SQL - Case Study

Company Name	XYZ
Category	E-Commerce Retailer
Country Data	Brazil
No of Tables	8

By

Naman Garg

Table Names:

1. customers

2. geolocation

3. order_items

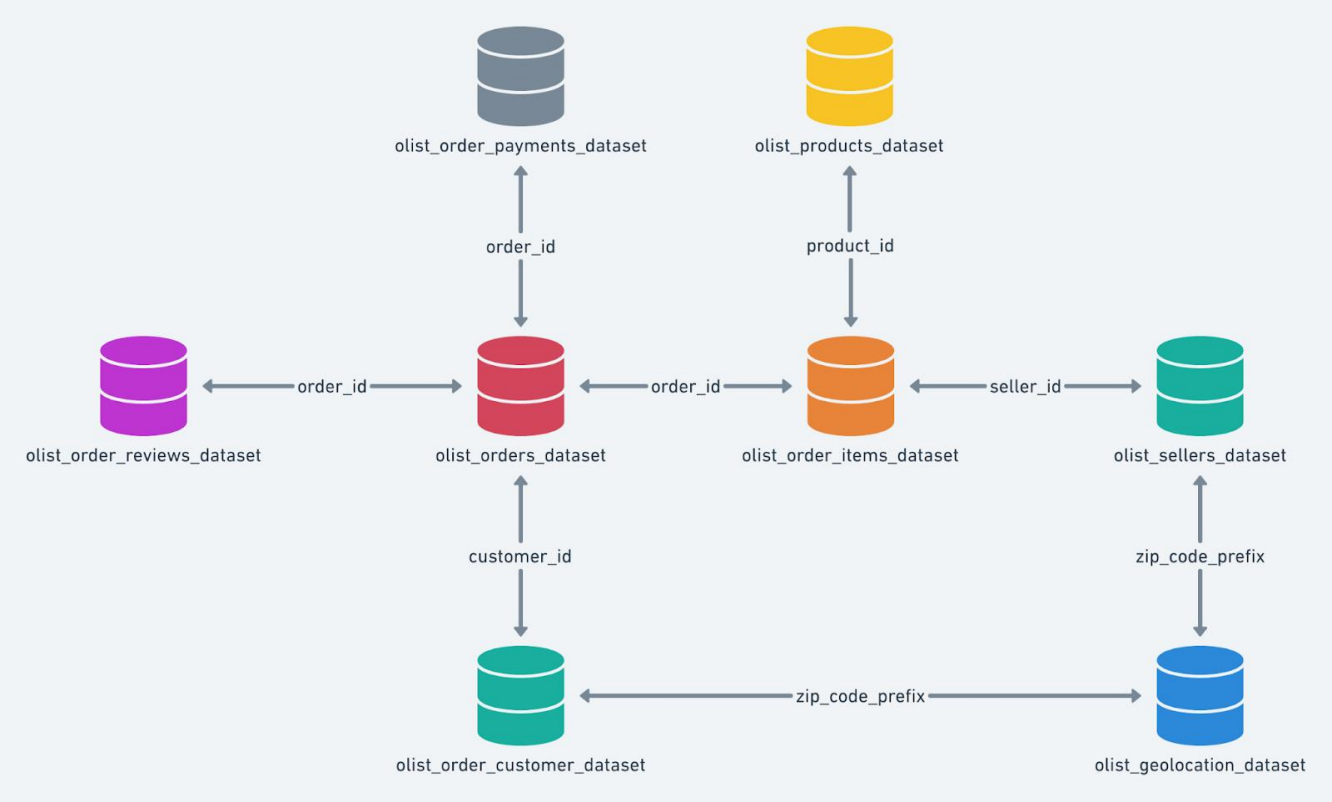
4. payments

5. reviews

6. orders

7. products

8. sellers

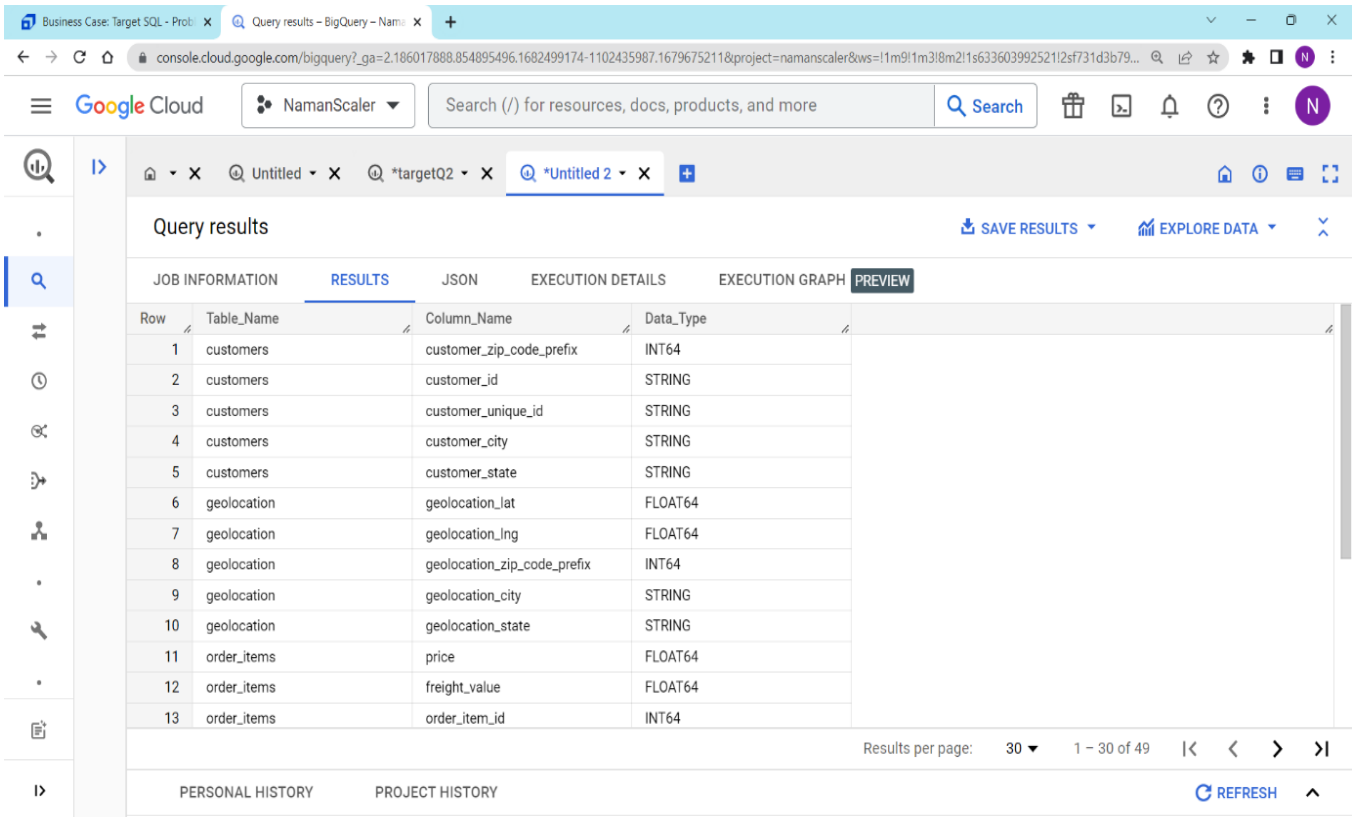


Database Schema

Q1.1 Data type of columns in a table.

Ans - I have fetched all column names and their datatypes from Database using below query.

```
select Table_Name, Column_Name, Data_Type
from namanscaler.Target_Database.INFORMATION_SCHEMA.COLUMNS
order by Table_name,Data_Type
```



Query results

Row	Table_Name	Column_Name	Data_Type
1	customers	customer_zip_code_prefix	INT64
2	customers	customer_id	STRING
3	customers	customer_unique_id	STRING
4	customers	customer_city	STRING
5	customers	customer_state	STRING
6	geolocation	geolocation_lat	FLOAT64
7	geolocation	geolocation_lng	FLOAT64
8	geolocation	geolocation_zip_code_prefix	INT64
9	geolocation	geolocation_city	STRING
10	geolocation	geolocation_state	STRING
11	order_items	price	FLOAT64
12	order_items	freight_value	FLOAT64
13	order_items	order_item_id	INT64

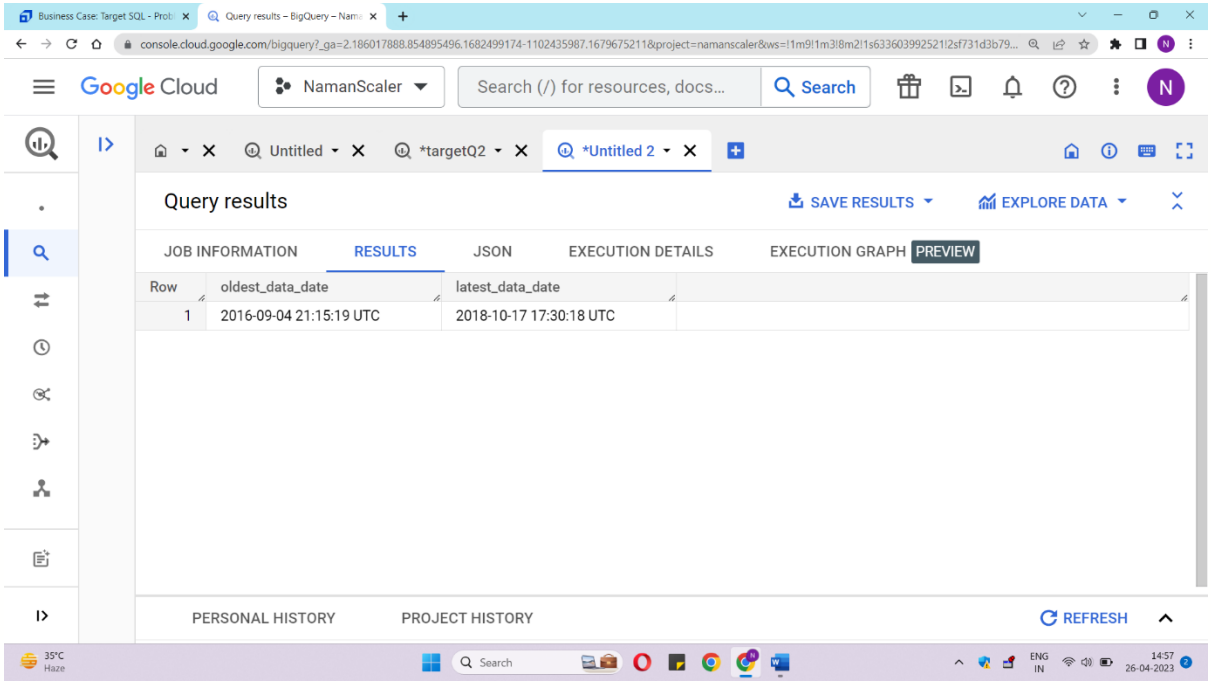
Insight:

From this I understood the structure and type of data present in the database. Mostly string, integer, timestamp are used as datatype and most of the data are connected through **order_id** and **column_id**.

Q1.2 Time period for which the data is given.

Ans- After going through the schema I have found out that 'order_purchase_timestamp' column can tell us about the time period of data using below query.

```
select min(order_purchase_timestamp) as oldest_data_date,
max(order_purchase_timestamp) as latest_data_date
from `Target_Database.orders`
```



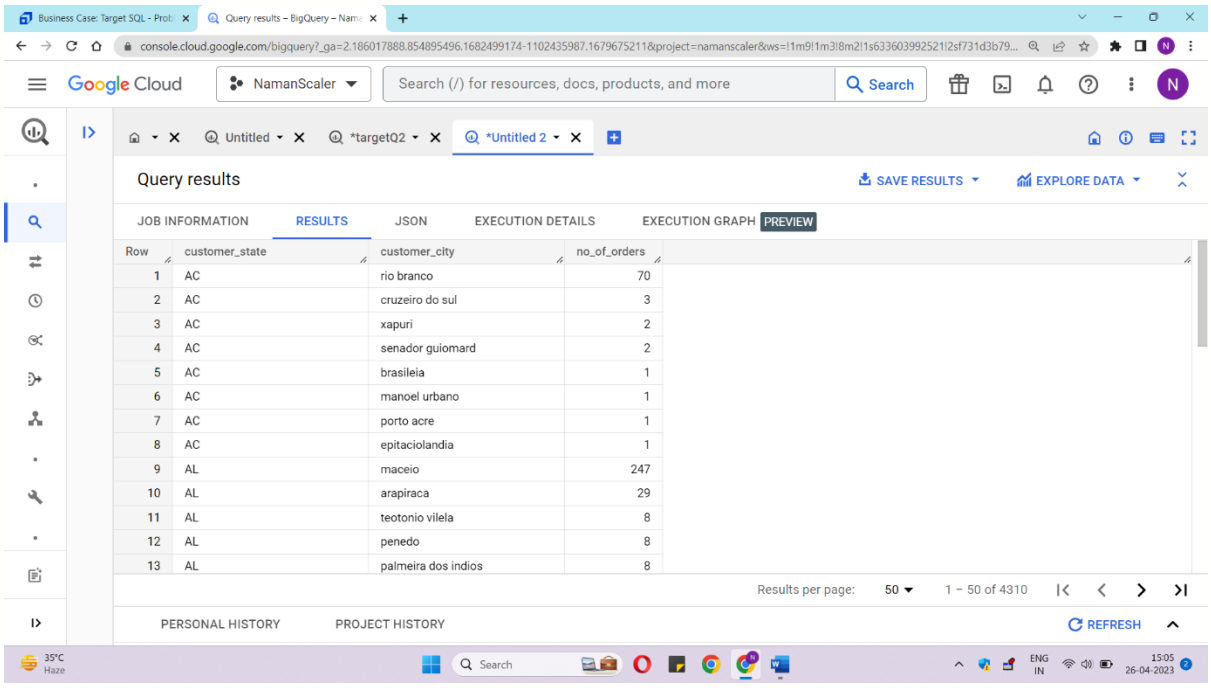
Insight:

From this I got to know about the oldest data date and latest data date and that is from September 2016 to October 2018.

Q1.3 Cities and States of customers ordered during the given period.

Ans- I have taken all the states and their respective cities from which orders are placed and their amount by using below query.

```
select customer_state, customer_city, count(*) as no_of_orders
from `Target_Database.orders` o1
join `Target_Database.customers` cust on o1.customer_id=cust.customer_id
group by customer_state, customer_city
order by customer_state, no_of_orders desc
```



Row	customer_state	customer_city	no_of_orders
1	AC	rio branco	70
2	AC	cruzeiro do sul	3
3	AC	xapuri	2
4	AC	senador guiomard	2
5	AC	brasileia	1
6	AC	manoel urbano	1
7	AC	porto acre	1
8	AC	epitaciolandia	1
9	AL	maceio	247
10	AL	arapiraca	29
11	AL	teotonio vilela	8
12	AL	penedo	8
13	AL	palmeira dos indios	8

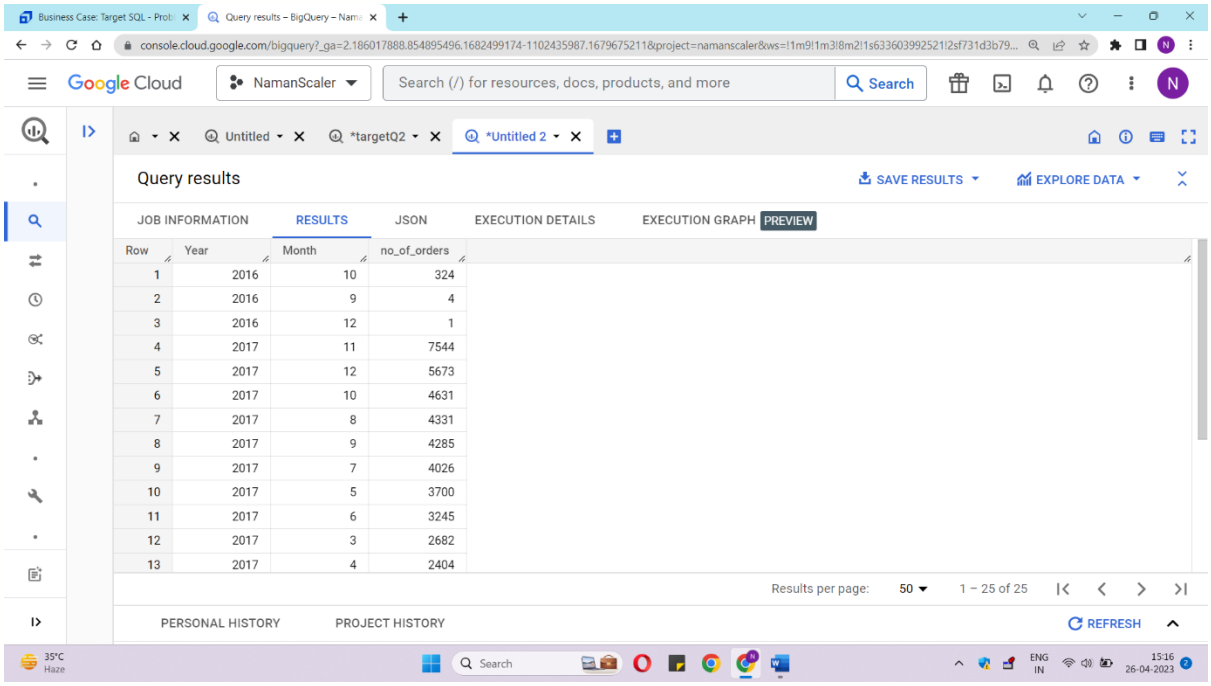
Insight:

From this we can see the number of orders placed from each city of each state and by ordering we can also infer that city 'rio branco' is generating highest number of orders from customer state 'AC' and similarly we can see of other states as well.

Q2.1 Is there a growing trend on e-commerce in Brazil? How can we describe a complete scenario? Can we see some seasonality with peaks at specific months?

Ans - In this I have counted all orders from 2016 to 2018 month on month.

```
select Year, Month, count (*) as no_of_orders
from (select extract (year from order_purchase_timestamp) as Year,
extract (month from order_purchase_timestamp) as Month
from `Target_Database.orders`) as temp
group by Year, Month
order by Year, no_of_orders desc
```



Row	Year	Month	no_of_orders
1	2016	10	324
2	2016	9	4
3	2016	12	1
4	2017	11	7544
5	2017	12	5673
6	2017	10	4631
7	2017	8	4331
8	2017	9	4285
9	2017	7	4026
10	2017	5	3700
11	2017	6	3245
12	2017	3	2682
13	2017	4	2404

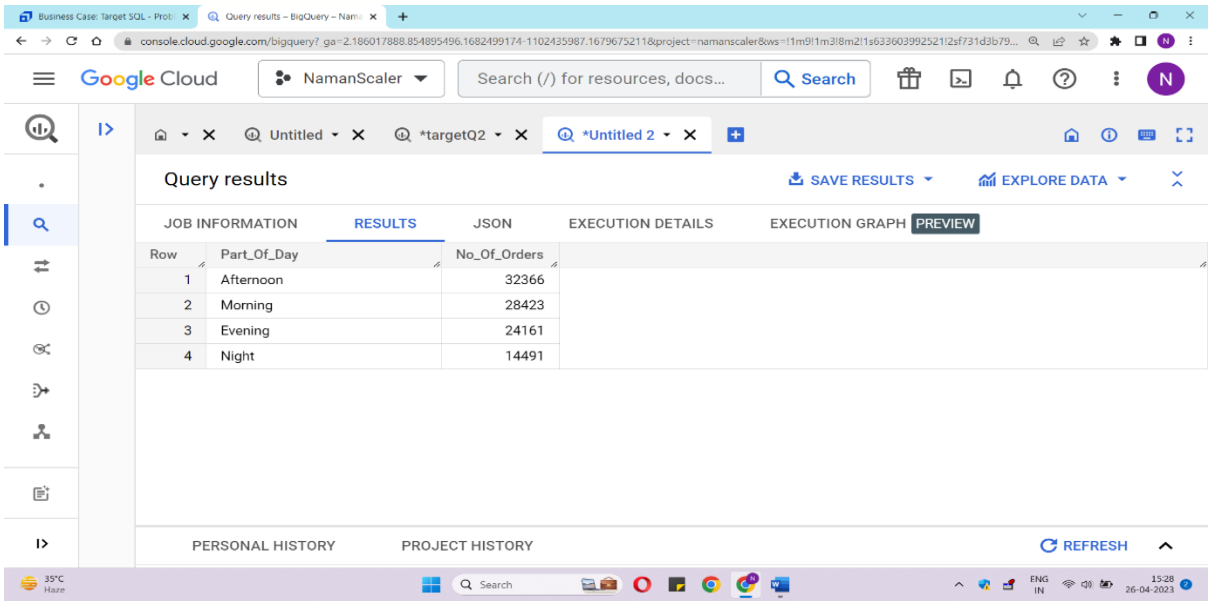
Insight:

From this we infer that this e-commerce business is growing as no_of_orders are increasing month on month. And by ordering we figure out that most no_of_orders are in the months between October and February.

Q2.2 What time do Brazilian customers tend to buy (Evening, Morning, Afternoon or Night)?

Ans- I have used case statement to indicate part of days and then have grouped them by taking no of orders in that part of day using below query.

```
Select Part_Of_Day, count (*) as No_Of_Orders
from (
select extract (hour from order_purchase_timestamp) as Hour,
case
when extract(hour from order_purchase_timestamp)>=5 and extract(hour from order_purc
hase_timestamp)<=12 then 'Morning'
when extract(hour from order_purchase_timestamp)>12 and extract(hour from order_purc
hase_timestamp)<=17 then 'Afternoon'
when extract(hour from order_purchase_timestamp)>17 and extract(hour from order_purc
hase_timestamp)<=21 then 'Evening'
when extract(hour from order_purchase_timestamp)>21 and  extract(hour from order_purc
hase_timestamp)<=23 then 'Night'
when extract(hour from order_purchase_timestamp)>=0 and extract(hour from order_purc
hase_timestamp)<=4 then 'Night'
end as Part_Of_Day
from `Target_Database.orders`) as temp
group by Part_Of_Day
order by No_Of_Orders desc
```



Row	Part_Of_Day	No_Of_Orders
1	Afternoon	32366
2	Morning	28423
3	Evening	24161
4	Night	14491

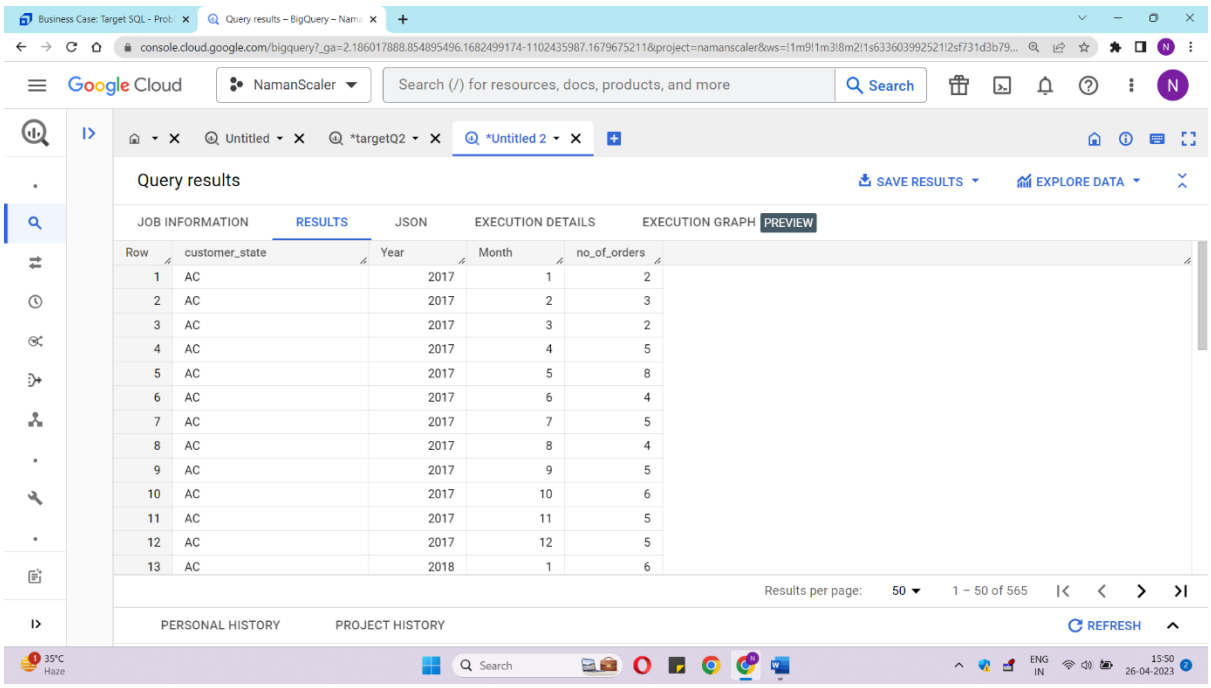
Insight:

From this we infer that people mostly place orders in afternoon and morning that is between 5 am to 5pm and very less people place orders at night that is from 9pm to 4am.

Q3.1 Get month on month orders by states.

Ans- I have taken out count of orders state wise and month wise for the entire time period of data.

```
select customer_state, extract (year from order_purchase_timestamp) as Year,
extract (month from order_purchase_timestamp) as Month,
count (distinct ord.order_id) as no_of_orders
from `Target_Database.orders` ord
join `Target_Database.customers` cust on ord.customer_id=cust.customer_id
group by customer_state, Year, Month
order by customer_state, Year, Month
```



Query results

Row	customer_state	Year	Month	no_of_orders
1	AC	2017	1	2
2	AC	2017	2	3
3	AC	2017	3	2
4	AC	2017	4	5
5	AC	2017	5	8
6	AC	2017	6	4
7	AC	2017	7	5
8	AC	2017	8	4
9	AC	2017	9	5
10	AC	2017	10	6
11	AC	2017	11	5
12	AC	2017	12	5
13	AC	2018	1	6

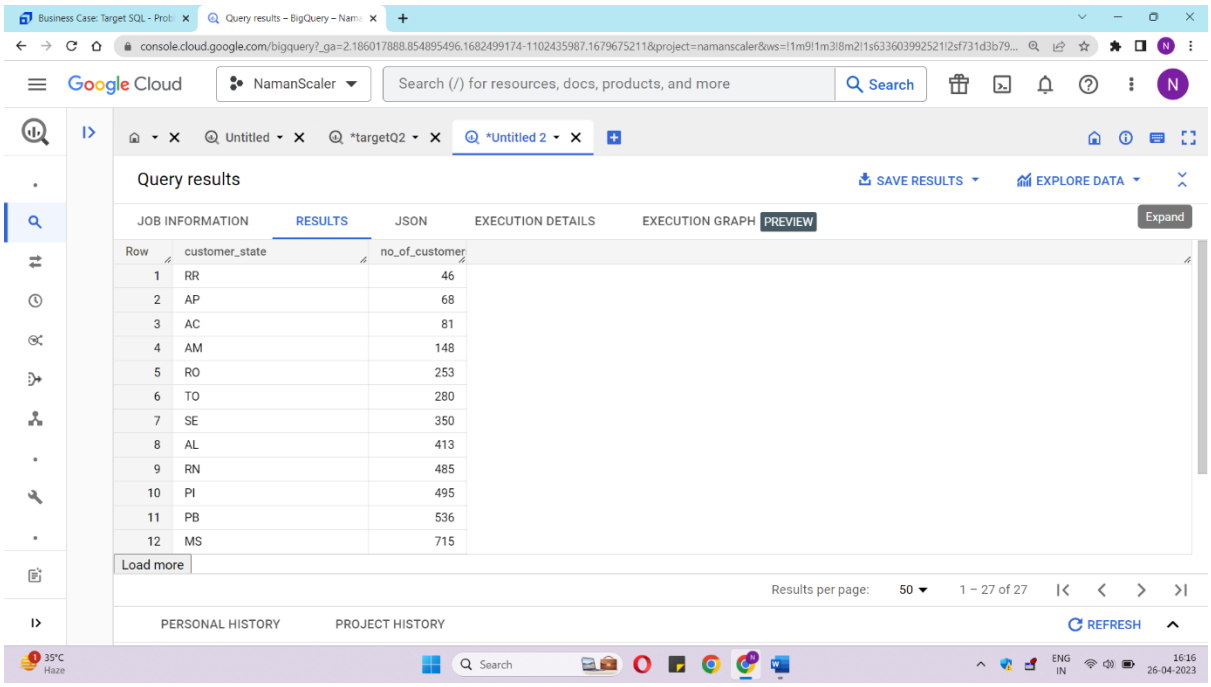
Insight:

From this we can see growth of business state wise. There is not much growth in business.

Q3.2 Distribution of customers across the states in Brazil

Ans- For Distribution data we have counted number of customers from each state in Brazil.

```
select customer_state, count (distinct customer_id) as no_of_customers
from `Target_Database.customers`
group by customer_state
order by no_of_customers
```



Query results

Row	customer_state	no_of_customer
1	RR	46
2	AP	68
3	AC	81
4	AM	148
5	RO	253
6	TO	280
7	SE	350
8	AL	413
9	RN	485
10	PI	495
11	PB	536
12	MS	715

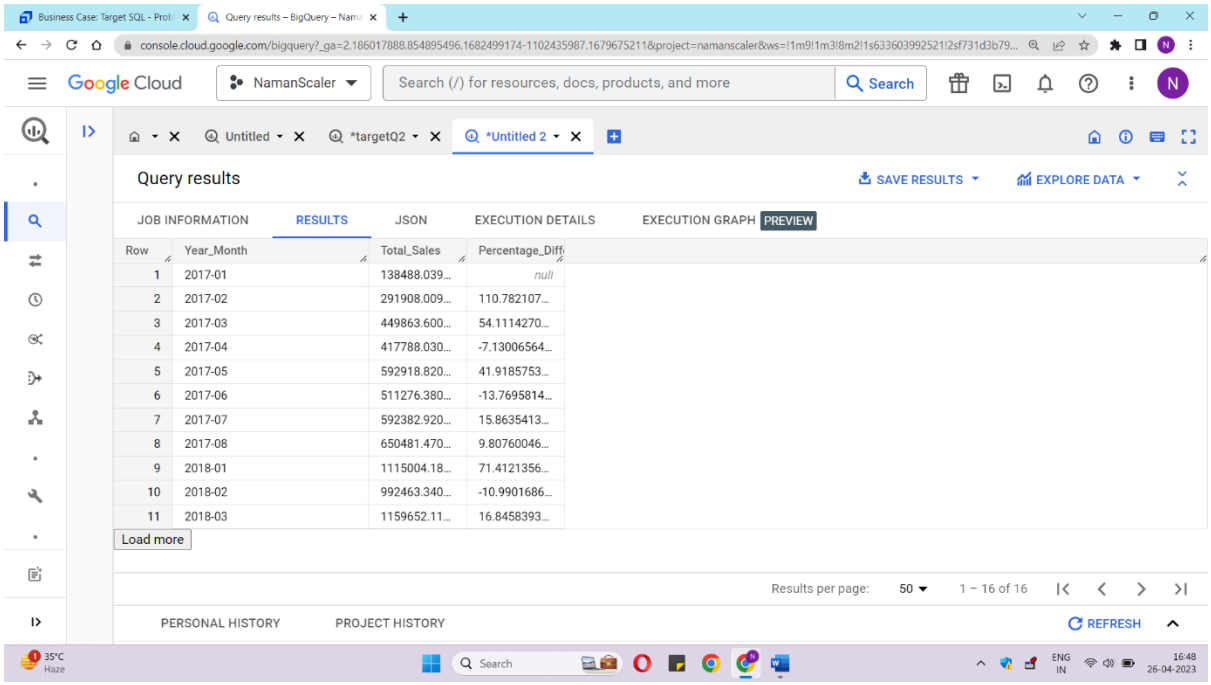
Insight:

From this we can get total number of customers from each state and thus find out which state needs more attention. Thus, from above we can see that top 5 customer states needs more attention.

Q4.1 Get % increase in cost of orders from 2017 to 2018 (include months between Jan to Aug only) - You can use "payment_value" column in payments table.

Ans-

```
Select *,
((Total_Sales - lag(Total_Sales, 1)
over(order by Year_Month))/(lag(Total_Sales,1) over(order by Year_Month))*100) as
Percentage_Difference_Cost_Of_Orders
From (
select FORMAT_DATE ('%Y-%m', DateTime (order_purchase_timestamp)) as Year_Month,
sum(payment_value) as Total_Sales
from `Target_Database.orders` ord
join `Target_Database.payments` pay on ord.order_id = pay.order_id
where (order_purchase_timestamp>='2017-01-01' and order_purchase_timestamp<='2017-
08-31') or (order_purchase_timestamp>='2018-01-
01' and order_purchase_timestamp<='2018-08-31')
group by Year_Month
order by Year_Month) as temp
order by Year_Month
```



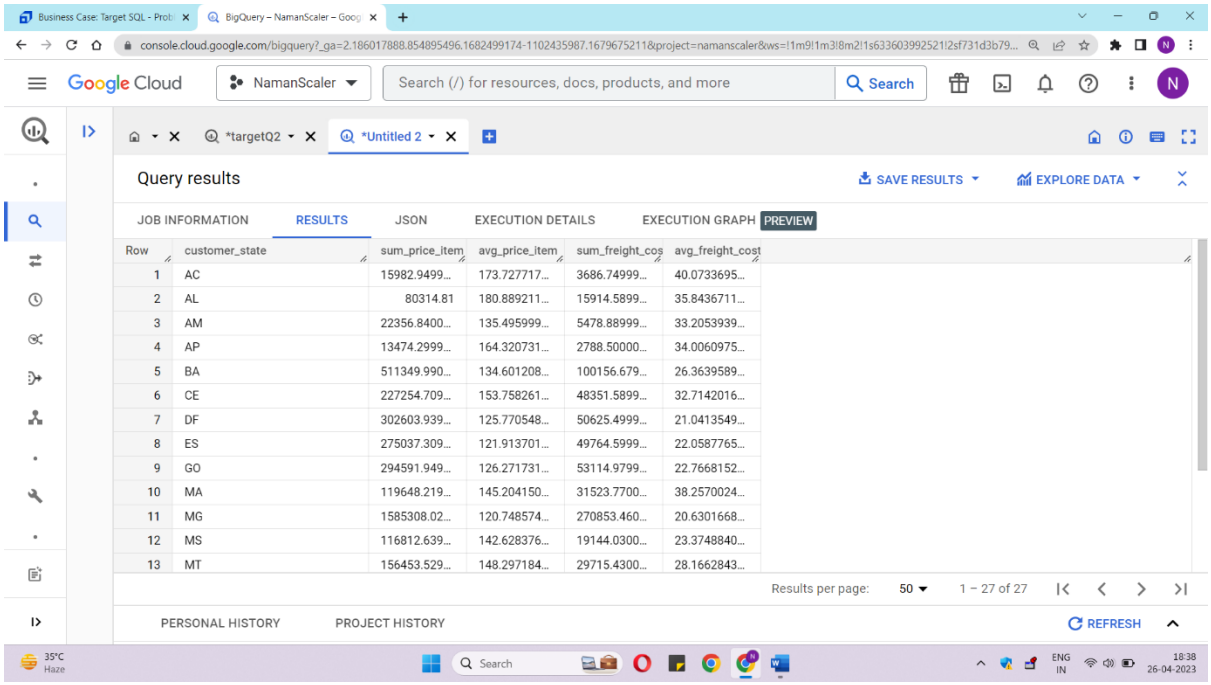
Row	Year_Month	Total_Sales	Percentage_Diff
1	2017-01	138488.039...	null
2	2017-02	291908.009...	110.782107...
3	2017-03	449863.600...	54.1114270...
4	2017-04	417788.030...	-7.13006564...
5	2017-05	592918.820...	41.9185753...
6	2017-06	511276.380...	-13.7695814...
7	2017-07	592382.920...	15.8635413...
8	2017-08	650481.470...	9.80760046...
9	2018-01	1115004.18...	71.4121356...
10	2018-02	992463.340...	-10.9901686...
11	2018-03	1159652.11...	16.8458393...

Insight:
From this you can see the % increase in cost of orders from 2017 to 2018 month-wise, negative percentage indicates that there is decrease in cost of orders. We can see that % difference is decreasing which means that total sales is decreasing which is not good.

Q4.2 Mean & Sum of price and freight value by customer state.

Ans-

```
select customer_state, sum(price) as sum_price_item, avg(price) as avg_price_item,
sum(freight_value) as sum_freight_cost, avg(freight_value) as avg_freight_cost
from `Target_Database.orders` ord
join `Target_Database.order_items` ord_i on ord.order_id=ord_i.order_id
join `Target_Database.customers` cust on cust.customer_id=ord.customer_id
group by customer_state
order by customer_state
```



Row	customer_state	sum_price_item	avg_price_item	sum_freight_cos	avg_freight_cost
1	AC	15982.9499...	173.727717...	3686.74999...	40.0733695...
2	AL	80314.81	180.889211...	15914.5899...	35.8436711...
3	AM	22356.8400...	135.495999...	5478.88999...	33.2053939...
4	AP	13474.2999...	164.320731...	2788.50000...	34.0060975...
5	BA	511349.990...	134.601208...	100156.679...	26.3639589...
6	CE	227254.709...	153.758261...	48351.5899...	32.7142016...
7	DF	302603.939...	125.770548...	50625.4999...	21.0413549...
8	ES	275037.309...	121.913701...	49764.5999...	22.0587765...
9	GO	294591.949...	126.271731...	53114.9799...	22.7668152...
10	MA	119648.219...	145.204150...	31523.7700...	38.2570024...
11	MG	1585308.02...	120.748574...	270853.460...	20.6301668...
12	MS	116812.639...	142.628376...	19144.0300...	23.3748840...
13	MT	156453.529...	148.297184...	29715.4300...	28.1662843...

Insight:

From this we can see average order value and average freight cost contribution by different states and total sales contribution.

Q5.1 Calculate days between purchasing, delivering and estimated delivery.

time_to_delivery = order_purchase_timestamp -order_delivered_customer_date

diff_estimated_delivery = order_estimated_delivery_date - order_delivered_customer_date

Group data by state, take mean of freight_value, time_to_delivery, diff_estimated_delivery.

Ans-

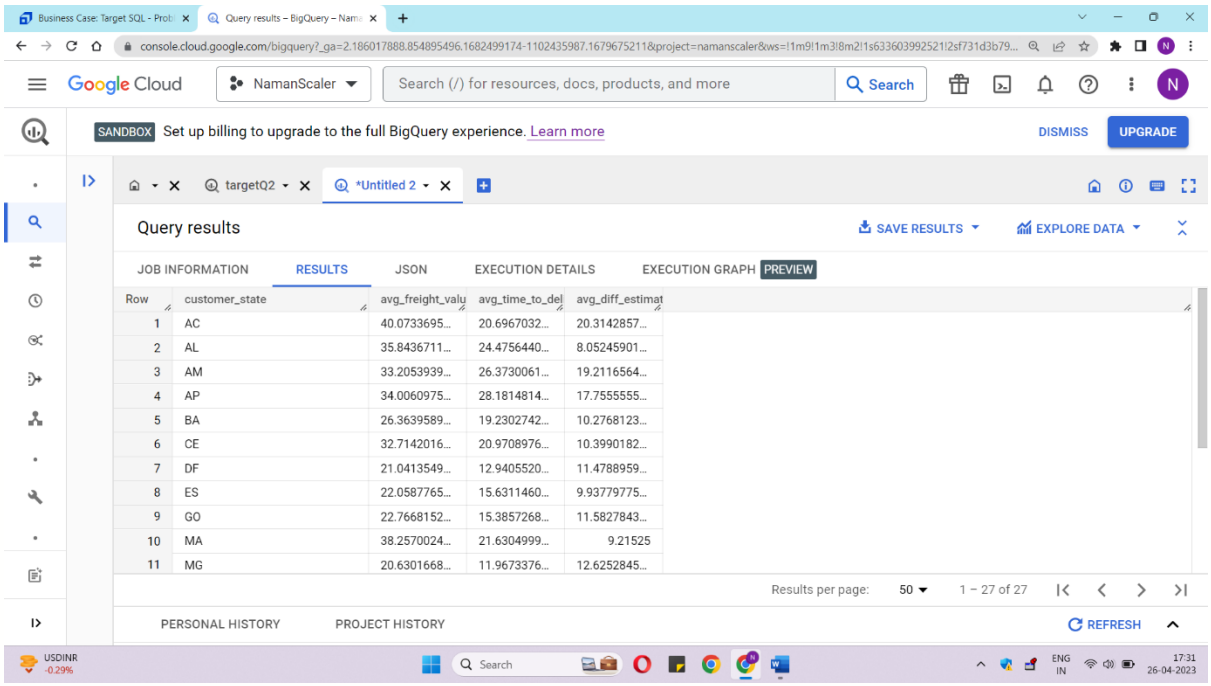
```
with ctedelivery as (

select customer_state, avg(freight_value) as avg_freight_value,

avg (round (date_diff (order_delivered_customer_date, order_purchase_timestamp, hour)/24,1)) as avg_time_to_delivery,

avg (round (date_diff (order_estimated_delivery_date, order_delivered_customer_date, hour)/24,1)) as avg_diff_estimated_delivery
from `Target_Database.orders` ord
join `Target_Database.customers` cust on ord.customer_id=cust.customer_id
join `Target_Database.order_items` oitem on oitem.order_id=ord.order_id
group by customer_state)

select * from ctedelivery
order by customer_state
```

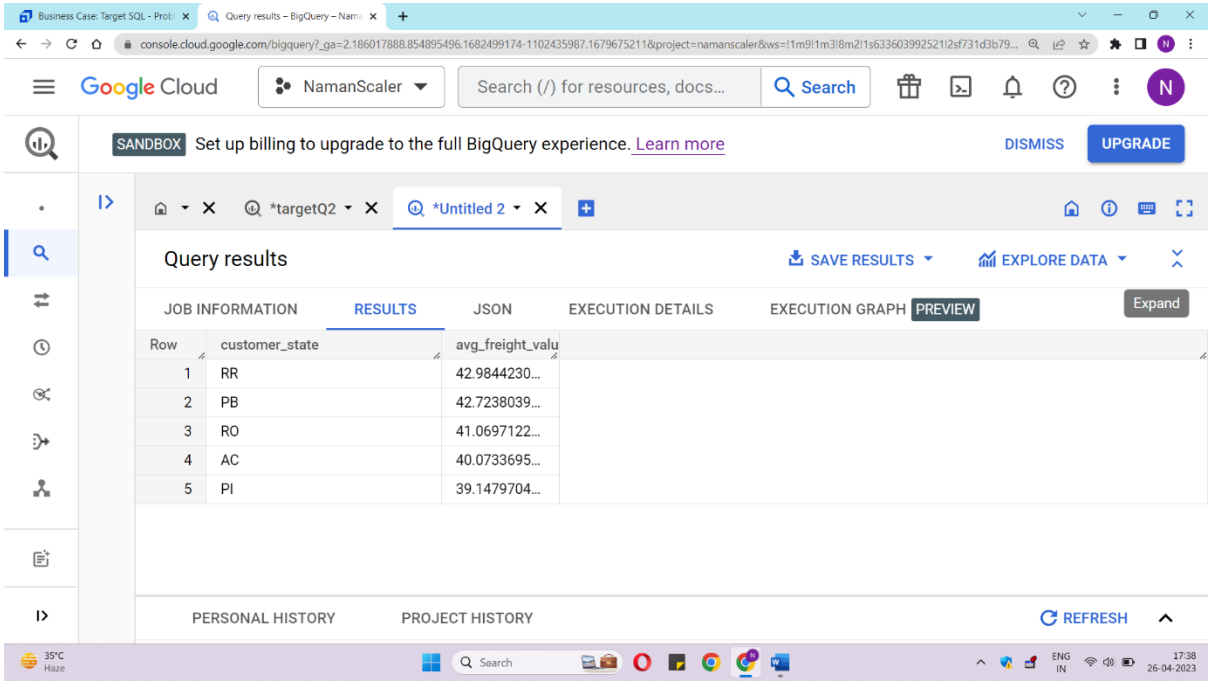


Row	customer_state	avg_freight_valu	avg_time_to_del	avg_diff_estimat
1	AC	40.0733695...	20.6967032...	20.3142857...
2	AL	35.8436711...	24.4756440...	8.05245901...
3	AM	33.2053939...	26.3730061...	19.2116564...
4	AP	34.0060975...	28.1814814...	17.7555555...
5	BA	26.3639589...	19.2302742...	10.2768123...
6	CE	32.7142016...	20.9708976...	10.3990182...
7	DF	21.0413549...	12.9405520...	11.4788959...
8	ES	22.0587765...	15.6311460...	9.93779775...
9	GO	22.7668152...	15.3857268...	11.5827843...
10	MA	38.2570024...	21.6304999...	9.21525
11	MG	20.6301668...	11.9673376...	12.6252845...

Q5.1 Top 5 states with highest/lowest average freight value - sort in desc/asc limit 5

Ans-

```
select customer_state, avg_freight_value
from ctedelivery
order by avg_freight_value desc
limit 5
```

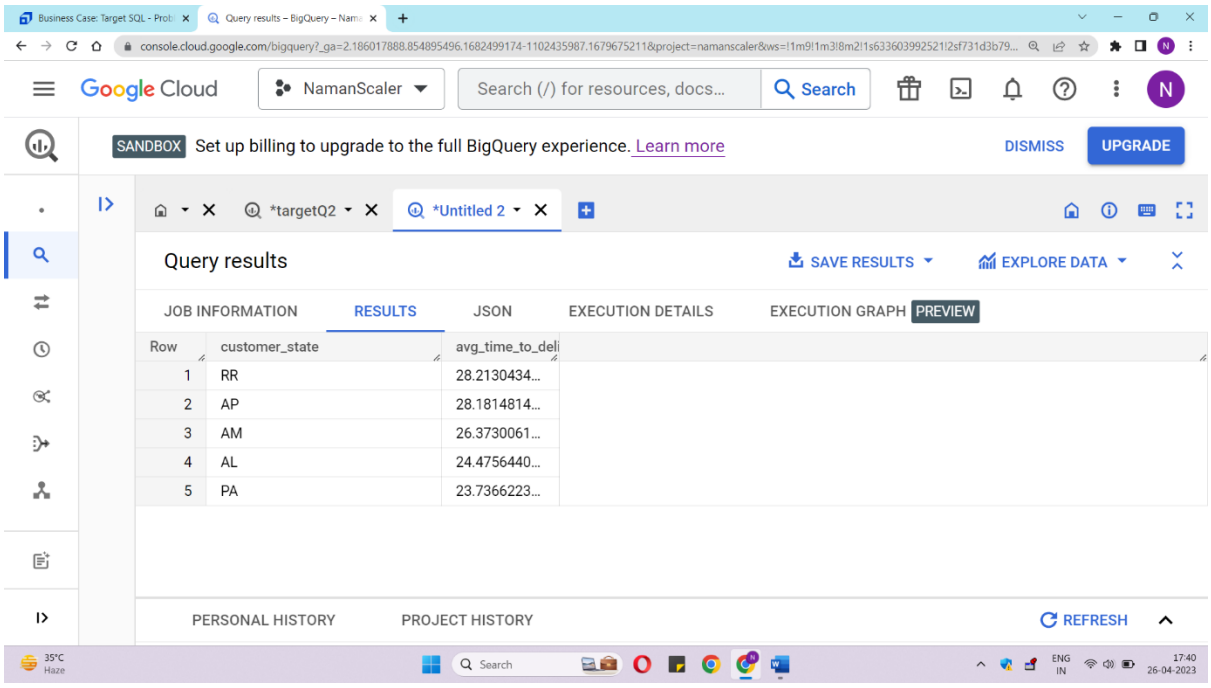


Row	customer_state	avg_freight_valu
1	RR	42.9844230...
2	PB	42.7238039...
3	RO	41.0697122...
4	AC	40.0733695...
5	PI	39.1479704...

5.2 Top 5 states with highest/lowest average time to delivery

Ans-

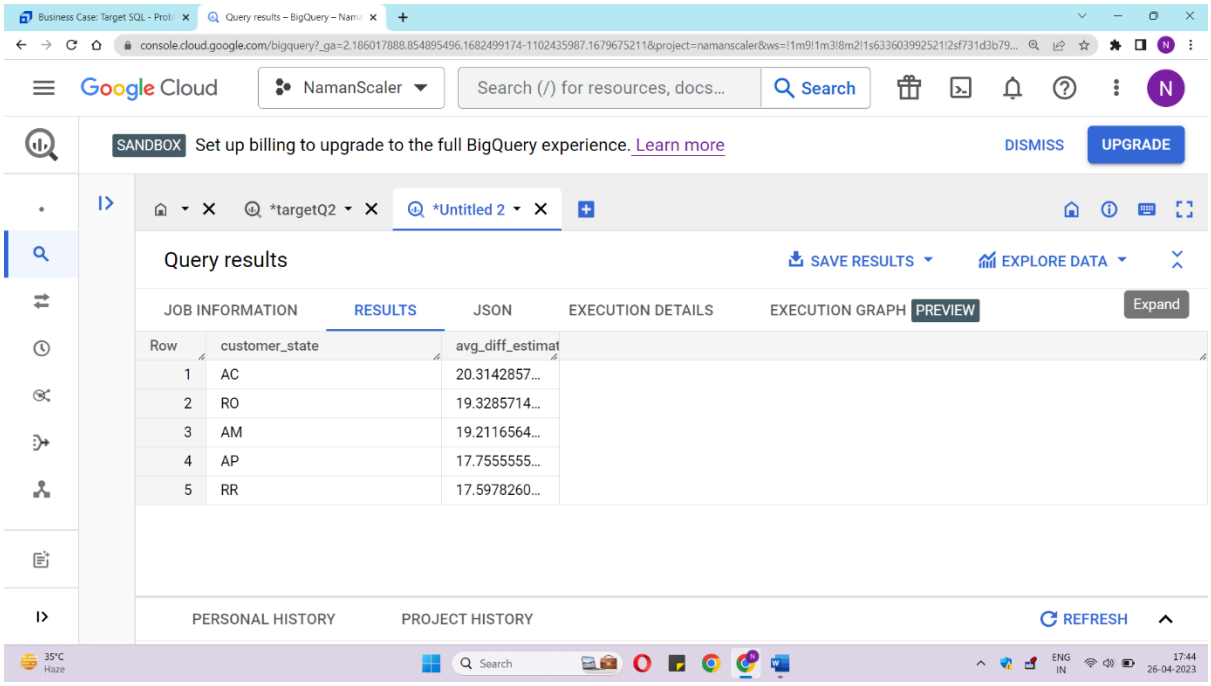
```
select customer_state, avg_time_to_delivery
from ctedelivery
order by avg_time_to_delivery desc
limit 5
```



Q5.3 Top 5 states where delivery is really fast/ not so fast compared to estimated date.

Ans-

```
select customer_state, avg_diff_estimated_delivery
from ctedelivery
order by avg_diff_estimated_delivery desc
limit 5
```



Row	customer_state	avg_diff_estimat
1	AC	20.3142857...
2	RO	19.3285714...
3	AM	19.2116564...
4	AP	17.7555555...
5	RR	17.5978260...

Insight:

From above data we can analyse that as time of delivery increases freight value also increases.So there is a need to see why for some states freight are high,is it due to distance or something else.

Next we can see that for many states estimated delivery date is prediicted wrong

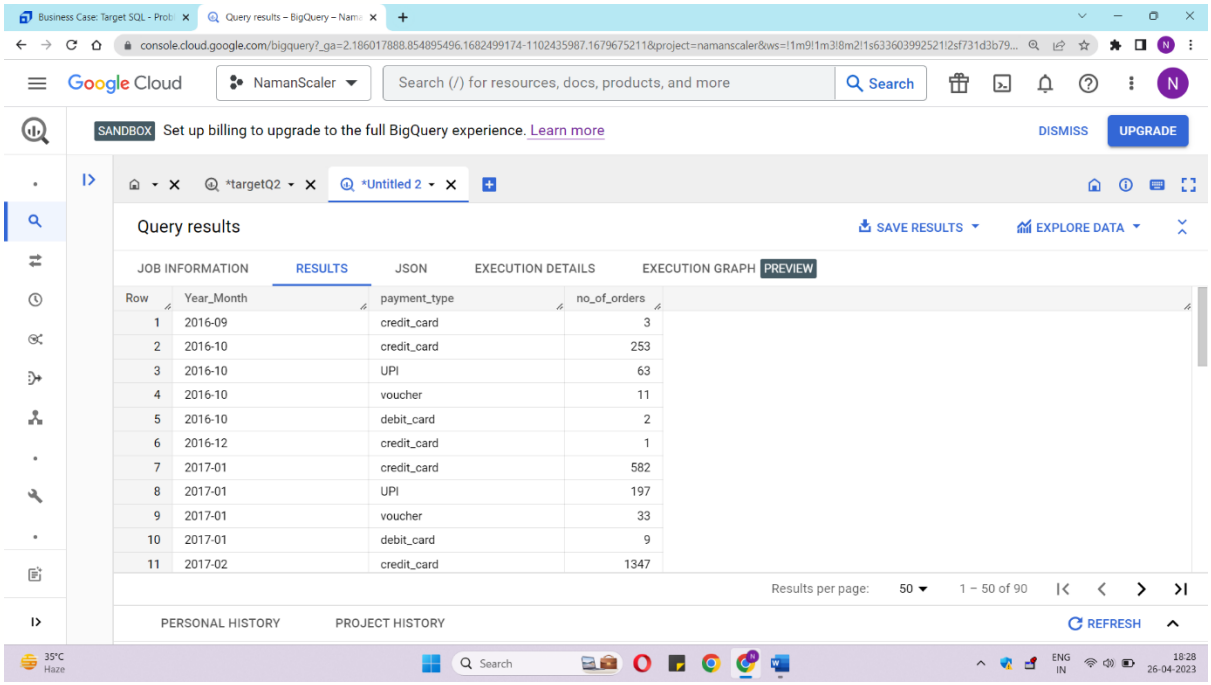
as you can see that for customer_state AC the avg_diff_estimated_Delivery

is 20 days ,this means that the product was delivered 20 days earlier than predicted so there is a need to optimize the estimated delivery date prediction system

Q6.1 Month over Month count of orders for different payment types

Ans-

```
Select  FORMAT_DATE ('%Y-%m', DateTime (order_purchase_timestamp)) as Year_Month,
payment_type, count (distinct pay.order_id) as no_of_orders
from `Target_Database.orders` ord
join `Target_Database.payments` pay on ord.order_id=pay.order_id
group by Year_Month, payment_type
order by Year_Month, no_of_orders desc
```



Query results

Row	Year_Month	payment_type	no_of_orders
1	2016-09	credit_card	3
2	2016-10	credit_card	253
3	2016-10	UPI	63
4	2016-10	voucher	11
5	2016-10	debit_card	2
6	2016-12	credit_card	1
7	2017-01	credit_card	582
8	2017-01	UPI	197
9	2017-01	voucher	33
10	2017-01	debit_card	9
11	2017-02	credit_card	1347

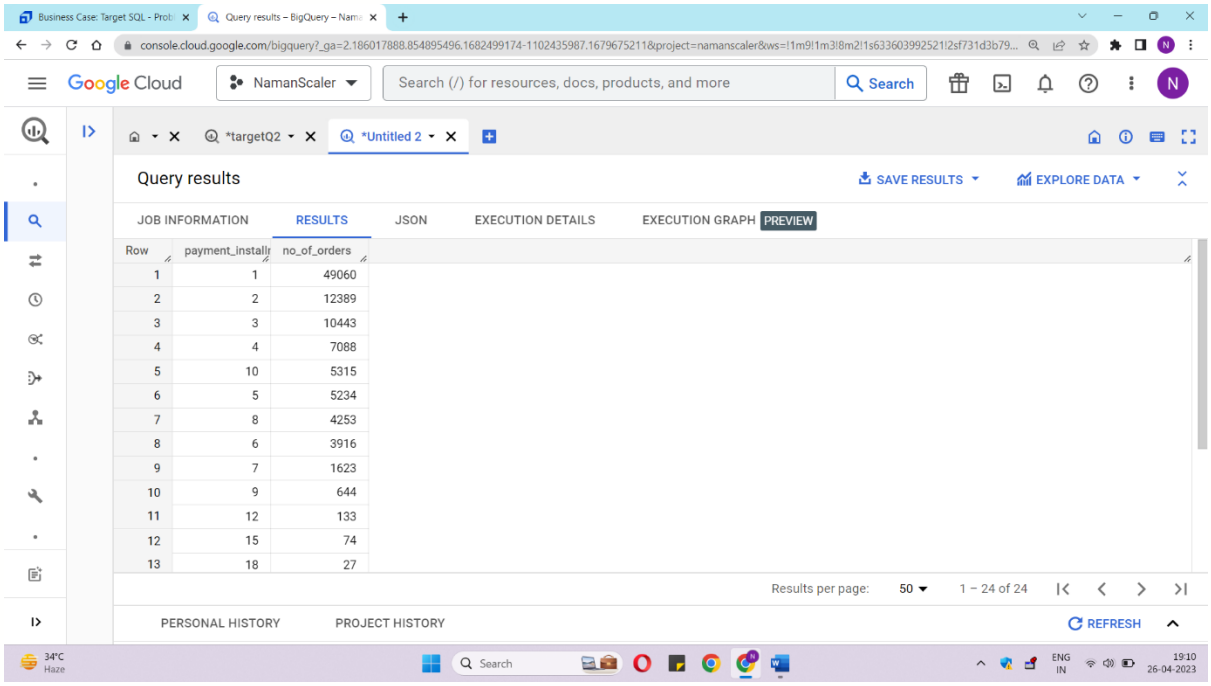
Insight:

From above data we can clearly see monthwise count of orders for different payment types and then we can infer which mode of payment is growing and here we can see that credit card is mostly used as payment_type for orders.

Q6.2 Count of orders based on the no. of payment installments.

Ans-

```
select payment_installments, count (distinct order_id) as no_of_orders
from `Target_Database.payments`
group by payment_installments
order by no_of_orders desc
```



Row	payment_installi	no_of_orders
1	1	49060
2	2	12389
3	3	10443
4	4	7088
5	10	5315
6	5	5234
7	8	4253
8	6	3916
9	7	1623
10	9	644
11	12	133
12	15	74
13	18	27

Insight:

From above data we can see no of payment installments preferred by most of customers. And we can see that most payment_installments preferred are of 1,2,3.

Recommendations-

1. we should try to increase sales on months where no of orders are less by adopting an appropriate strategy.

2. We can also promote sales at night by offering midnight by offering exclusive deals so that more and more people order at night

3. For expanding our business we can focus on states where number of orders and customers are less

4. We should constantly focus on cost of orders monthwise and as it is decreasing so we need to adopt a strategy to increase cost of orders.

5. we should try to deliver the order within estimated delivery date,some states are facing delay in orders and also at some places order is delivered very early as compared to estimated delivery date ,so there is need to optimize the delivery predictioion system.