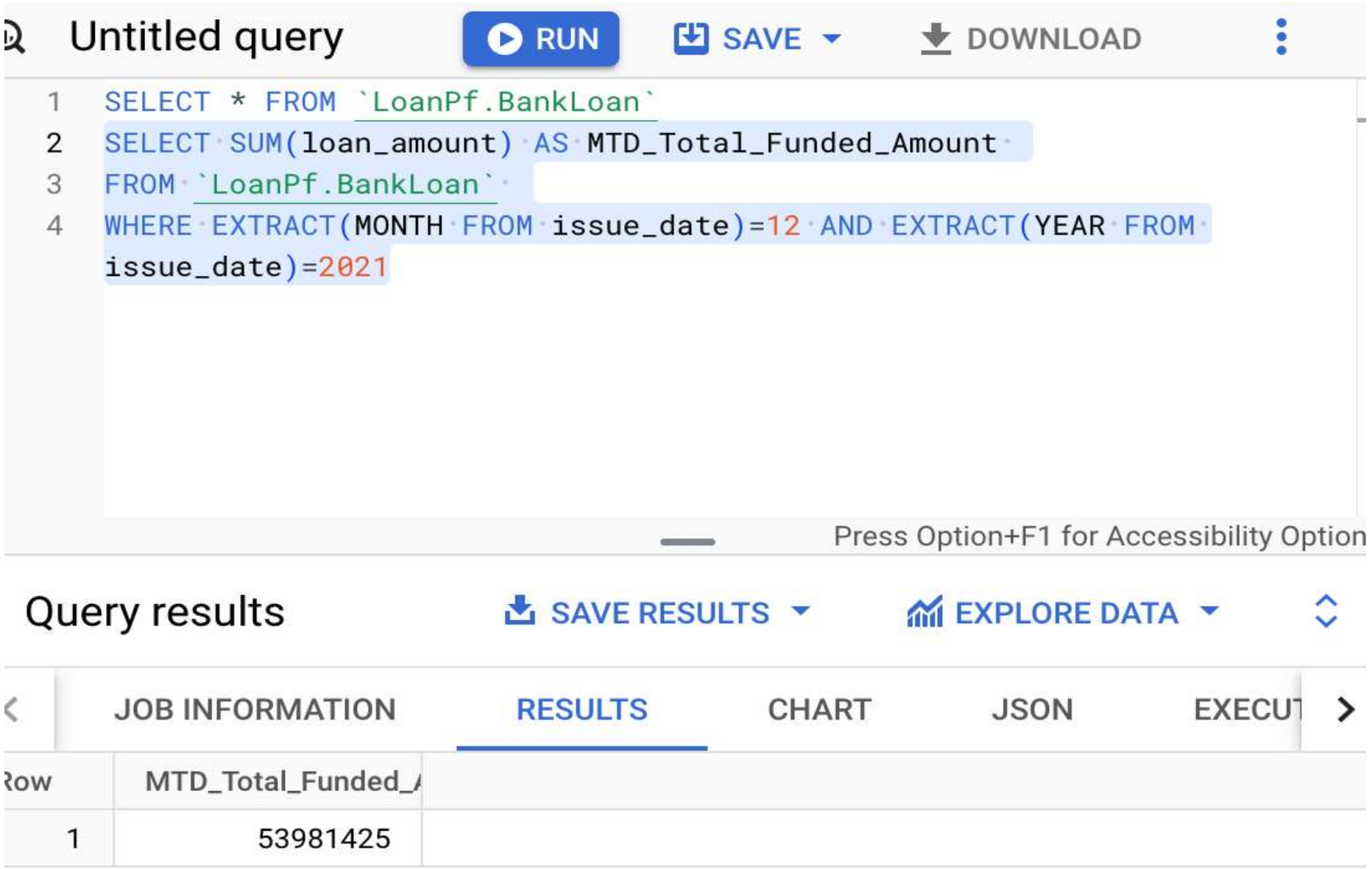
SAVE RESULTS EXPLORE DATA

JOB INFORMATION | RESULTS | CHART | JSON | EXECUT

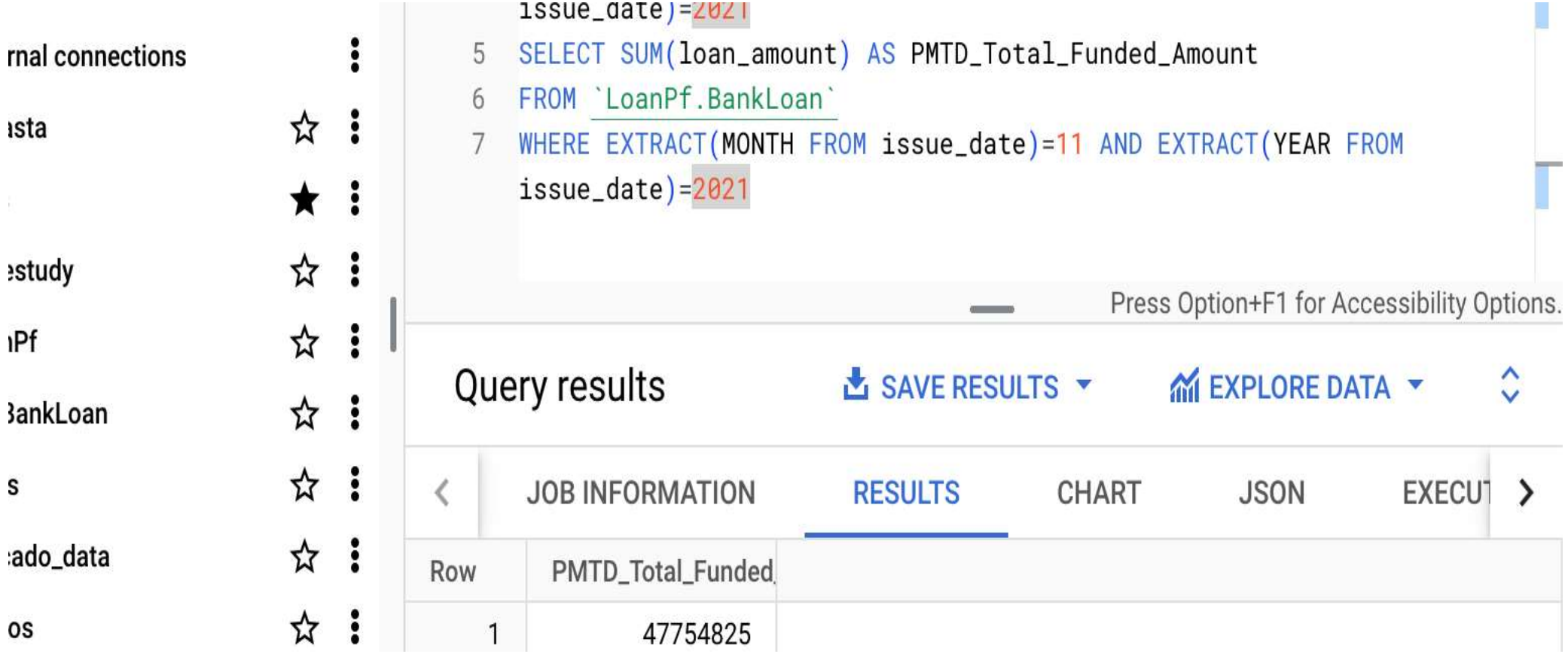
ow	PtotalLoan_APP
1	4035

Total Funded Amount

MTD Total Funded Amount

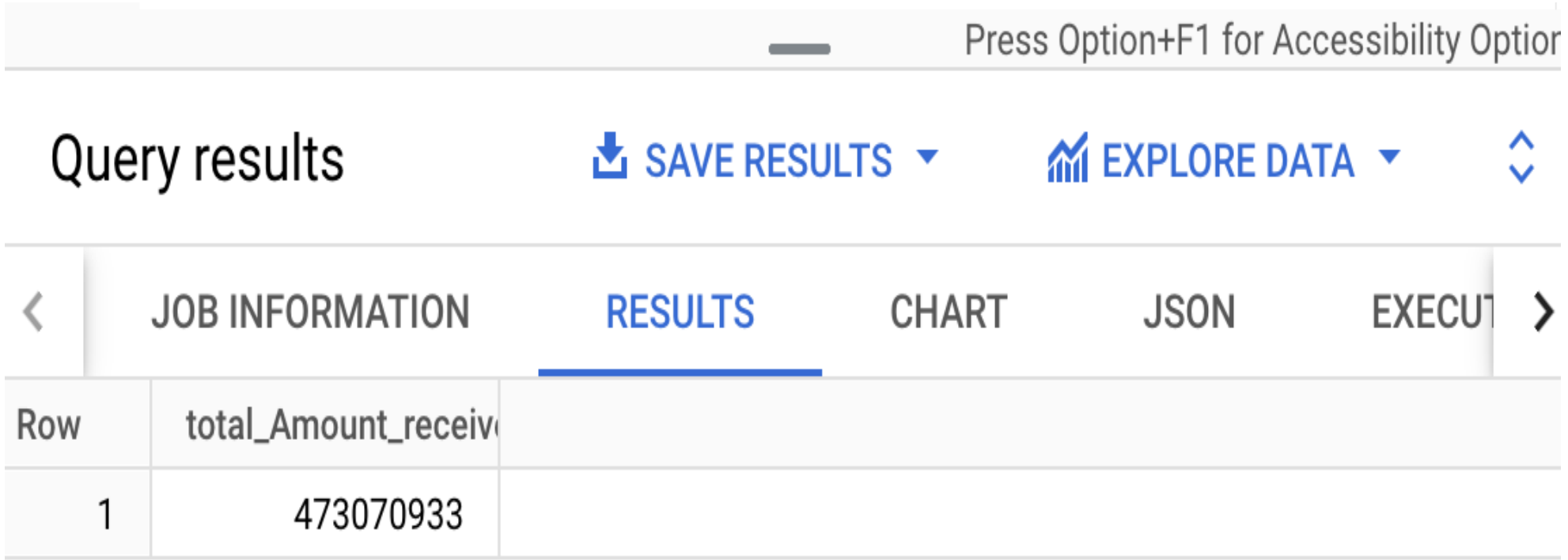


PMTD Total Funded Amount



Total Amount Received

```
SELECT SUM(total_payment)AS
total_Amount_received FROM `LoanPf.BankLoan`
```



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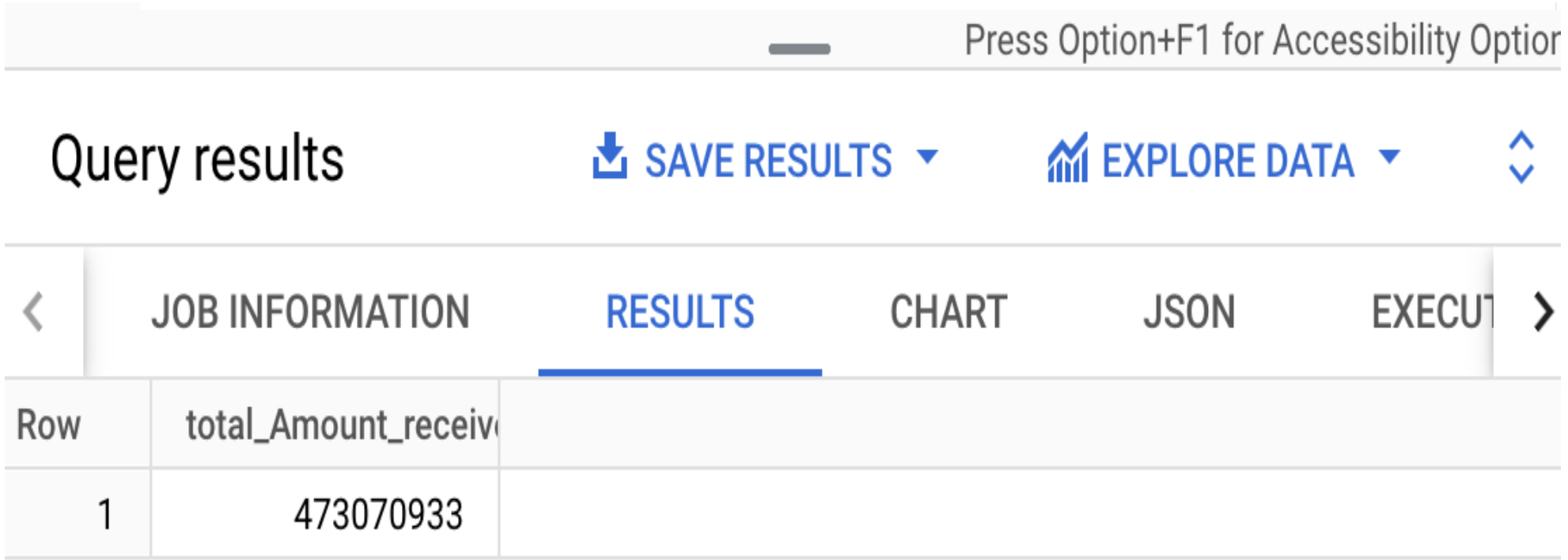


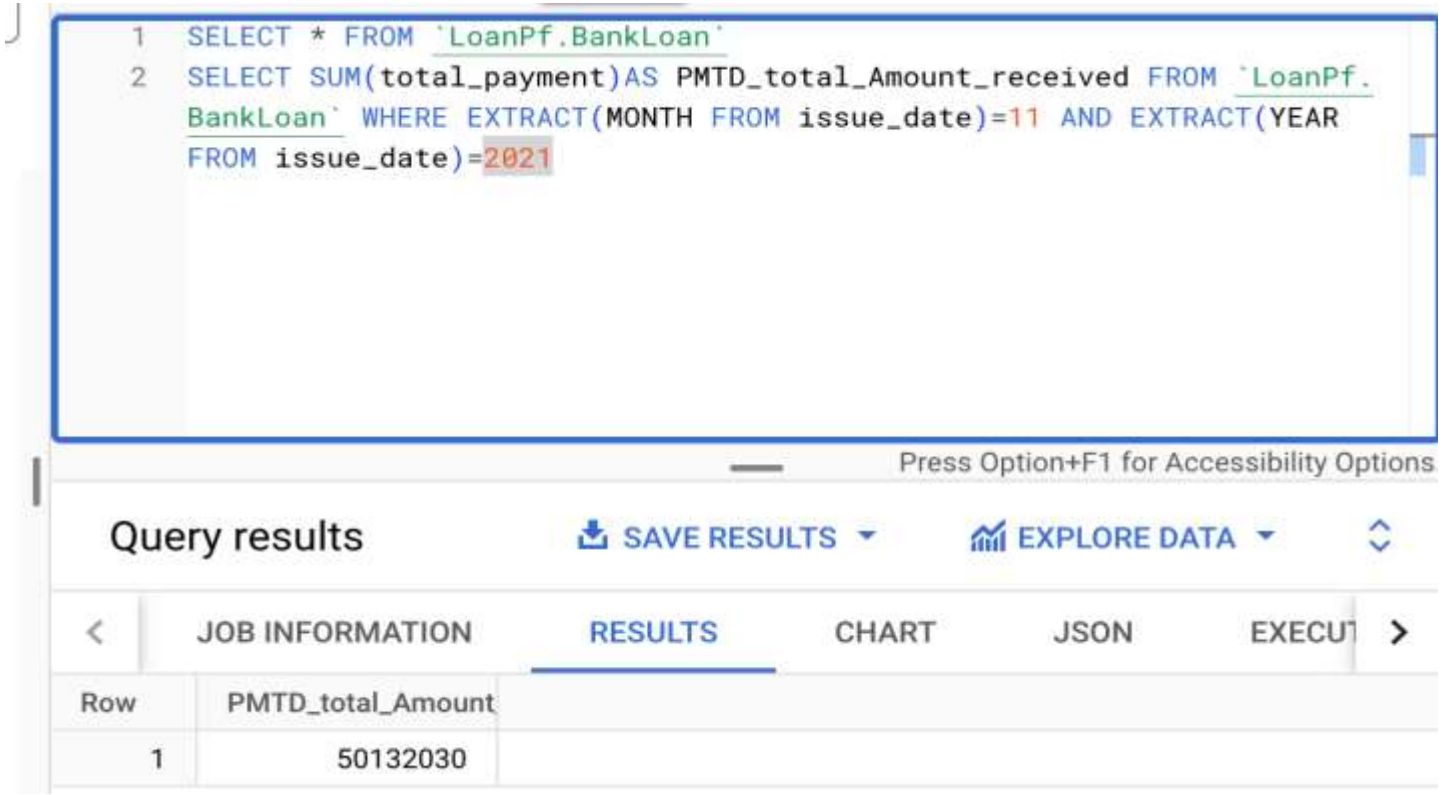
MTD Total Amount Received

```
SELECT SUM(total_payment)
AS MTD_total_Amount_received
FROM `LoanPf.BankLoan
`   WHERE  EXTRACT(MONTH FROM issue_date)=12 AND

EXTRACT(YEAR FROM issue_date)=2021
```

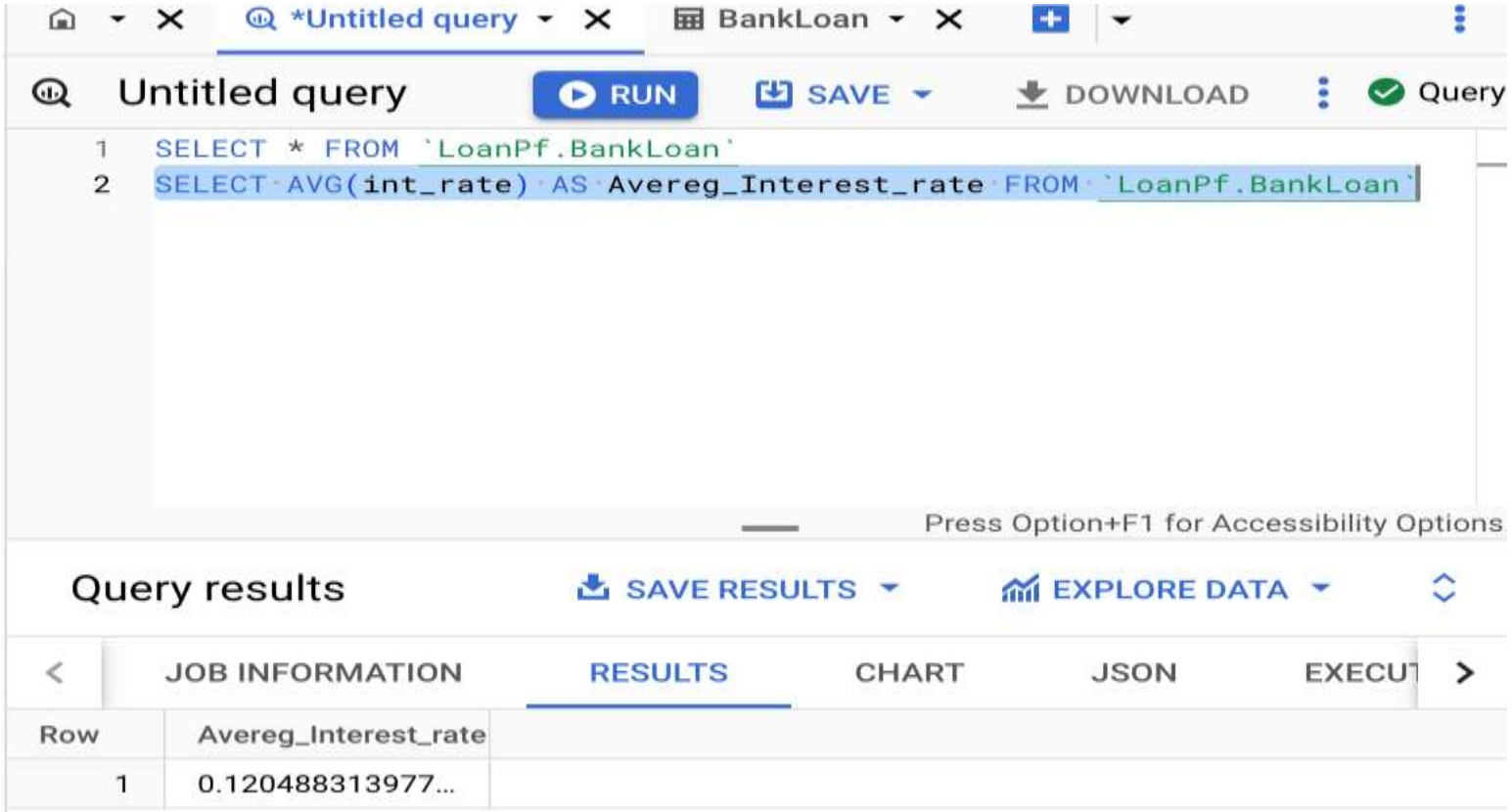
PMTD Total Amount Received

```
SELECT SUM(total_payment)
AS MTD_total_Amount_received
FROM `LoanPf.BankLoan`WHERE
EXTRACT(MONTH FROM issue_date)=12 AND
EXTRACT(YEAR FROM issue_date)=2021
```



Average Interest Rate

```
SELECT AVG(int_rate) AS
Avereg_Interest_rate FROM
`LoanPf.BankLoan`
```



MTD Average Interest

```
SELECT AVG(int_rate) * 100 AS
Average_Interest_rate
FROM `LoanPf.BankLoan`

WHERE EXTRACT(MONTH FROM issue_date) = 12
AND EXTRACT(YEAR FROM issue_date) = 2021;
```

Query results

JOB INFORMATION

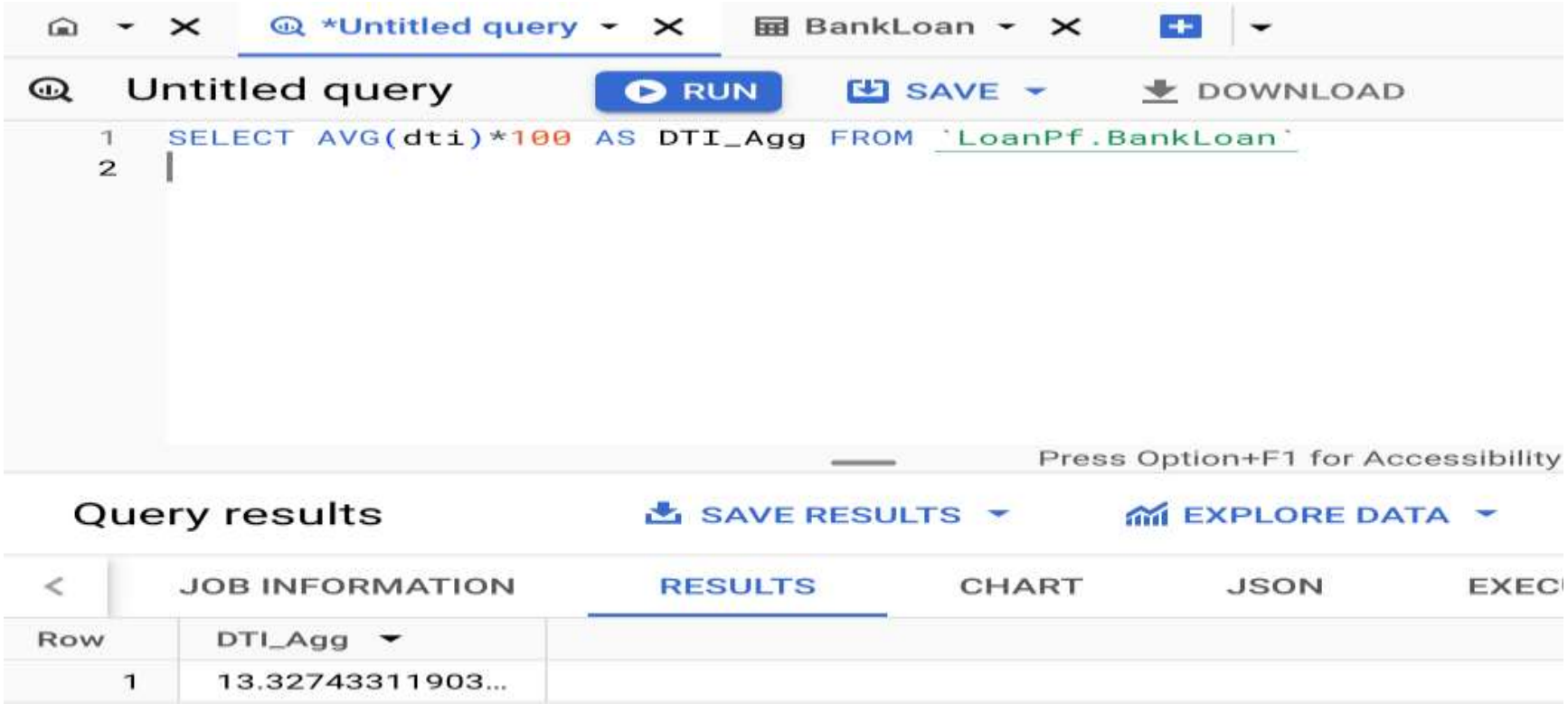
Row	Average_Interest_rat
1	12.35604079740...

PMTD Average Interest

```sql
SELECT AVG(int_rate)*100 AS
PMTD_AVG_Interest_rate FROM
`LoanPf.BankLoan` WHERE EXTRACT(MONTH
FROM issue_date)=11 AND EXTRACT(YEAR FROM
issue_date)=2021;
```

Avg DTI

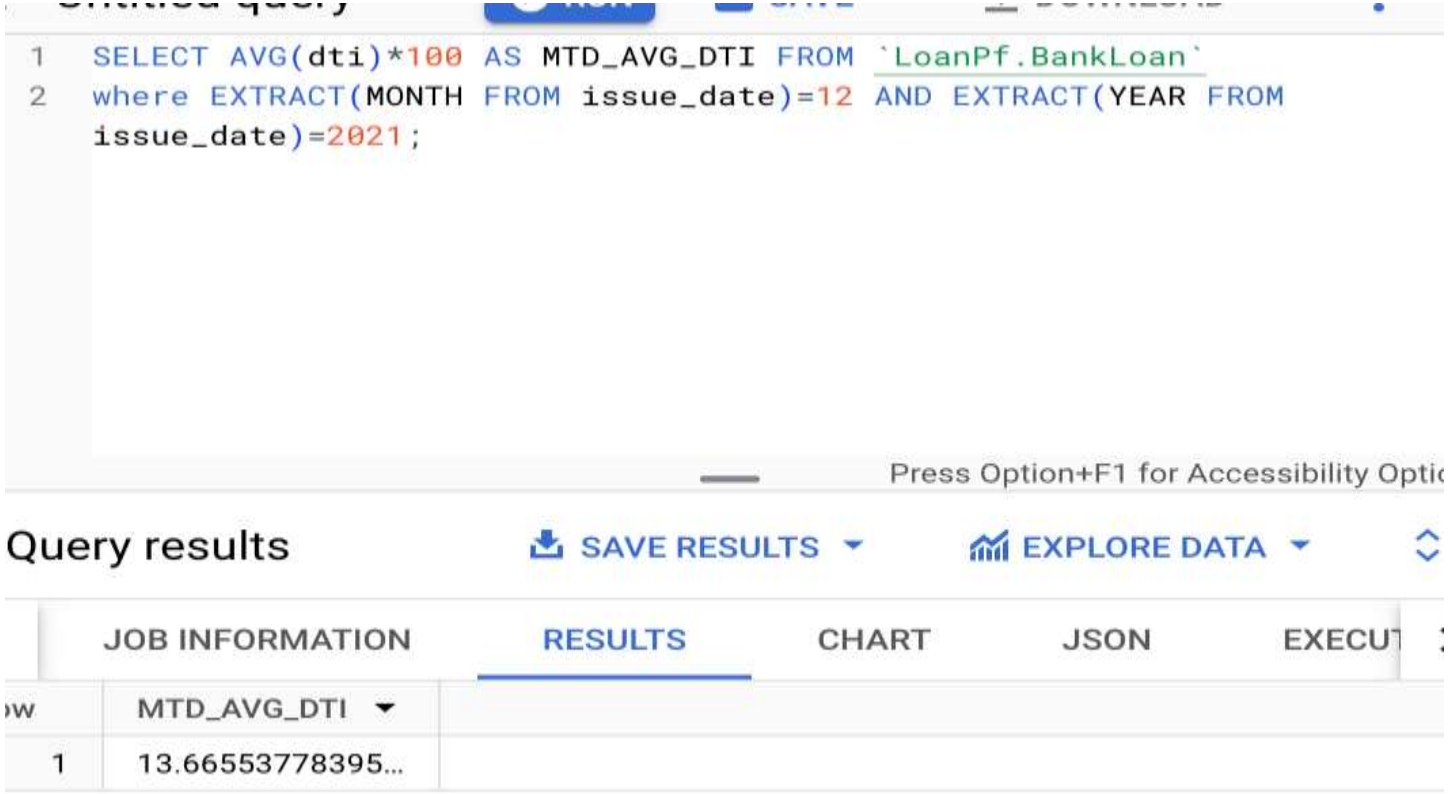
```
SELECT AVG(dti)*100 AS DTI_Agg FROM
`LoanPf.BankLoan`
```



MTD Avg DTI

```
SELECT AVG(dti)*100 AS MTD_AVG_DTI FROM
`LoanPf.BankLoan`

where EXTRACT(MONTH FROM issue_date)=12
AND EXTRACT(YEAR FROM issue_date)=2021;
```

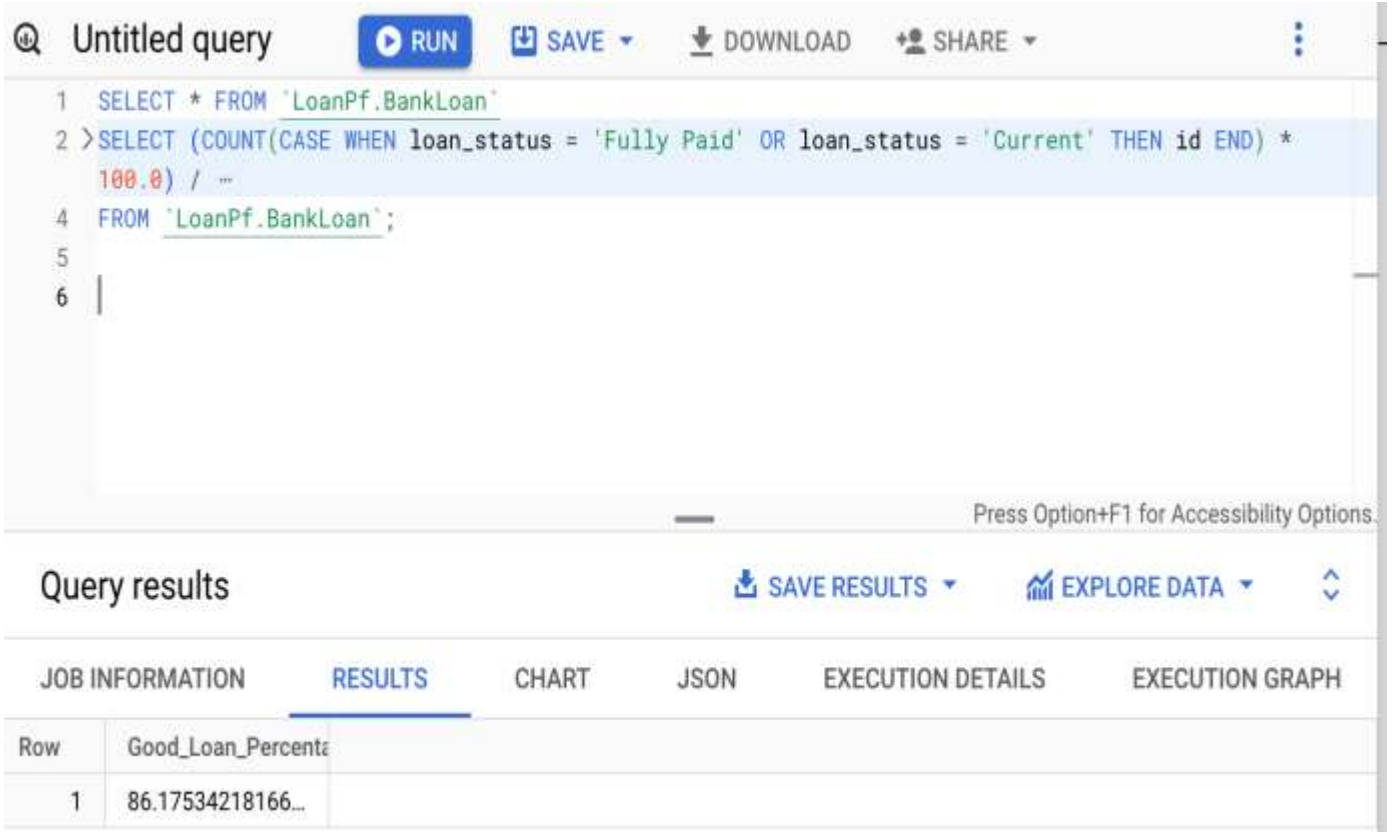


PMTD Avg DTI

```
SELECT AVG(dti)*100 AS PMTD_AVG_DTI FROM
`LoanPf.BankLoan`
where EXTRACT(MONTH FROM issue_date)=11
AND EXTRACT(YEAR FROM issue_date)=2021;
```

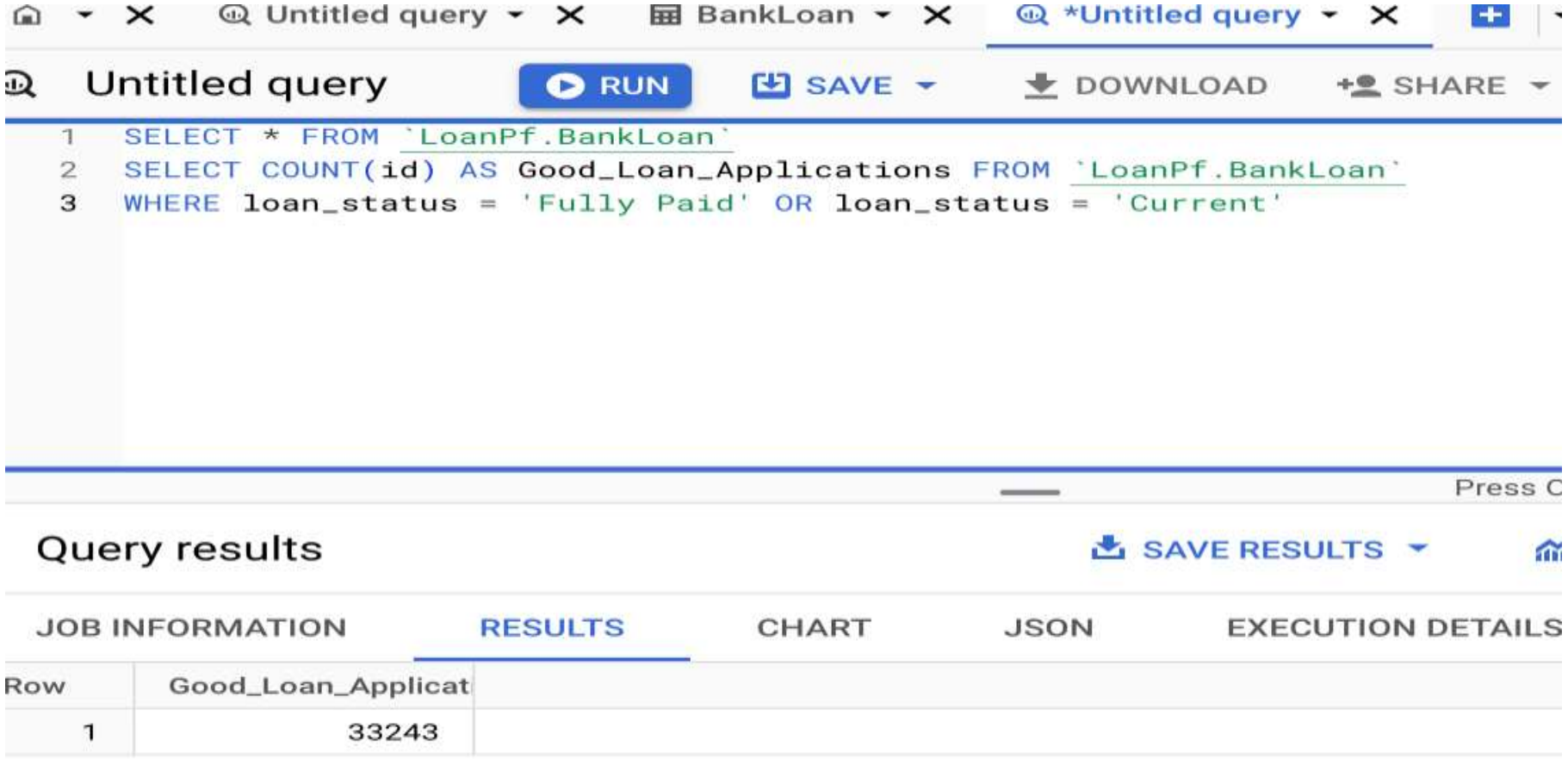
Good Loan Percentage

```sql
SELECT
    (COUNT(CASE WHEN loan_status = 'Fully Paid' OR loan_status = 'Current' THEN id END) * 100.0) /
    COUNT(id) AS Good_Loan_Percentage
FROM `LoanPf.BankLoan`;
```



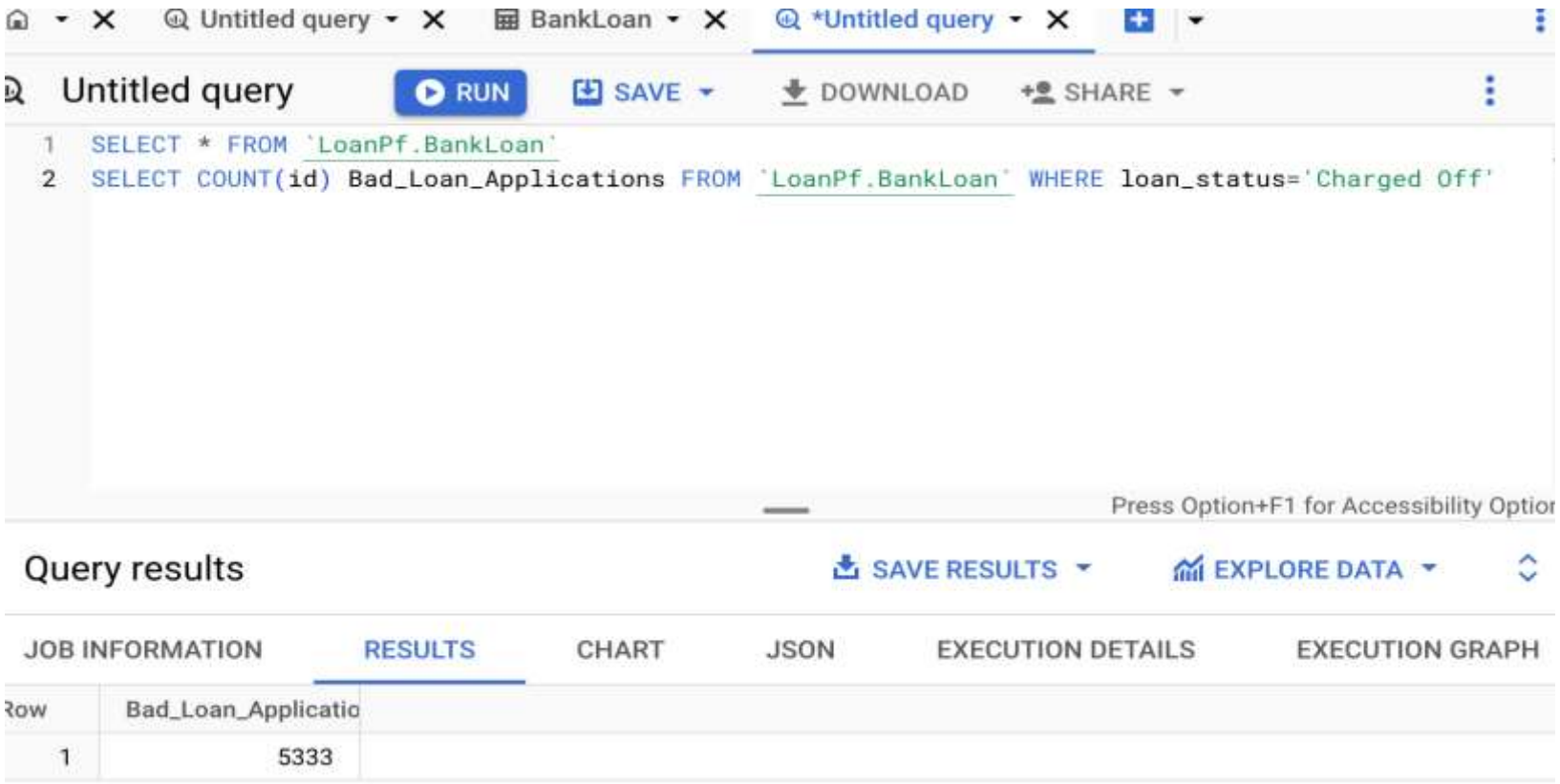
Good Loan Funded Amount

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



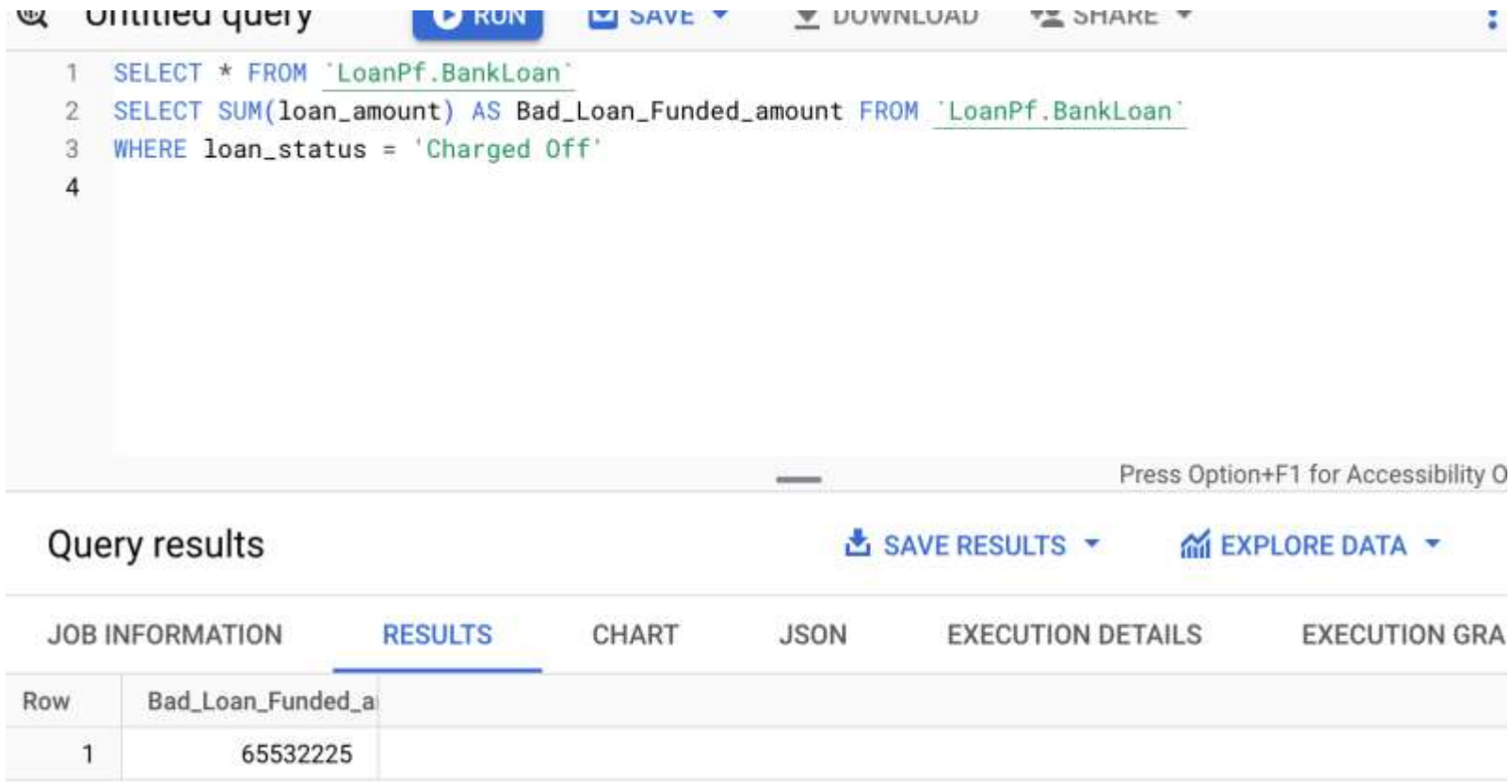
Bad Loan Applications

```
SELECT COUNT(id)
Bad_Loan_Applications FROM
`LoanPf.BankLoan` WHERE
loan_status='Charged Off'
```



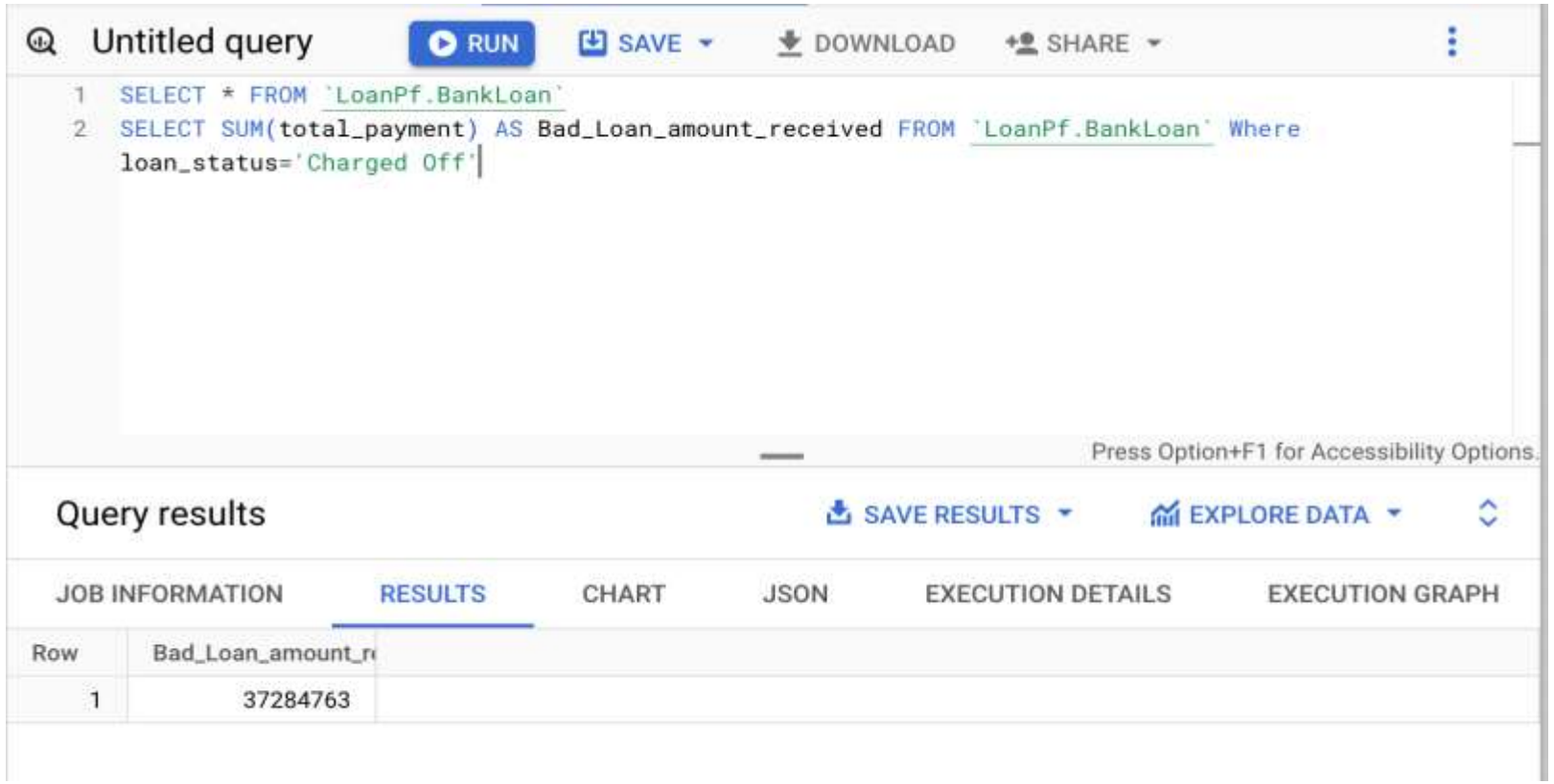
Bad Loan Funded Amount

```sql
SELECT SUM(loan_amount) AS
Bad_Loan_Funded_amount FROM
`LoanPf.BankLoan`
WHERE loan_status = 'Charged Off'
```

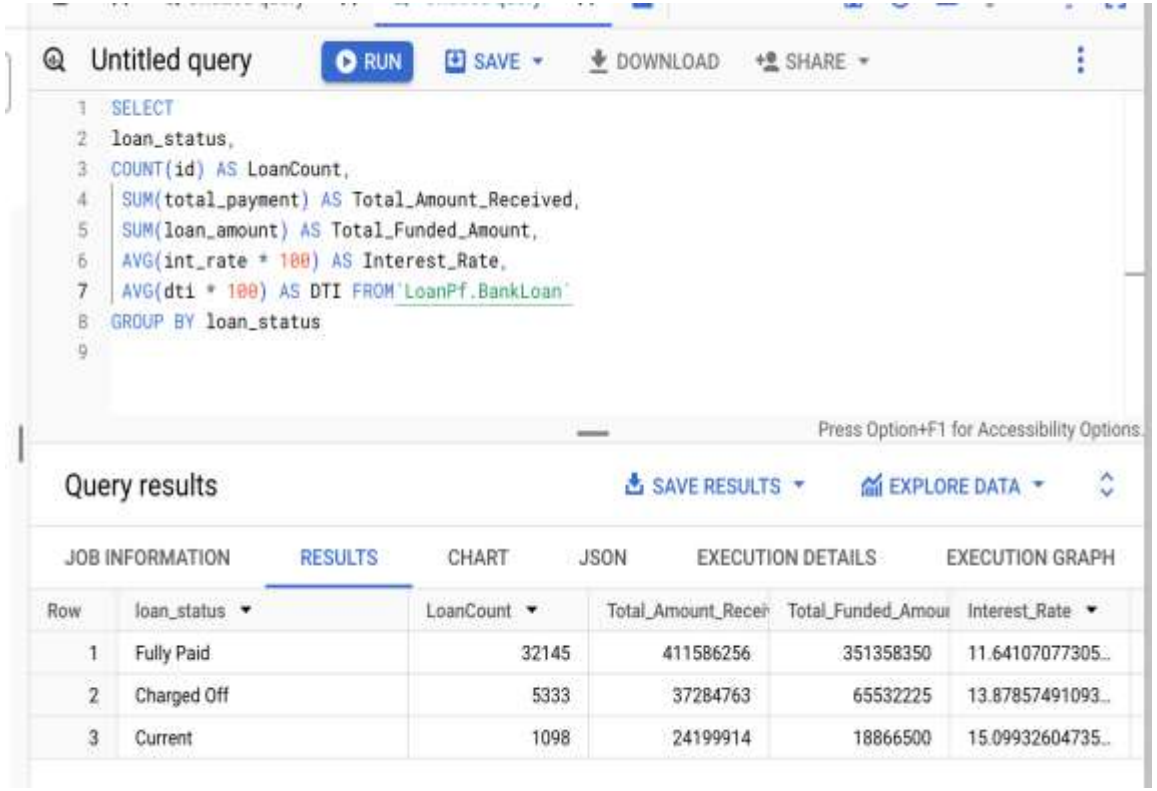


Bad Loan Amount Received

```
SELECT SUM(total_payment) AS
Bad_Loan_amount_received FROM
`LoanPf.BankLoan` Where
loan_status='Charged Off'
```

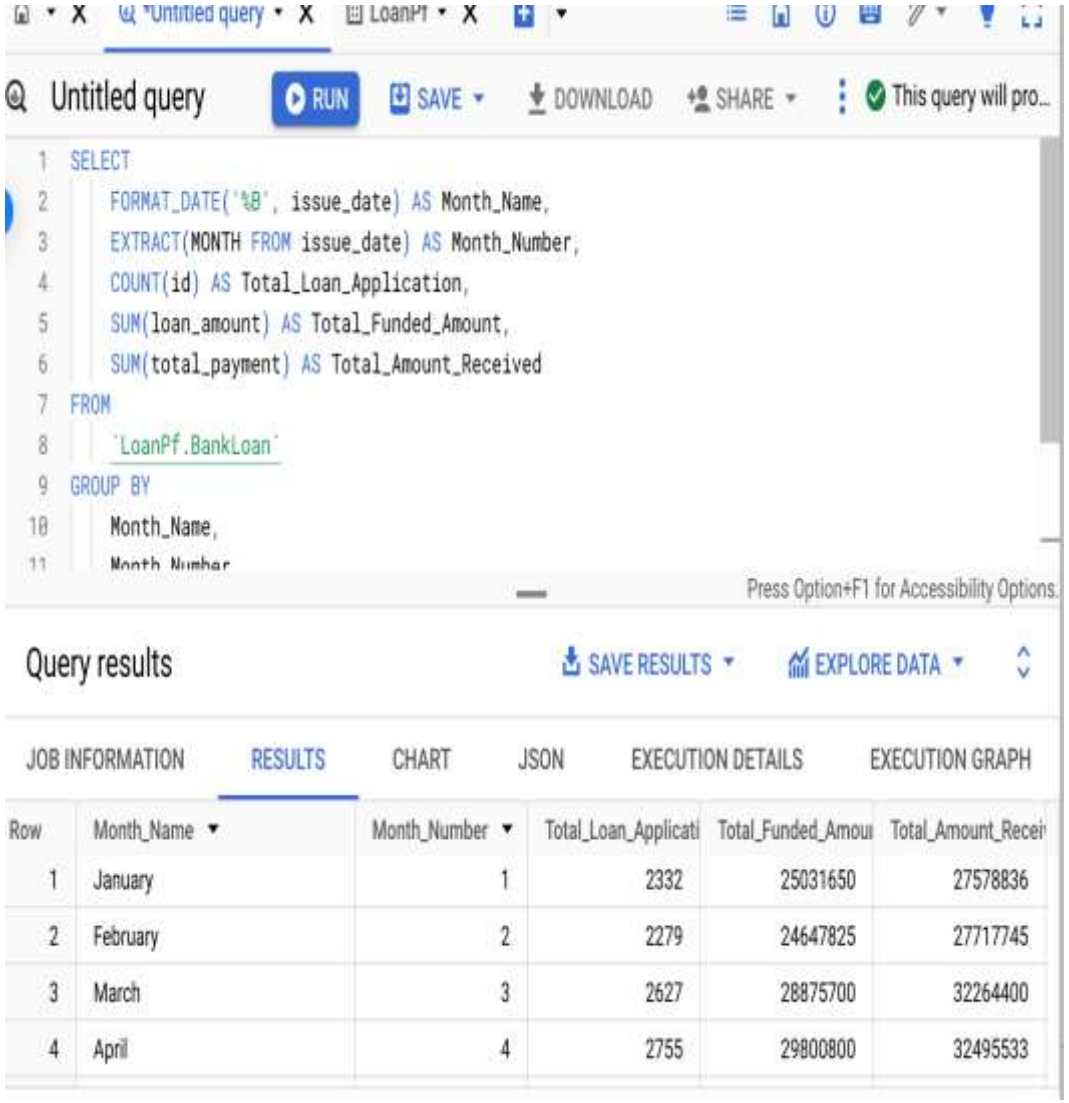


LOAN STATUS




```sql
SELECT
loan_status,
COUNT(id) AS LoanCount,
 SUM(total_payment) AS
Total_Amount_Received,
 SUM(loan_amount) AS
Total_Funded_Amount,
 AVG(int_rate * 100) AS Interest_Rate,
 AVG(dti * 100) AS DTI
FROM`LoanPf.BankLoan`
GROUP BY loan_status
```

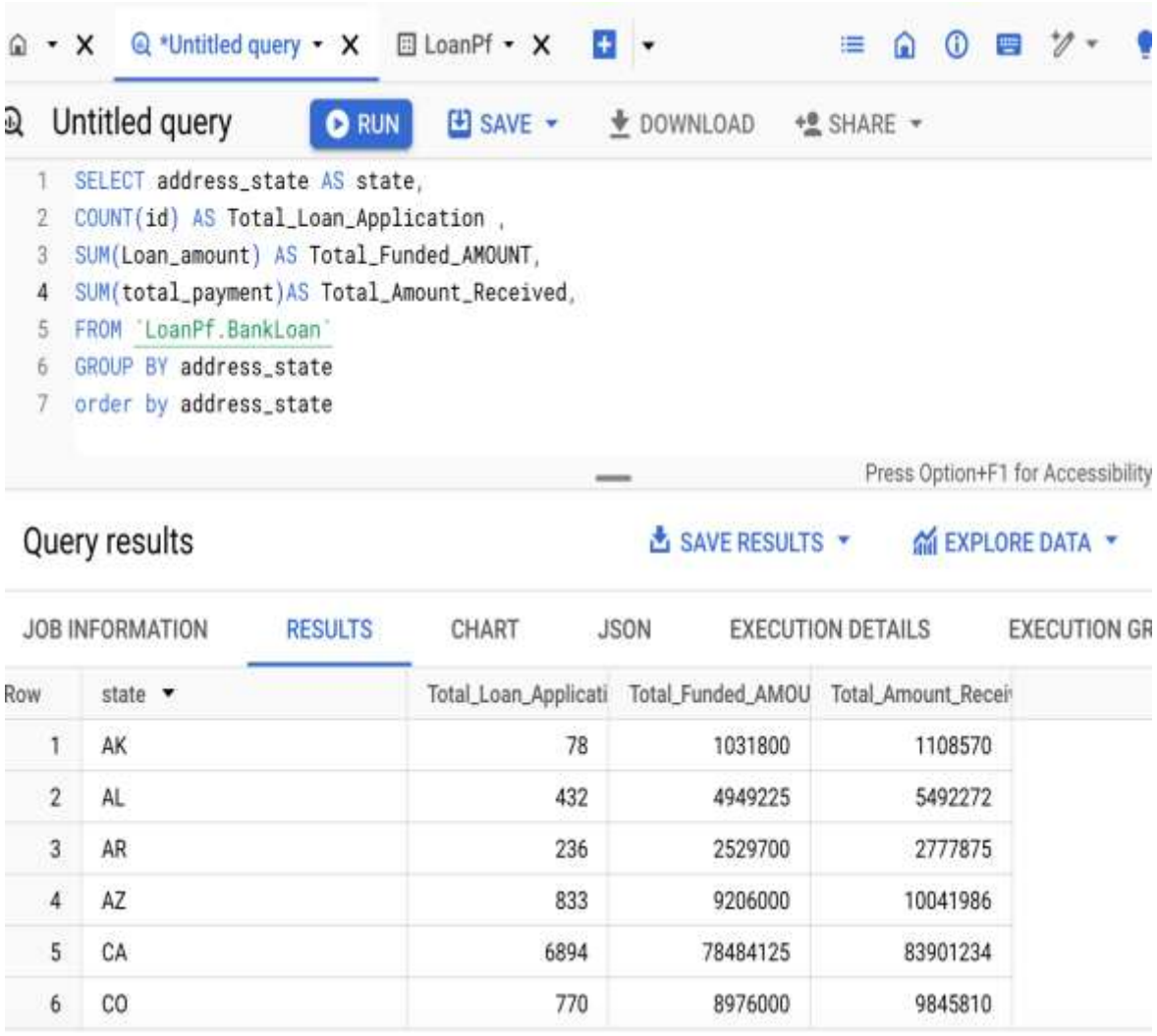
Loan By Month



Row	Month_Name	Month_Number	Total_Loan_Applicati	Total_Funded_Amou	Total_Amount_Recei
1	January	1	2332	25031650	27578836
2	February	2	2279	24647825	27717745
3	March	3	2627	28875700	32264400
4	April	4	2755	29800800	32495533

```sql
SELECT
    FORMAT_DATE('%B', issue_date) AS
Month_Name,
    EXTRACT(MONTH FROM issue_date) AS
Month_Number,
    COUNT(id) AS Total_Loan_Application,
    SUM(loan_amount) AS Total_Funded_Amount,
    SUM(total_payment) AS
Total_Amount_Received
FROM
    `LoanPf.BankLoan`
GROUP BY
    Month_Name,
    Month_Number
ORDER BY
    Month_Number;
```

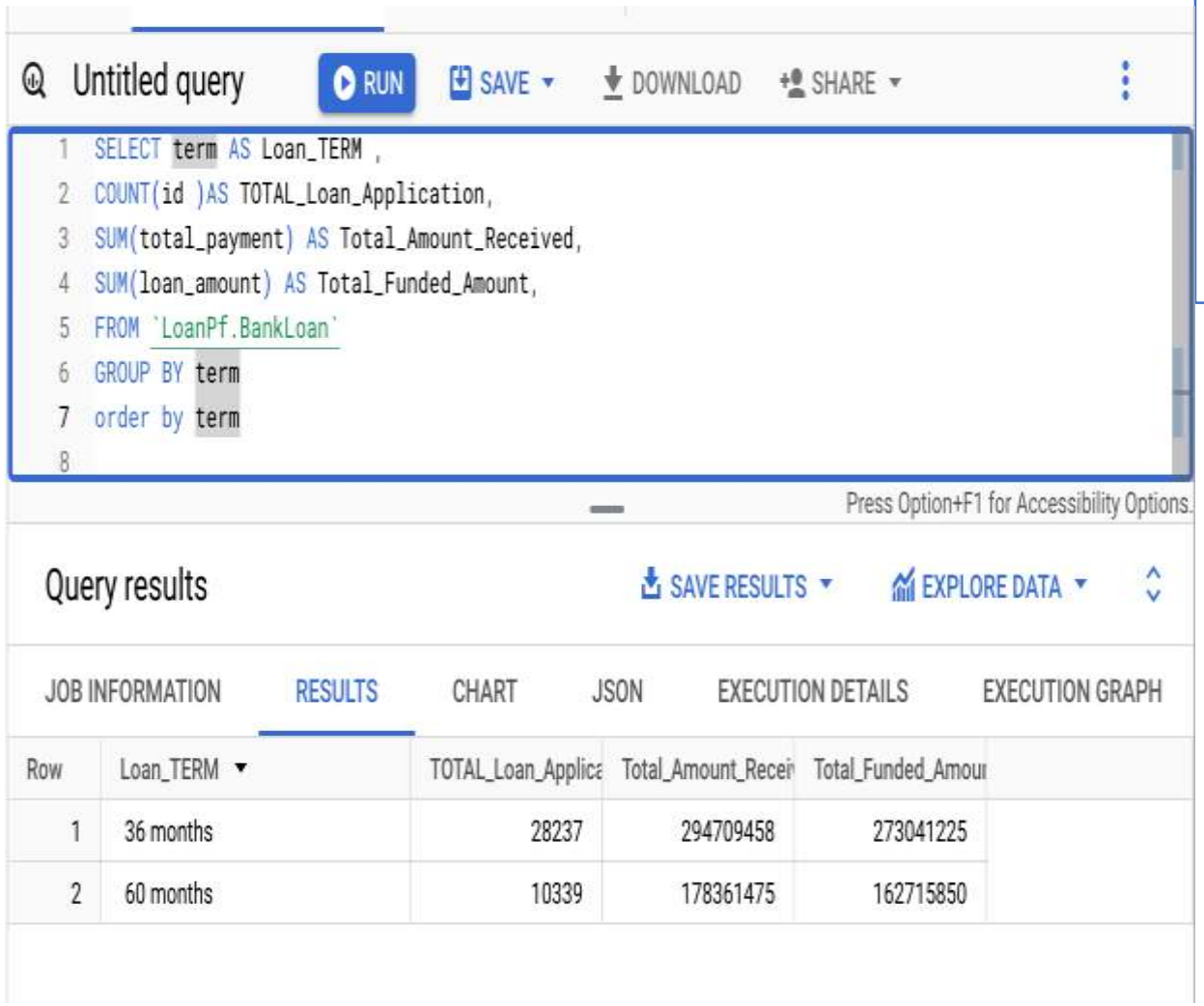
Loan By state



Row	state	Total_Loan_Applicati	Total_Funded_AMOU	Total_Amount_Recei
1	AK	78	1031800	1108570
2	AL	432	4949225	5492272
3	AR	236	2529700	2777875
4	AZ	833	9206000	10041986
5	CA	6894	78484125	83901234
6	CO	770	8976000	9845810

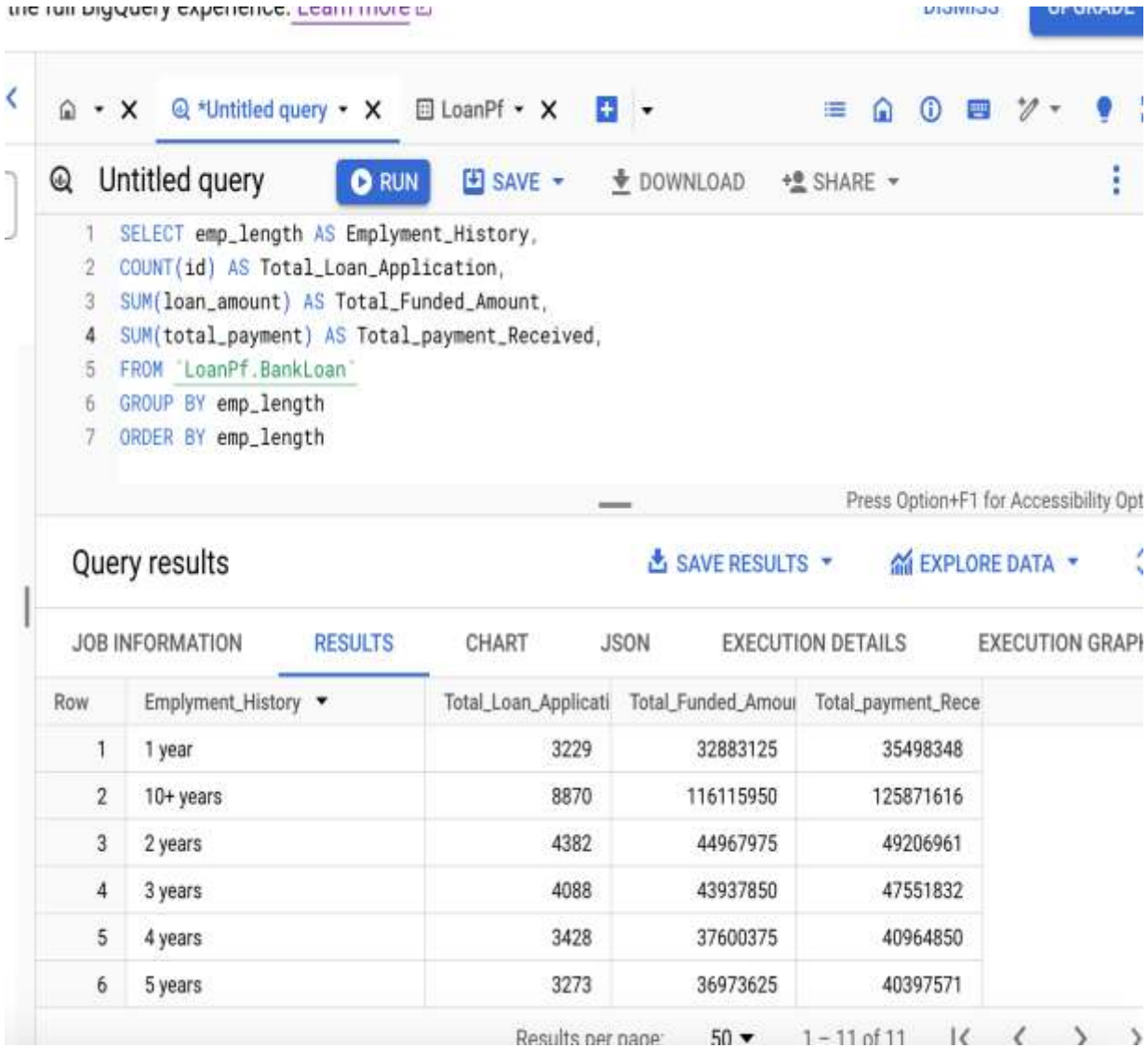
```sql
SELECT address_state AS state,
COUNT(id) AS Total_Loan_Application ,
SUM(Loan_amount) AS
Total_Funded_AMOUNT,
SUM(total_payment)AS
Total_Amount_Received,
FROM `LoanPf.BankLoan`
GROUP BY address_state
order by address_state
```

Loan By TERM



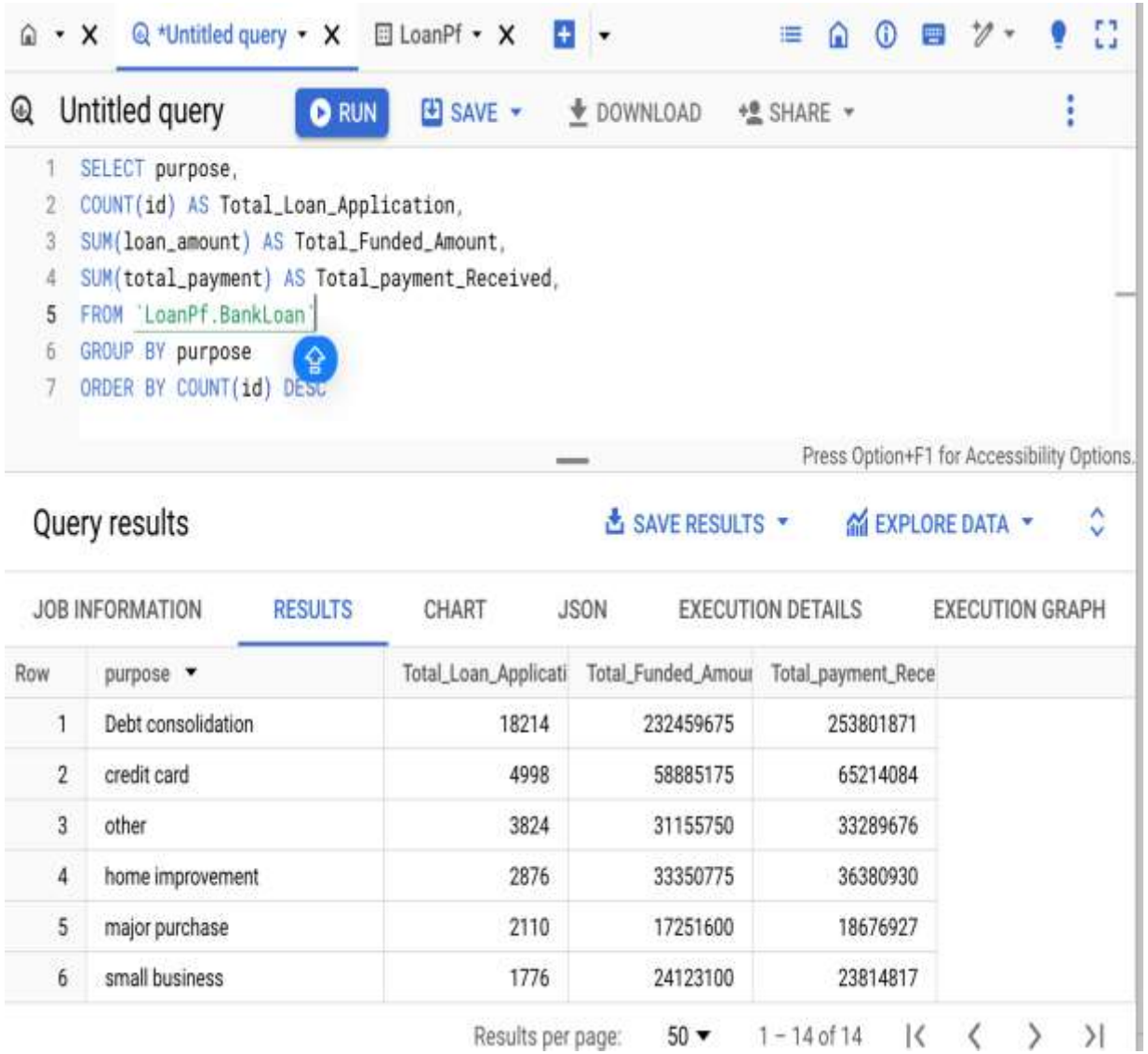

```sql
SELECT term AS Loan_TERM ,
COUNT(id )AS TOTAL_Loan_Application,
SUM(total_payment) AS
Total_Amount_Received,
SUM(loan_amount) AS
Total_Funded_Amount,
FROM `LoanPf.BankLoan`
GROUP BY term
order by term
```

Loan By Employee Length



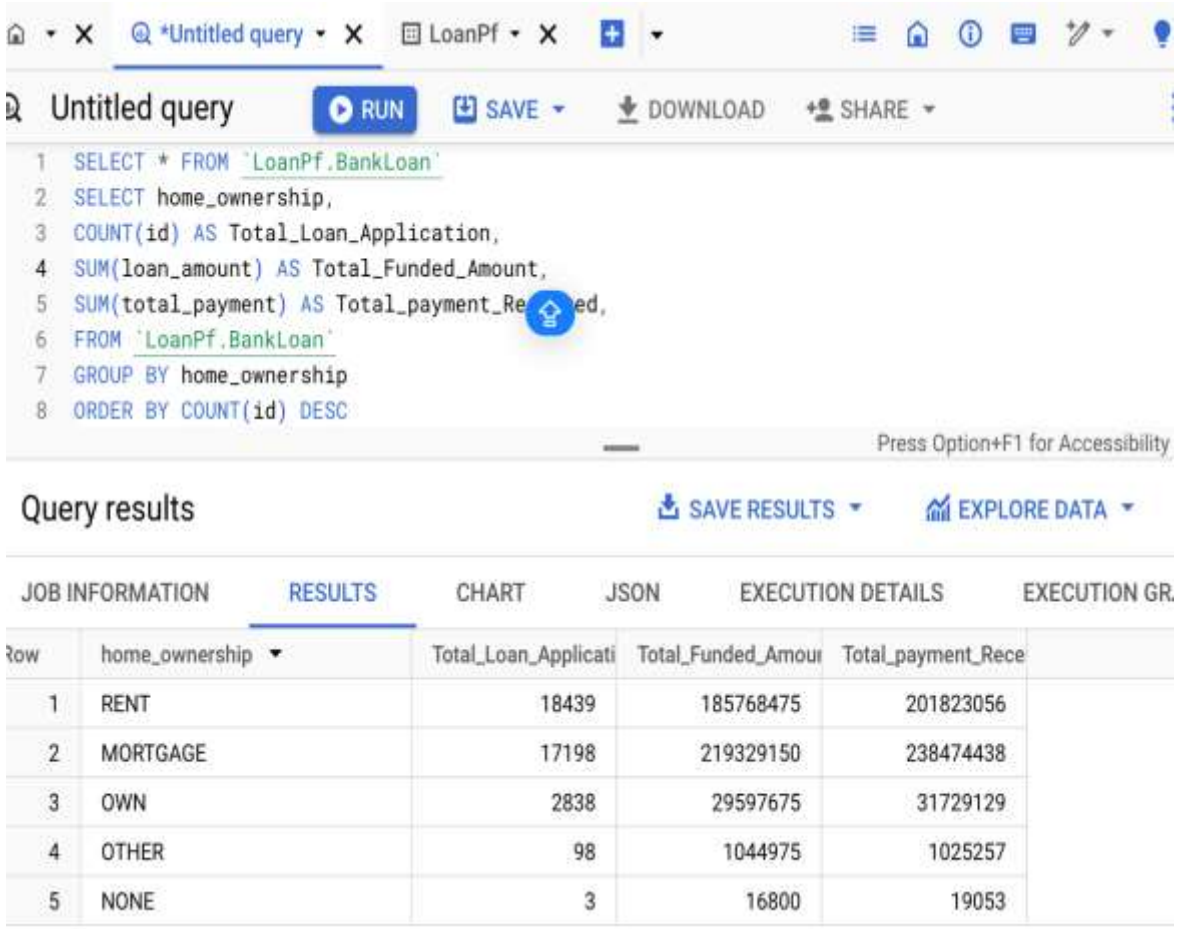

```
SELECT emp_length AS Emplyment_History,
COUNT(id) AS Total_Loan_Application,
SUM(loan_amount) AS
Total_Funded_Amount,
SUM(total_payment) AS
Total_payment_Received,
FROM `LoanPf.BankLoan`
GROUP BY emp_length
ORDER BY emp_length
```

Loan By PURPOSE




```sql
SELECT purpose,
COUNT(id) AS Total_Loan_Application,
SUM(loan_amount) AS
Total_Funded_Amount,
SUM(total_payment) AS
Total_payment_Received,
FROM `LoanPf.BankLoan`
GROUP BY purpose
ORDER BY COUNT(id) DESC
```

Loan By HOME OWNERSHIP



Row	home_ownership	Total_Loan_Applicati	Total_Funded_Amour	Total_payment_Rece
1	RENT	18439	185768475	201823056
2	MORTGAGE	17198	219329150	238474438
3	OWN	2838	29597675	31729129
4	OTHER	98	1044975	1025257
5	NONE	3	16800	19053

```
SELECT home_ownership,
COUNT(id) AS Total_Loan_Application,
SUM(loan_amount) AS
Total_Funded_Amount,
SUM(total_payment) AS
Total_payment_Received,
FROM `LoanPf.BankLoan`
GROUP BY home_ownership
ORDER BY COUNT(id) DESC
```

Conclusion of the Bank Loan Report

Conclusion of the Bank Loan Report

1.High-Level Overview and Key Performance Indicators (KPIs):

- The dashboard highlights a significant loan portfolio with **38.6K total applications** and a **funded amount of $435.8M**.
- The **average interest rate** is relatively moderate at **12.0%**, and the **average Debt-to-Income (DTI) ratio** stands at **13.3%**.
- The Month-to-Date (MTD) and Month-over-Month (MOM) metrics indicate steady growth in both loan applications and amounts funded, suggesting a consistent demand and strong lending activity

Conclusion of the Bank Loan Report

2. **Portfolio Composition and Trends:**

- The portfolio is heavily skewed towards **good loans**, with **86.2%** categorized as low-risk. This is a positive indicator of portfolio health, showing a strong preference for funding reliable borrowers. However, a smaller portion of **bad loans** (**5.3K applications, funded at $65.5M**) could represent a potential risk if not managed carefully.
- Most loans are for **36-month terms (73.2%)**, indicating a borrower preference for shorter repayment periods, possibly due to manageable debt obligations or a desire for quicker repayment.

Conclusion of the Bank Loan Report

3. Loan Purposes and Borrower Demographics:

- **Debt consolidation** is the primary reason for loan applications, followed by **credit card refinancing** and **home improvement**, pointing to a high demand for loans that manage existing debt. This trend could signal consumer financial challenges, with many borrowers looking to reduce or reorganize their debt burdens.
- Applicants with **10+ years of employment** make up the largest share, suggesting that borrowers with stable job histories are a key target demographic. Furthermore, most applicants are either **renters or mortgage holders**, which reflects a mix of middle-class and aspiring homeowners likely to be managing ongoing financial obligations.

Conclusion of the Bank Loan Report

4. Individual Loan Analysis and Risk Management:

- The Details section enables close monitoring of individual loan characteristics, such as **interest rates**, **loan grades**, and **payment terms**. The ability to drill down into each loan record allows for targeted risk assessments, especially for loans that are **higher risk** (e.g., loans with higher interest rates or longer terms)

Final Insights:

The bank’s portfolio appears generally healthy, with a strong representation of low-risk loans. However, the high demand for debt-related loans like debt consolidation and credit card refinancing suggests that economic factors may be influencing borrower behavior, possibly indicating higher consumer debt levels.

Moving forward, the bank could focus on monitoring **high-risk loan segments** (e.g., loans with higher interest rates or bad loans) to ensure sustainable performance and mitigate potential default risks.

Additionally, further insights into borrower demographics, such as employment stability and homeownership, can help refine the bank’s lending strategies, focusing on reliable borrowers while cautiously managing high-risk segments.