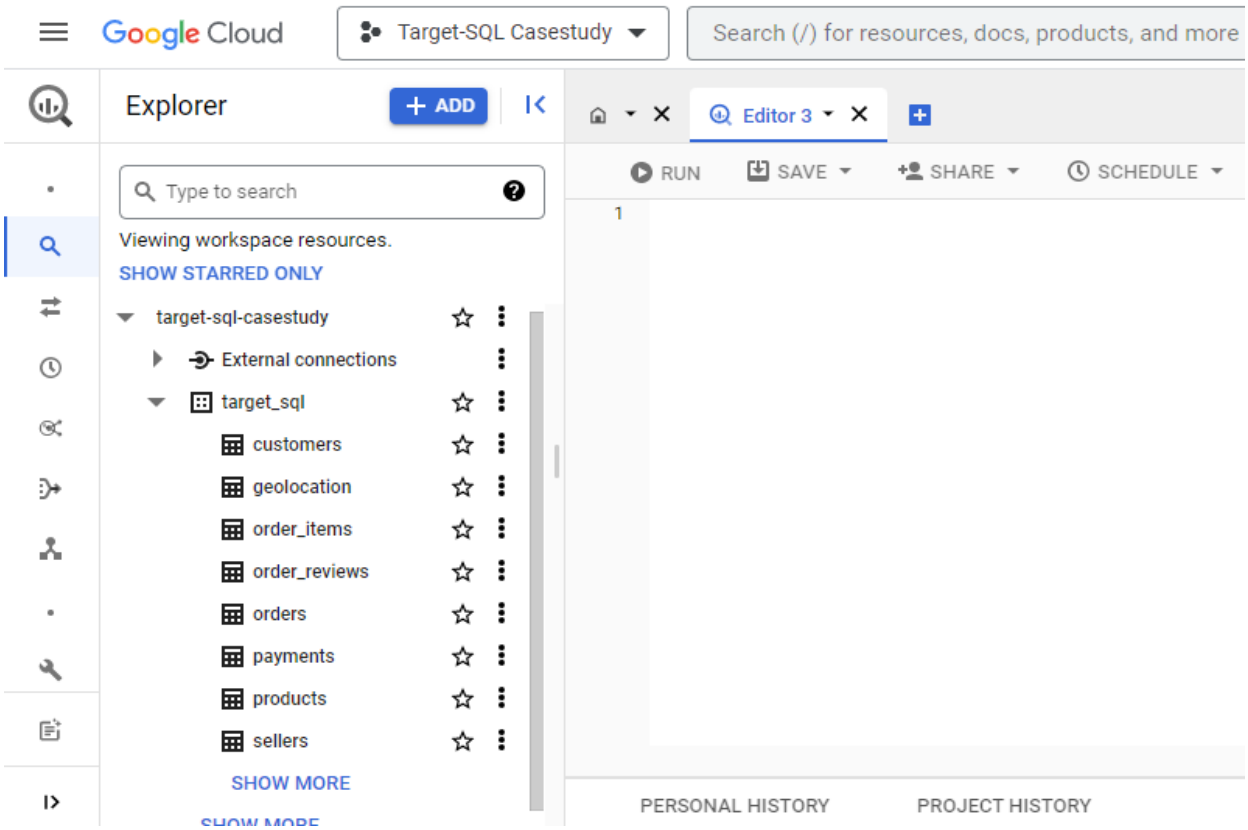
1. Importing the data & Initial exploration of dataset like checking the characteristics of data

- Data is imported in Bigquery:



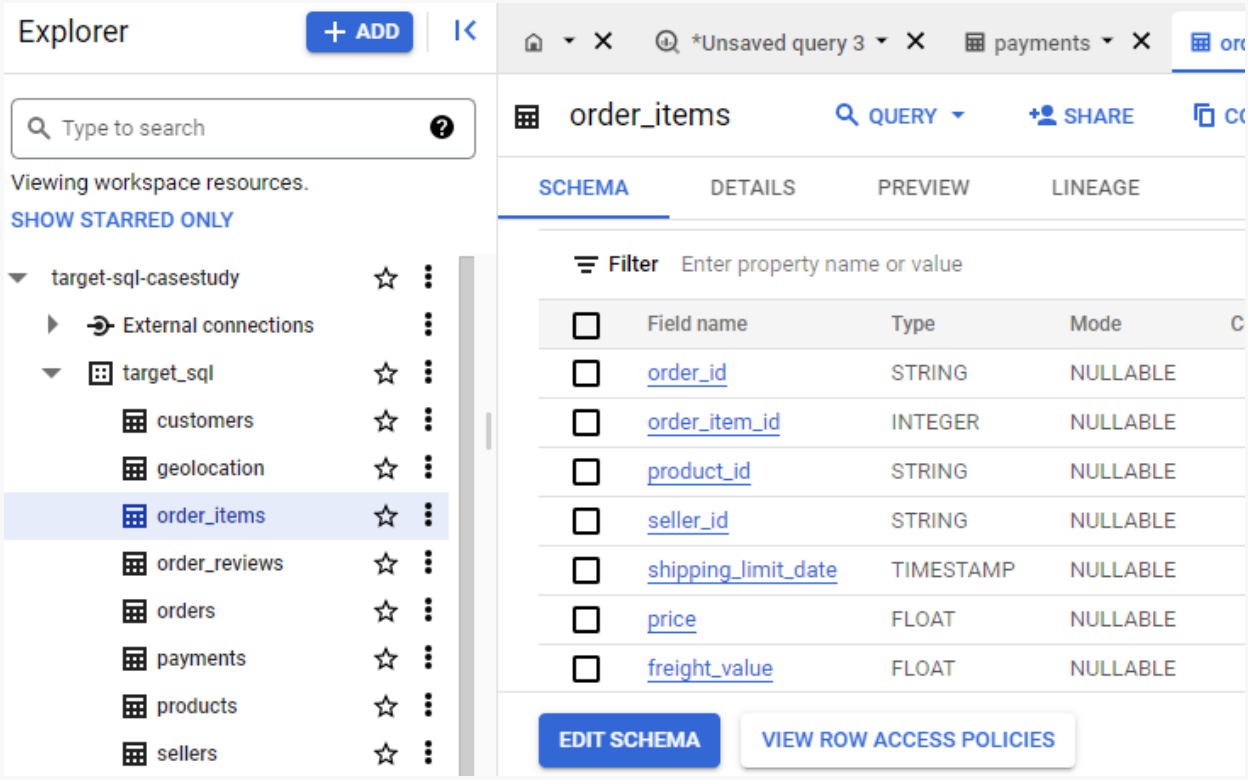
1.1. Data type of columns in a table

- For customer Table using SQL Query

```
SELECT
  *,
  data_type
FROM `target-sql-casestudy.target_sql.INFORMATION_SCHEMA.COLUMNS`
WHERE table_name='customers'
```

Row	column_name	ordinal_position	is_nullable	data_type
1	customer_id	1	YES	STRING
2	customer_unique_id	2	YES	STRING
3	customer_zip_code_prefix	3	YES	INT64
4	customer_city	4	YES	STRING
5	customer_state	5	YES	STRING

- For order_items Table



1.2. Time period for which the data is given

Time period for given data is considered as difference between first order purchasing date & last order purchasing date.

Time period (in Days)=772 days

First order purchased on 2016-09-04 at 21:15:19 UTC

Last order purchased on 2018-10-17 at 17:30:18 UTC

```
SELECT
```

```
  MIN(order_purchase_timestamp) AS order_purchase_first_day,
  MAX(order_purchase_timestamp) AS order_purchase_last_day,
  DATE_DIFF(MAX(order_purchase_timestamp), MIN(order_purchase_timestamp), Day) as
order_purchase_time_period
FROM `target_sql.orders`
```

Row	order_purchase_first_day	order_purchase_last_day	order_purchase_time_period
1	2016-09-04 21:15:19 UTC	2018-10-17 17:30:18 UTC	772

1.3. Cities and States of customers ordered during the given period

```
SELECT
  o.customer_id,
  c.customer_state,
  c.customer_city,
  o.order_purchase_timestamp
FROM `target_sql.orders` AS o
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
ORDER BY o.order_purchase_timestamp
```

Row	customer_id	customer_state	customer_city	order_purchase_timestamp
1	08c5351a6aca1c1589a38f244edeee9d	RR	boa vista	2016-09-04 21:15:19 UTC
2	683c54fc24d40ee9f8a6fc179fd9856c	RS	passo fundo	2016-09-05 00:15:34 UTC
3	622e13439d6b5a0b486c435618b2679e	SP	sao jose dos campos	2016-09-13 15:24:19 UTC
4	86dc2ffce2dfff336de2f386a786e574	SP	sao joaquim da barra	2016-09-15 12:16:38 UTC
5	b106b360fe2ef8849fbbd056f777b4d5	SP	sao paulo	2016-10-02 22:07:52 UTC
6	355077684019f7f60a031656bd7262b8	SP	sao paulo	2016-10-03 09:44:50 UTC
7	7ec40b22510fdbea1b08921dd39e63d8	RS	panambi	2016-10-03 16:56:50 UTC
8	70fc57eeae292675927697fe03ad3ff5	RJ	rio de janeiro	2016-10-03 21:01:41 UTC
9	6f989332712d3222b6571b1cf5b835ce	RS	porto alegre	2016-10-03 21:13:36 UTC
10	b8cf418e97ae795672d326288dfab7a7	SP	hortolandia	2016-10-03 22:06:03 UTC

2. In-depth Exploration

2.1. 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?

- Growing trend of e-commerce in Brazil is observed Year-by-Year as the number of products ordered by customers increased year by year (2016 to 2018).

```
SELECT
  x.order_purchase_year,
  COUNT(*) AS total_items_order_by_year
FROM(
SELECT
  *,
  EXTRACT(YEAR FROM order_purchase_timestamp) AS order_purchase_year
FROM `target_sql.orders`
) AS x
GROUP BY x.order_purchase_year
ORDER BY x.order_purchase_year
```

Row	order_purchase_year	total_items_order_by_year
1	2016	329
2	2017	45101
3	2018	54011

-More complete scenarios can be obtained by further seeing the month wise trend (From 2016 to 2018).
-It is clearly visible that as we move from Jan'2017 to Nov'2017, no of orders purchased by customer went from 800 to 7544 and then further dropped down to 6512 in Aug'2018, which clearly indicates that there is upward growth on e-commerce in Brazil Year-By-Year but upward growth is not strictly increasing over the whole period, and also observed few seasonal peaks .

```
SELECT
  x.order_purchase_year,
  x.order_purchase_month,
  COUNT(*) AS total_items_order_by_month
FROM(
SELECT
  *,
```

```
  EXTRACT(YEAR FROM order_purchase_timestamp) AS order_purchase_year,
  EXTRACT(MONTH FROM order_purchase_timestamp) AS order_purchase_month
FROM `target_sql.orders`
) AS x
GROUP BY x.order_purchase_month,x.order_purchase_year
ORDER BY x.order_purchase_year,x.order_purchase_month
```

Row	order_purchase_year	order_purchase_month	total_items_order_by_month
1	2016	9	4
2	2016	10	324
3	2016	12	1
4	2017	1	800
5	2017	2	1780
6	2017	3	2682
7	2017	4	2404
8	2017	5	3700
9	2017	6	3245
10	2017	7	4026
11	2017	8	4331
12	2017	9	4285
13	2017	10	4631
14	2017	11	7544
15	2017	12	5673

- We can observe some seasonality with peaks at specific months like Nov '2017 as no of orders by customer went from 4631 in Oct' 2017 to 7544 in Nov '2017.
-Also No of orders went from 5673 in Dec '2017 to 7269 in Jan'2018.Thus, Peak is observed in the months of Nov '2017 and Jan'2018.
-Although , data of Nov '2018 or Jan'2019 is not available to further analyze if peaks are observed every year during this time of month.

```
SELECT
  x.order_purchase_year,
```

```sql
  x.order_purchase_month,
  COUNT(*) AS total_items_order_by_month,
  DENSE_RANK() OVER(
    ORDER BY Count(*) DESC
  ) AS Highest_order_rank
FROM(
SELECT
  *,
  EXTRACT(YEAR FROM order_purchase_timestamp) AS order_purchase_year,
  EXTRACT(MONTH FROM order_purchase_timestamp) AS order_purchase_month
FROM `target_sql.orders`
) AS x
GROUP BY x.order_purchase_month,x.order_purchase_year
ORDER BY x.order_purchase_year,x.order_purchase_month
```

Row	order_purchase_year	order_purchase_month	total_items_order_by_month	Highest_order_rank
1	2016	9	4	23
2	2016	10	324	21
3	2016	12	1	24
4	2017	1	800	20
5	2017	2	1780	19
6	2017	3	2682	17
7	2017	4	2404	18
8	2017	5	3700	15
9	2017	6	3245	16
10	2017	7	4026	14
11	2017	8	4331	12
12	2017	9	4285	13
13	2017	10	4631	11
14	2017	11	7544	1
15	2017	12	5673	10
16	2018	1	7269	2
17	2018	2	6728	6

2.2. What time do Brazilian customers tend to buy (Dawn, Morning, Afternoon or Night)?

- To solve the given problem, I have firstly classify the day hours as below:

4AM-6.59AM=Dawn

7AM-11.59AM=Morning

12PM-4.59PM=Afternoon

5PM-7.59 PM=Evening

8PM-3.59AM(Next Day)=Night

-It is observed that Brazilian customers tend to buy more during Afternoon i.e.32211 products ordered which is almost twice as that of products ordered during evening. Only 896 products ordered during Dawn, and least among all.

```
SELECT
  x.time_classify,
  count(*) AS no_of_products_ordered
FROM
(SELECT
  *,
  EXTRACT(HOUR FROM order_purchase_timestamp) AS hour_,
  case
   when EXTRACT(HOUR FROM order_purchase_timestamp) between 4 and 6
      then 'Dawn'
   when EXTRACT(HOUR FROM order_purchase_timestamp) between 7 and 11
      then 'Morning'
   when EXTRACT(HOUR FROM order_purchase_timestamp) between 12 and 16
      then 'Afternoon'
   when EXTRACT(HOUR FROM order_purchase_timestamp) between 17 and 19
      then 'Evening'
   ELSE 'Night'
end AS time_classify
FROM `target_sql.orders`
) AS x
GROUP BY x.time_classify
ORDER BY no_of_products_ordered DESC
```

Row	time_classify	no_of_products_ordered
1	Afternoon	32211

2	Night	26695
3	Morning	21738
4	Evening	17901
5	Dawn	896

3. Evaluation of E-commerce orders in the Brazil region

3.1. Get month on month orders by states

```
SELECT
  x.customer_state,
  x.order_year,
  x.order_month,
  count(*) AS orders_
  FROM
(SELECT
  *,
  EXTRACT(MONTH FROM order_purchase_timestamp) AS order_month,
  EXTRACT(YEAR FROM order_purchase_timestamp) AS order_year
FROM `target_sql.orders` AS o
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id) AS x
GROUP BY x.order_year,x.order_month,x.customer_state
ORDER BY x.customer_state,x.order_year,x.order_month
```

Row	customer_state	order_year	order_month	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

3.2. Distribution of customers across the states in Brazil

-Top 5 States by No of customers

SP > RJ > MG>RS>PR

```
SELECT
  customer_state,
  COUNT(*) AS No_of_customers_in_state
FROM `target_sql.customers`
GROUP BY customer_state
ORDER BY No_of_customers_in_state DESC
```

Row	customer_state	No_of_customers_in_state
1	SP	41746
2	RJ	12852
3	MG	11635
4	RS	5466
5	PR	5045
6	SC	3637
7	BA	3380
8	DF	2140
9	ES	2033
10	GO	2020

-Bottom 5 states by No. of Customers

RR > AP > AC > AM > RO

```
SELECT
  customer_state,
  COUNT(*) AS No_of_customers_in_state
FROM `target_sql.customers`
GROUP BY customer_state
```

```
ORDER BY No_of_customers_in_state
```

Row	customer_state	No_of_customers_in_state
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

4. Impact on Economy: Analyze the money movement by e-commerce by looking at order prices, freight and others.

4.1. Get % increase in cost of orders from 2017 to 2018 (include months between Jan to Aug only)

- Total % increase in cost of orders from 2017 to 2018 (including months between Jan to Aug only)=136.98%

```
SELECT
  x.order_year,
  ROUND(SUM(x.payment_value),2)AS sum_cost_of_orders_,
  ROUND((SUM(x.payment_value) - LAG (SUM(x.payment_value)) OVER (ORDER BY x.order_year
))/LAG (SUM(x.payment_value)) OVER (ORDER BY x.order_year)*100,2) AS
cost_of_order_percentage_growth
FROM(
SELECT
```

```
  *,
  EXTRACT(YEAR FROM o.order_purchase_timestamp) AS order_year,
  EXTRACT(MONTH FROM o.order_purchase_timestamp) AS order_month
FROM `target_sql.payments` AS p
INNER JOIN `target_sql.orders` AS o
ON p.order_id=o.order_id) AS x
WHERE x.order_year IN (2017,2018)
AND x.order_month IN (1,2,3,4,5,6,7,8)
GROUP BY x.order_year
ORDER BY x.order_year
```

Row	order_year	sum_cost_of_orders_	cost_of_order_percentage_growth
1	2017	3669022.12	*null*
2	2018	8694733.84	136.98

4.2. Mean & sum of price and freight value by customer state

```
SELECT
  c.customer_state,
  ROUND(SUM(oi.price),2) AS sum_price,
  ROUND(SUM(oi.freight_value),2) AS sum_freight,
  ROUND(AVG(oi.price),2) AS average_price,
  ROUND(AVG(oi.freight_value),2) AS average_freight
FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
GROUP BY c.customer_state
ORDER BY c.customer_state
```

Row	customer_state	sum_price	sum_freight	average_price	average_freight
1	AC	15982.95	3686.75	173.73	40.07
2	AL	80314.81	15914.59	180.89	35.84
3	AM	22356.84	5478.89	135.5	33.21
4	AP	13474.3	2788.5	164.32	34.01

5	BA	511349.99	100156.68	134.6	26.36
6	CE	227254.71	48351.59	153.76	32.71
7	DF	302603.94	50625.5	125.77	21.04
8	ES	275037.31	49764.6	121.91	22.06
9	GO	294591.95	53114.98	126.27	22.77
10	MA	119648.22	31523.77	145.2	38.26

-Top 5 states in terms of average price of orders

PB>AL>AC>RO>PA

```
SELECT
  c.customer_state,
  ROUND(AVG(oi.price),2) AS average_price,
  ROUND(AVG(oi.freight_value),2) AS average_freight
FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
GROUP BY c.customer_state
ORDER BY average_price DESC
LIMIT 5
```

Row	customer_state	average_price	average_freight
1	PB	191.48	42.72
2	AL	180.89	35.84
3	AC	173.73	40.07
4	RO	165.97	41.07
5	PA	165.69	35.83

-Bottom 5 states in terms of average price of orders

SP>PR>RS>MG>ES

```
SELECT
  c.customer_state,
```

```
  ROUND(AVG(oi.price),2) AS average_price,
  ROUND(AVG(oi.freight_value),2) AS average_freight
FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
GROUP BY c.customer_state
ORDER BY average_price
LIMIT 5
```

Row	customer_state	average_price	average_freight
1	SP	109.65	15.15
2	PR	119.0	20.53
3	RS	120.34	21.74
4	MG	120.75	20.63
5	ES	121.91	22.06

5. Analysis on sales, freight and delivery time

5.1. Calculate days between purchasing, delivering and estimated delivery

Days b/w order purchase & order delivery

Average days taken for order to deliver once purchase is made= 12.09 Days

```
SELECT
  order_id,
  customer_id,
  order_status,
  order_purchase_timestamp,
  order_delivered_customer_date,
  DATE_DIFF(order_delivered_customer_date,order_purchase_timestamp,Day) AS
days_order_delivered,
  ROUND(AVG(DATE_DIFF(order_delivered_customer_date,order_purchase_timestamp,Day))
OVER(),2) AS avg_days_order_delivered
FROM `target_sql.orders`
WHERE order_purchase_timestamp IS NOT NULL
```

```
AND order_delivered_customer_date IS NOT NULL
```

Row	order_id	customer_id	order_status	order_purchase_timestamp	order_delivered_customer_date	days_order_delivered	avg_days_order_delivered
1	d7918e406132d7c81f1b845276b03a3b	53504e2e5940107ff1e2e52a02cf6f8f	delivered	2017-07-13 17:54:53 UTC	2017-08-17 18:35:38 UTC	35	12.09
2	dc32acbe8d41196887e5d7ac6c2972bd	1fcb9f10321dfd890dd7153a7dfcc890	delivered	2018-03-07 15:24:48 UTC	2018-04-12 20:52:41 UTC	36	12.09
3	4802922b16a37af8db6fb3df54b07860	f078095ff04dedf7d217df058773668b	delivered	2017-12-01 11:25:38 UTC	2018-01-08 18:54:58 UTC	38	12.09
4	ed78b29fa4c1255d275df5d4e464503b	a5dceb0a120a9b028d3d4582422ad480	delivered	2018-01-17 09:33:47 UTC	2018-02-20 18:36:45 UTC	34	12.09
5	3054c6a8e45b740723ec8a7145d867b7	78d543ef68ecb2e26895755f8dc9c86a	delivered	2018-03-28 13:54:39 UTC	2018-05-02 15:38:26 UTC	35	12.09
6	5d6e9993ecc20a59e637ce711858d081	47fd93db3f6e715f6d06f90ba501b94d	delivered	2017-01-19 11:26:57 UTC	2017-03-23 08:21:38 UTC	62	12.09
7	86c25bbc1d16736365d6e747e71695f0	ae79842e6e74fffdd282a258b22a757b	delivered	2018-01-13 13:50:29 UTC	2018-02-21 20:29:00 UTC	39	12.09
8	42873babe11a5362e2b59e1bf80fbd92	3ec4d59cd0d003ac1da03b3c5fe970f2	delivered	2017-11-19 08:16:33 UTC	2017-12-28 14:29:14 UTC	39	12.09
9	482b0898624ebab18e90d224126c98a8	6e422478a5ccc422a4a7e50df1bff41e	delivered	2017-11-21 10:46:57 UTC	2017-12-21 14:22:58 UTC	30	12.09
10	3522f6da18c89c3dfc0ddb540afac391	e8af75d51a3972af7ed977ad4855aad6	delivered	2017-06-28 11:55:21 UTC	2017-07-27 21:51:47 UTC	29	12.09

Days b/w delivery date and estimated delivery date

Average days of difference b/w Order delivery date & Order estimated delivery date= 10.96 Days.
It includes both cases i.e. when order is delivered before estimated delivery date & when order is delivered after estimated delivery date.

```
SELECT
  order_id,
  customer_id,
  order_status,
  order_delivered_customer_date,
  order_estimated_delivery_date,
  DATE_DIFF(order_estimated_delivery_date,order_delivered_customer_date,Day) AS
days_diff_estimated_delivery,

ROUND(AVG(DATE_DIFF(order_estimated_delivery_date,order_delivered_customer_date,Day))
OVER(),2) AS days_diff_estimated_delivery
FROM `target_sql.orders`
WHERE order_delivered_customer_date IS NOT NULL
AND order_estimated_delivery_date IS NOT NULL
```

Row	order_id	customer_id	order_status	order_delivered_customer_date	order_estimated_delivery_date	days_diff_estimated_delivery	days_diff_estimated_delivery_1
1	a9d9e48bc0905664f33c53779b5edfb6	7195875a1f2cdaa5e75a1f132530e156	delivered	2017-11-15 00:42:59 UTC	2017-11-10 00:00:00 UTC	-5	10.96
2	9e7b4dc19aadc8298e2984986d3bf014	2ab4c04d8d6160749ea57e125c32a6a1	delivered	2017-12-20 14:32:58 UTC	2017-11-10 00:00:00 UTC	-40	10.96
3	d0240bcff59b720e55a2fc2c74344b6f	09f758f6da558eae5292b1a7718518b2	delivered	2017-02-10 10:34:45 UTC	2017-03-15 00:00:00 UTC	32	10.96
4	15b1aceab346b46189a6eea3b6f4b951	8ec1617ce630c731866f5a041b5d408c	delivered	2017-02-09 09:27:56 UTC	2017-03-15 00:00:00 UTC	33	10.96
5	643e340c6c562d108526c36d5a94c027	d268eb5ab77b7f0837b538ea3856884a	delivered	2018-01-18 22:51:54 UTC	2018-01-05 00:00:00 UTC	-13	10.96
6	3f26a399c8a1c0cf2c9dc8a194b134d3	e03322e99d1228607781f6db2ead35fb	delivered	2018-06-06 18:51:44 UTC	2018-05-29 00:00:00 UTC	-8	10.96
7	03ddab02775c66c855ad41424ae356e3	ed87333e69d2709d374534505818c9e2	delivered	2018-02-19 18:11:40 UTC	2018-03-26 00:00:00 UTC	34	10.96
8	2c60bc71e6da917194c35fa7c8477e7f	c14ee009789095771e86aece808515aa	delivered	2018-04-16 21:26:58 UTC	2018-03-26 00:00:00 UTC	-21	10.96
9	7fb6586ab530ed69383ddde20ef388f9	b0d72b227b0caa8a7156db18f5cbe0f4	delivered	2018-04-16 20:22:03 UTC	2018-03-26 00:00:00 UTC	-21	10.96
10	5ed3ec02627cdee4cc803950b95aaf02	62ccb3e4d92ff9d183f032bbcc727821	delivered	2018-05-02 19:52:07 UTC	2018-04-19 00:00:00 UTC	-13	10.96

where order delivered before the estimated delivery date

Average days of difference b/w Order delivery date & Order estimated delivery date=12.71 Days when order is delivered before estimated delivery date .

```
SELECT
  order_id,
  customer_id,
  order_status,
  order_delivered_customer_date,
  order_estimated_delivery_date,
  DATE_DIFF(order_estimated_delivery_date,order_delivered_customer_date,Day) AS
days_diff_estimated_delivery,

ROUND(AVG(DATE_DIFF(order_estimated_delivery_date,order_delivered_customer_date,Day))
OVER(),2) AS avg_days_diff_estimated_delivery
FROM `target_sql.orders`
WHERE order_delivered_customer_date IS NOT NULL
AND order_estimated_delivery_date IS NOT NULL
AND order_estimated_delivery_date>order_delivered_customer_date
```

Row	order_id	customer_id	order_status	order_delivered_customer_date	order_estimated_delivery_date	days_diff_estimated_delivery	avg_days_diff_estimated_delivery
1	445736171736c70c6187ee83c34165fe	b0cd60f17cb2a0ffd09d607e65d3874a	delivered	2018-08-21 14:24:37 UTC	2018-09-26 00:00:00 UTC	35	12.71

2	1a2582ca80feaaf937cc94d437ba1635	99efadd052716ca57a64a6287caca0eb	delivered	2018-06-09 15:42:09 UTC	2018-07-16 00:00:00 UTC	36	12.71
3	ff4cdf9a24ffba79c88c81aeb858b4c7	671c88e6f743e984ae2f877fb66e1a1f	delivered	2017-08-16 21:23:56 UTC	2017-09-15 00:00:00 UTC	29	12.71
4	2c0063b6f94aadf5af90291765541726	0541a0155b375e5d1ca9ed98e674e3b2	delivered	2018-05-21 23:52:14 UTC	2018-06-25 00:00:00 UTC	34	12.71
5	2c3f481e97111f73a244fdfc556e2303	ff0feea3121816d8a9918cd346d2ab7d	delivered	2017-02-24 10:38:56 UTC	2017-04-03 00:00:00 UTC	37	12.71
6	10492d21e254a11aa46c125a01702bfa	8f3fc20a1f8167dde23e0da111626aa0	delivered	2018-04-02 16:49:39 UTC	2018-05-08 00:00:00 UTC	35	12.71
7	523dafc7e66222e30a400621133aca08	6ec64888059bae0f28043de36f7f4516	delivered	2018-06-18 19:12:12 UTC	2018-08-07 00:00:00 UTC	49	12.71
8	0516c22655fe1e1f0b3390f4ee3fc5f6	4830a9c02b42036ffca989c6d2f8ff67	delivered	2017-02-09 18:38:01 UTC	2017-03-13 00:00:00 UTC	31	12.71
9	86df4a2f1f5cd47ee3f5bf1781240d1a	b0db02848249cbe57e7e5732976ced8e	delivered	2016-10-26 10:38:43 UTC	2016-11-29 00:00:00 UTC	33	12.71
10	b4e9e179195a7cee910bf458c5b6e01e	acad76e6005b7efd172a9fed40f7d31f	delivered	2017-02-08 13:37:45 UTC	2017-03-16 00:00:00 UTC	35	12.71

No of products delivered before estimated delivery date

```
SELECT
  count(*) AS no_Products_delivered_before_estimated
FROM `target_sql.orders`
WHERE order_delivered_customer_date IS NOT NULL
AND order_estimated_delivery_date IS NOT NULL
AND order_estimated_delivery_date>order_delivered_customer_date
```

Row	no_Products_delivered_before_estimated
1	88649

orders delivered after estimated delivery date

Average days of difference b/w Order delivery date & Order estimated delivery date=8.87 Days when order is delivered after estimated delivery date .

```
SELECT
  order_id,
  customer_id,
  order_status,
  order_delivered_customer_date,
  order_estimated_delivery_date,
  DATE_DIFF(order_estimated_delivery_date,order_delivered_customer_date,Day) AS
days_diff_estimated_delivery,
```

```
ROUND(AVG(DATE_DIFF(order_estimated_delivery_date,order_delivered_customer_date,Day))
OVER(),2) AS avg_days_diff_estimated_delivery
FROM `target_sql.orders`
WHERE order_delivered_customer_date IS NOT NULL
AND order_estimated_delivery_date IS NOT NULL
AND order_estimated_delivery_date<order_delivered_customer_date
```

Row	order_id	customer_id	order_status	order_delivered_customer_date	order_estimated_delivery_date	days_diff_estimated_delivery	avg_days_diff_estimated_delivery
1	0f4519c5f1c541ddec9f21b3bddd533a	1a8a4a30dc296976717f44e7801fdeef	delivered	2017-09-19 14:38:21 UTC	2017-04-11 00:00:00 UTC	-161	-8.87
2	866314550f6d7a55c82917d9b4463e1f	9009e9f0ac28d47bd18433d82aa028d6	delivered	2018-01-25 19:38:35 UTC	2017-12-13 00:00:00 UTC	-43	-8.87
3	465cfd7016202e455adf9b1a83736c86	3ae208c673c9a1bd78c2dc73fdcd1121	delivered	2018-02-06 15:58:54 UTC	2017-12-27 00:00:00 UTC	-41	-8.87
4	621f567448cbf2281b22381247c491ca	7a4e8b61d5570efb155ab9bf4a0659c3	delivered	2018-04-18 21:16:43 UTC	2018-03-13 00:00:00 UTC	-36	-8.87
5	2e56f943f231f5fe108f43fb370b0ed6	66b9bc2d53ea09b027966337424fa0c7	delivered	2017-05-25 07:14:44 UTC	2017-03-16 00:00:00 UTC	-70	-8.87
6	69c7a1e070c1759e15f7a5fd24c36e5b	6cbc69ef01df8d34bd134c6d828c1e53	delivered	2017-05-29 09:42:44 UTC	2017-04-04 00:00:00 UTC	-55	-8.87
7	32fef9bb0f0402350b640eb6f13dbe09	28c857caf2f37bb8751725b85dac2481	delivered	2018-05-03 00:39:55 UTC	2018-03-29 00:00:00 UTC	-35	-8.87
8	b73bbac6285251dbf2dd01842e0ce0de	b97669f12cafebbe9441bf4af0a8fe2a	delivered	2018-02-26 21:07:44 UTC	2018-01-24 00:00:00 UTC	-33	-8.87
9	6cbad422849c13ec8f4517ee01a6c02b	23a74d590627edc3207d90d96ec739a6	delivered	2017-05-10 13:40:06 UTC	2017-04-06 00:00:00 UTC	-34	-8.87
10	880a2443009447fa88b518da4806fc93	e4f06fec45100ba91af9bc48190aacf0	delivered	2018-03-11 21:06:06 UTC	2018-01-30 00:00:00 UTC	-40	-8.87

No of orders delivered after estimated delivery date

```
SELECT
  count(*) AS no_Products_delivered_after_estimated
FROM `target_sql.orders`
WHERE order_delivered_customer_date IS NOT NULL
AND order_estimated_delivery_date IS NOT NULL
AND order_estimated_delivery_date<order_delivered_customer_date
```

Row	no_Products_delivered_after_estimated
1	7827

No of orders delivered after estimated delivery date (By state)

```
With order_sum AS(
```

```sql
SELECT
  order_id,
  customer_id,
  order_status,
  order_delivered_customer_date,
  order_estimated_delivery_date,
  DATE_DIFF(order_estimated_delivery_date,order_delivered_customer_date,Day) AS
days_diff_estimated_delivery,

ROUND(AVG(DATE_DIFF(order_estimated_delivery_date,order_delivered_customer_date,Day))
OVER(),2) AS avg_days_diff_estimated_delivery
FROM `target_sql.orders`
WHERE order_delivered_customer_date IS NOT NULL
AND order_estimated_delivery_date IS NOT NULL
AND order_estimated_delivery_date<order_delivered_customer_date
)

SELECT
  c.customer_state,
  ROUND(AVG(os.days_diff_estimated_delivery),2) AS avg_days_state,
  COUNT(os.order_id) AS no_of_orders_state
FROM order_sum AS os
INNER JOIN `target_sql.customers` AS c
ON os.customer_id=c.customer_id
GROUP BY c.customer_state
ORDER BY no_of_orders_state DESC
```

Row	customer_state	avg_days_state	no_of_orders_state
1	SP	-6.35	2387
2	RJ	-12.15	1664
3	MG	-6.85	638
4	BA	-10.42	457
5	RS	-8.71	382
6	SC	-6.99	346
7	PR	-6.73	246
8	ES	-9.91	244

9	CE	-13.63	196
10	PE	-10.65	172
11	GO	-9.09	160
12	DF	-5.95	147
13	MA	-9.31	141
14	PA	-11.62	117
15	AL	-8.54	95

5.2. Time_to_delivery & diff_estimated_delivery

Time_to_delivery (order_purchase_timestamp - order_delivered_customer_date)

```
WITH difference_in_seconds AS (
  SELECT
    order_id,
    customer_id,
    order_purchase_timestamp,
    order_delivered_customer_date,
    TIMESTAMP_DIFF(order_delivered_customer_date, order_purchase_timestamp, SECOND) AS
seconds
  FROM `target_sql.orders`
  WHERE order_delivered_customer_date IS NOT NULL AND order_purchase_timestamp IS NOT
NULL
),

differences AS (
  SELECT
    order_id,
    customer_id,
    order_purchase_timestamp,
    order_delivered_customer_date,
    seconds,
    MOD(seconds, 60) AS seconds_part,
    MOD(seconds, 3600) AS minutes_part,
    MOD(seconds, 3600 * 24) AS hours_part
  FROM difference_in_seconds
)
```

```sql
SELECT
  order_id,
  customer_id,
  order_purchase_timestamp,
  order_delivered_customer_date,
  CONCAT(
    FLOOR(seconds / 3600 / 24), ' days ',
    FLOOR(hours_part / 3600), ' hours ',
    FLOOR(minutes_part / 60), ' minutes ',
    seconds_part, ' seconds'
  ) AS time_to_delivery
FROM differences
```

Row	order_id	customer_id	order_purchase_timestamp	order_delivered_customer_date	time_to_delivery
1	770d331c84e5b214bd9dc70a10b829d0	6c57e6119369185e575b36712766b0ef	2016-10-07 14:52:30 UTC	2016-10-14 15:07:11 UTC	7 days 0 hours 14 minutes 41 seconds
2	1950d777989f6a877539f53795b4c3c3	1bccb206de9f0f25adc6871a1bcf77b2	2018-02-19 19:48:52 UTC	2018-03-21 22:03:51 UTC	30 days 2 hours 14 minutes 59 seconds
3	2c45c33d2f9cb8ff8b1c86cc28c11c30	de4caa97afa80c8eeac2ff4c8da5b72e	2016-10-09 15:39:56 UTC	2016-11-09 14:53:50 UTC	30 days 23 hours 13 minutes 54 seconds
4	dabf2b0e35b423f94618bf965fcb7514	5cdec0bb8cbdf53ffc8fdc212cd247c6	2016-10-09 00:56:52 UTC	2016-10-16 14:36:59 UTC	7 days 13 hours 40 minutes 7 seconds
5	8beb59392e21af5eb9547ae1a9938d06	bf609b5741f71697f65ce3852c5d2623	2016-10-08 20:17:50 UTC	2016-10-19 18:47:43 UTC	10 days 22 hours 29 minutes 53 seconds
6	65d1e226dfaeb8cdc42f665422522d14	70fc57eeae292675927697fe03ad3ff5	2016-10-03 21:01:41 UTC	2016-11-08 10:58:34 UTC	35 days 13 hours 56 minutes 53 seconds
7	c158e9806f85a33877bdfd4f607b72e7	25456ee3b0cf84658015e46686025224	2017-04-14 22:06:32 UTC	2017-05-08 11:10:26 UTC	23 days 13 hours 3 minutes 54 seconds
8	b60b53ad0bb7dacacf2989fe27ad567a	2f9902d85fcd930227f711cf47012bdf	2017-05-10 14:03:27 UTC	2017-05-23 13:12:27 UTC	12 days 23 hours 9 minutes 0 seconds
9	c830f223aae08493ebecb52f29aa48ca	af626bcc9c27c08077b02e6d3aa00c36	2017-04-22 15:50:30 UTC	2017-05-05 13:27:50 UTC	12 days 21 hours 37 minutes 20 seconds
10	a8aa2cd070eeac7e4368cae3d8222e2b	2c5519c36277c3f69df911c68cc97e50	2017-05-09 17:42:45 UTC	2017-05-16 23:22:20 UTC	7 days 5 hours 39 minutes 35 sec

diff_estimated_delivery (order_estimated_delivery_date - order_delivered_customer_date)

```sql
WITH difference_in_seconds AS (
  SELECT
    order_id,
    customer_id,
    order_delivered_customer_date,
    order_estimated_delivery_date,
    TIMESTAMP_DIFF(order_estimated_delivery_date, order_delivered_customer_date,
SECOND) AS seconds
```

```
  FROM `target_sql.orders`
  WHERE order_delivered_customer_date IS NOT NULL AND order_estimated_delivery_date IS
NOT NULL
),

differences AS (
  SELECT
    order_id,
    customer_id,
    order_delivered_customer_date,
    order_estimated_delivery_date,
    seconds,
    MOD(seconds, 60) AS seconds_part,
    MOD(seconds, 3600) AS minutes_part,
    MOD(seconds, 3600 * 24) AS hours_part
  FROM difference_in_seconds
)

SELECT
  order_id,
    customer_id,
    order_delivered_customer_date,
    order_estimated_delivery_date,
  CONCAT(
    FLOOR(seconds / 3600 / 24), ' days ',
    FLOOR(hours_part / 3600), ' hours ',
    FLOOR(minutes_part / 60), ' minutes ',
    seconds_part, ' seconds'
  ) AS diff_estimated_delivery
FROM differences
```

Row	order_id	customer_id	order_delivered_customer_date	order_estimated_delivery_date	diff_estimated_delivery
1	770d331c84e5b214bd9dc70a10b829d0	6c57e6119369185e575b36712766b0ef	2016-10-14 15:07:11 UTC	2016-11-29 00:00:00 UTC	45 days 8 hours 52 minutes 49 seconds
2	1950d777989f6a877539f53795b4c3c3	1bccb206de9f0f25adc6871a1bcf77b2	2018-03-21 22:03:51 UTC	2018-03-09 00:00:00 UTC	-13 days -23 hours -4 minutes -51 seconds
3	2c45c33d2f9cb8ff8b1c86cc28c11c30	de4caa97afa80c8eeac2ff4c8da5b72e	2016-11-09 14:53:50 UTC	2016-12-08 00:00:00 UTC	28 days 9 hours 6 minutes 10 seconds
4	dabf2b0e35b423f94618bf965fcb7514	5cdec0bb8cbdf53ffc8fdc212cd247c6	2016-10-16 14:36:59 UTC	2016-11-30 00:00:00 UTC	44 days 9 hours 23 minutes 1 seconds
5	8beb59392e21af5eb9547ae1a9938d06	bf609b5741f71697f65ce3852c5d2623	2016-10-19 18:47:43 UTC	2016-11-30 00:00:00 UTC	41 days 5 hours 12 minutes 17 seconds

6	65d1e226dfaeb8cdc42f665422522d14	70fc57eeae292675927697fe03ad3ff5	2016-11-08 10:58:34 UTC	2016-11-25 00:00:00 UTC	16 days 13 hours 1 minutes 26 seconds
7	c158e9806f85a33877bdfd4f607b72e7	25456ee3b0cf84658015e46686025224	2017-05-08 11:10:26 UTC	2017-05-18 00:00:00 UTC	9 days 12 hours 49 minutes 34 seconds
8	b60b53ad0bb7dacacf2989fe27ad567a	2f9902d85fcd930227f711cf47012bdf	2017-05-23 13:12:27 UTC	2017-05-18 00:00:00 UTC	-6 days -14 hours -13 minutes -27 seconds
9	c830f223aae08493ebecb52f29aa48ca	af626bcc9c27c08077b02e6d3aa00c36	2017-05-05 13:27:50 UTC	2017-05-18 00:00:00 UTC	12 days 10 hours 32 minutes 10 seconds
10	a8aa2cd070eeac7e4368cae3d8222e2b	2c5519c36277c3f69df911c68cc97e50	2017-05-16 23:22:20 UTC	2017-05-18 00:00:00 UTC	1 days 0 hours 37 minutes 40 s

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

```
SELECT
  DISTINCT
  c.customer_state,
  ROUND(AVG(oi.freight_value) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_freight_state,
  ROUND(AVG(DATE_DIFF(o.order_delivered_customer_date,o.order_purchase_timestamp,Day))
OVER(
    PARTITION BY c.customer_state
  ),2) AS average_order_delivery_state,

ROUND(AVG(DATE_DIFF(o.order_estimated_delivery_date,o.order_delivered_customer_date,Da
y)) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_order_estimated_state

FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
WHERE o.order_purchase_timestamp IS NOT NULL
AND o.order_delivered_customer_date IS NOT NULL
AND o.order_estimated_delivery_date IS NOT NULL
ORDER BY c.customer_state
```

Row	customer_state	average_freight_state	average_order_delivery_state	average_order_estimated_state
1	AC	40.05	20.33	20.01

2	AL	35.87	23.99	7.98
3	AM	33.31	25.96	18.98
4	AP	34.16	27.75	17.44
5	BA	26.49	18.77	10.12
6	CE	32.73	20.54	10.26
7	DF	21.07	12.5	11.27
8	ES	22.03	15.19	9.77
9	GO	22.56	14.95	11.37
10	MA	38.49	21.2	9.11
11	MG	20.63	11.52	12.4

Top 5 states with highest average freight value

PB>RR>RO>AC>PI

```
SELECT
  DISTINCT
  c.customer_state,
  ROUND(AVG(oi.freight_value) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_freight_state,
  ROUND(AVG(DATE_DIFF(o.order_delivered_customer_date,o.order_purchase_timestamp,Day))
OVER(
    PARTITION BY c.customer_state
  ),2) AS average_Day_order_delivery_state,

ROUND(AVG(DATE_DIFF(o.order_estimated_delivery_date,o.order_delivered_customer_date,Da
y)) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_Day_order_estimated_state

FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
WHERE o.order_purchase_timestamp IS NOT NULL
```

```
AND o.order_delivered_customer_date IS NOT NULL
AND o.order_estimated_delivery_date IS NOT NULL
ORDER BY average_freight_state DESC
LIMIT 5
```

Row	customer_state	average_freight_state	average_Day_order_delivery_state	average_Day_order_estimated_state
1	PB	43.09	20.12	12.15
2	RR	43.09	27.83	17.43
3	RO	41.33	19.28	19.08
4	AC	40.05	20.33	20.01
5	PI	39.12	18.93	10.68

Top 5 states with lowest average freight value

SP>PR>MG>RJ>DF

```
SELECT
  DISTINCT
  c.customer_state,
  ROUND(AVG(oi.freight_value) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_freight_state,
  ROUND(AVG(DATE_DIFF(o.order_delivered_customer_date,o.order_purchase_timestamp,Day))
OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_delivery_state,

ROUND(AVG(DATE_DIFF(o.order_estimated_delivery_date,o.order_delivered_customer_date,Da
y)) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_estimated_state

FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
```

```
WHERE o.order_purchase_timestamp IS NOT NULL
AND o.order_delivered_customer_date IS NOT NULL
AND o.order_estimated_delivery_date IS NOT NULL
ORDER BY average_freight_state
LIMIT 5
```

Row	customer_state	average_freight_state	average_day_order_delivery_state	average_day_order_estimated_state
1	SP	15.11	8.26	10.27
2	PR	20.47	11.48	12.53
3	MG	20.63	11.52	12.4
4	RJ	20.91	14.69	11.14
5	DF	21.07	12.5	11.27

Top 5 states with highest average time to delivery

RR>AP>AM>AL>PA

```
SELECT
  DISTINCT
  c.customer_state,
  ROUND(AVG(DATE_DIFF(o.order_delivered_customer_date,o.order_purchase_timestamp,Day))
OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_delivery_state,

ROUND(AVG(DATE_DIFF(o.order_estimated_delivery_date,o.order_delivered_customer_date,Da
y)) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_estimated_state,
  ROUND(AVG(oi.freight_value) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_freight_state
FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
```

```
WHERE o.order_purchase_timestamp IS NOT NULL
AND o.order_delivered_customer_date IS NOT NULL
AND o.order_estimated_delivery_date IS NOT NULL
ORDER BY average_day_order_delivery_state DESC
LIMIT 5
```

Row	customer_state	average_day_order_delivery_state	average_day_order_estimated_state	average_freight_state
1	RR	27.83	17.43	43.09
2	AP	27.75	17.44	34.16
3	AM	25.96	18.98	33.31
4	AL	23.99	7.98	35.87
5	PA	23.3	13.37	35.63

Top 5 states with lowest average time to delivery

SP>PR>MG>DF>SC

```
SELECT
  DISTINCT
  c.customer_state,
  ROUND(AVG(DATE_DIFF(o.order_delivered_customer_date,o.order_purchase_timestamp,Day))
OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_delivery_state,

ROUND(AVG(DATE_DIFF(o.order_estimated_delivery_date,o.order_delivered_customer_date,Da
y)) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_estimated_state,
  ROUND(AVG(oi.freight_value) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_freight_state
FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
WHERE o.order_purchase_timestamp IS NOT NULL
AND o.order_delivered_customer_date IS NOT NULL
```

```
AND o.order_estimated_delivery_date IS NOT NULL
ORDER BY average_day_order_delivery_state
LIMIT 5
```

Row	customer_state	average_day_order_delivery_state	average_day_order_estimated_state	average_freight_state
1	SP	8.26	10.27	15.11
2	PR	11.48	12.53	20.47
3	MG	11.52	12.4	20.63
4	DF	12.5	11.27	21.07
5	SC	14.52	10.67	21.51

Top 5 states where delivery is really fast compared to estimated date

AC>RO>AM>AP>RR

```
SELECT
  DISTINCT
  c.customer_state,

ROUND(AVG(DATE_DIFF(o.order_estimated_delivery_date,o.order_delivered_customer_date,Da
y)) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_estimated_state,
  ROUND(AVG(DATE_DIFF(o.order_delivered_customer_date,o.order_purchase_timestamp,Day))
OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_delivery_state,
  ROUND(AVG(oi.freight_value) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_freight_state
FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
WHERE o.order_purchase_timestamp IS NOT NULL
```

```
AND o.order_delivered_customer_date IS NOT NULL
AND o.order_estimated_delivery_date IS NOT NULL
ORDER BY average_day_order_estimated_state DESC
LIMIT 5
```

Row	customer_state	average_day_order_estimated_state	average_day_order_delivery_state	average_freight_state
1	AC	20.01	20.33	40.05
2	RO	19.08	19.28	41.33
3	AM	18.98	25.96	33.31
4	AP	17.44	27.75	34.16
5	RR	17.43	27.83	43.09

Top 5 states where delivery is not so fast compared to estimated date

AL>MA>SE>ES>BA

```
SELECT
  DISTINCT
  c.customer_state,

ROUND(AVG(DATE_DIFF(o.order_estimated_delivery_date,o.order_delivered_customer_date,Da
y)) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_estimated_state,
  ROUND(AVG(DATE_DIFF(o.order_delivered_customer_date,o.order_purchase_timestamp,Day))
OVER(
    PARTITION BY c.customer_state
  ),2) AS average_day_order_delivery_state,
  ROUND(AVG(oi.freight_value) OVER(
    PARTITION BY c.customer_state
  ),2) AS average_freight_state
FROM `target_sql.order_items` AS oi
INNER JOIN `target_sql.orders` AS o
ON oi.order_id=o.order_id
INNER JOIN `target_sql.customers` AS c
ON o.customer_id=c.customer_id
WHERE o.order_purchase_timestamp IS NOT NULL
AND o.order_delivered_customer_date IS NOT NULL
AND o.order_estimated_delivery_date IS NOT NULL
```

```
ORDER BY average_day_order_estimated_state
LIMIT 5
```

Row	customer_state	average_day_order_estimated_state	average_day_order_delivery_state	average_freight_state
1	AL	7.98	23.99	35.87
2	MA	9.11	21.2	38.49
3	SE	9.17	20.98	36.57
4	ES	9.77	15.19	22.03
5	BA	10.12	18.77	26.49

6. Payment type analysis

6.1. Month over Month count of orders for different payment types

```
SELECT
  x.payment_type,
  x.order_year,
  x.order_month,
  count(*) AS count_of_orders_type_year_month
FROM(
SELECT
  *,
  EXTRACT(YEAR FROM o.order_purchase_timestamp) AS order_year,
  EXTRACT(MONTH FROM o.order_purchase_timestamp) AS order_month
FROM `target_sql.payments` AS p
INNER JOIN `target_sql.orders` AS o
ON p.order_id=o.order_id) AS x
GROUP BY x.payment_type,x.order_year,x.order_month
ORDER BY x.payment_type,x.order_year,x.order_month
```

Row	payment_type	order_year	order_month	count_of_orders_type_year_month
1	UPI	2016	10	63
2	UPI	2017	1	197
3	UPI	2017	2	398
4	UPI	2017	3	590

5	UPI	2017	4	496
6	UPI	2017	5	772
7	UPI	2017	6	707
8	UPI	2017	7	845
9	UPI	2017	8	938
10	UPI	2017	9	903
11	UPI	2017	10	993
12	UPI	2017	11	1509

6.2. Count of orders based on the no. of payment installments

```
SELECT
  payment_installments,
  count(*) AS count_of_order_based_on_pInstallments
FROM `target_sql.payments`
GROUP BY payment_installments
ORDER BY payment_installments
```

Row	payment_installments	count_of_order_based_on_pInstallments
1	0	2
2	1	52546
3	2	12413
4	3	10461
5	4	7098
6	5	5239
7	6	3920
8	7	1626
9	8	4268
10	9	644
11	10	5328
12	11	23

13	12	133

7. Actionable Insights

7.1. Growing trend of e-commerce in Brazil is observed Year-by-Year as the number of products ordered by customers increased year by year (2016 to 2018). More complete scenario can be obtained by further seeing the month wise trend (From 2016 to 2018). It is clearly visible that as we move from Jan'2017 to Nov'2017, no of orders purchased by customer went from 800 to 7544 and then further dropped down to 6512 in Aug'2018, which clearly indicates that there is upward growth on e-commerce in Brazil Year-By-Year but upward growth is not strictly increasing over the whole period, and also observed few seasonal peaks .

7.2. We can observe some seasonality with peaks at specific months like Nov '2017 as no of orders by customer went from 4631 in Oct' 2017 to 7544 in Nov '2017. Also No of orders went from 5673 in Dec '2017 to 7269 in Jan'2018.Thus, Peak is observed in the months of Nov '2017 and Jan'2018. Although , data of Nov '2018 or Jan'2019 is not available to further analyze if peaks are observed every year during this time of month.

7.3. It is observed that Brazilian customers tend to buy more during Afternoon i.e.32211 products ordered which is almost twice as that of products ordered during evening. Only 896 products ordered during Dawn which is the least among all.

7.4. No of customers :
Top 5 States: SP > RJ > MG>RS>PR
Bottom 5 states: RR > AP > AC > AM > RO

7.5. Total % increase in cost of orders from 2017 to 2018 (including months between Jan to Aug only)= 136.98 %

7.6. Average price of orders :
Top 5 states: PB>AL>AC>RO>PA
Bottom 5 states: SP>PR>RS>MG>ES

7.7. Average days taken for order to deliver once purchase is made= 12.09 Days

7.8. Average days of difference b/w Order delivery date & Order estimated delivery date= 10.96 Days. It includes both cases i.e. when order is delivered before estimated delivery date & when order is delivered after estimated delivery date

7.9. Average days of difference b/w Order delivery date & Order estimated delivery date=12.71 Days when order is delivered before estimated delivery date .
Number of orders delivered before estimated delivery date=88649

7.10. Average days of difference b/w Order delivery date & Order estimated delivery date=8.87 Days when order is delivered after estimated delivery date .
Number of orders delivered after estimated delivery date=7827

7.11.Total orders which is delivered after estimated delivery date Vs Average days of difference b/w Order delivery date & Order estimated delivery date when order is delivered after estimated delivery date(Top 5 State sorted in decreasing no of orders)

SP: 2387, 6.35 Days
RJ: 1664, 12.15 Days
MG: 638, 6.85 Days
BA: 457, 10.42 Days
RS: 382, 8.71 Days

7.12. Average freight value

Top 5 states :PB>RR>RO>AC>PI
Bottom 5 states: SP>PR>MG>RJ>DF

7.13. Average time to delivery

Top 5 states : RR>AP>AM>AL>PA
Bottom 5 states: SP>PR>MG>DF>SC

7.14. Delivery is really fast compared to estimated date

Top 5 states: AC>RO>AM>AP>RR

7.15. Delivery is not so fast compared to estimated date

Top 5 states :AL>MA>SE>ES>BA

7.16. Total no of order review score equal to 1:

Top 5 states: SP>RJ>MG>RS>BA

As there are 2387 orders which are delivered after estimated delivery time in SP state of Brazil, and thus received the maximum no of review score of only 1(On scale of 1-5). Thus customer experience is not very good, and thus average price of order is lowest in state SP among all the states.

8. Recommendation

8.1. As Trend on e-commerce in Brazil is not strictly increasing, and thus efforts can be made on:

- Improving customer service by including prompt responses to customer inquiries, fast and reliable shipping, and easy returns and exchanges

- Optimizing the website which is easy to navigate, has clear product descriptions and high-quality images, and is optimized for search engines
- To offer promotions and discount which includes free shipping, a percentage off their order, or a free gift with purchase

8.2. As Seasonal peaks are observed during the month of November & January, and thus following can be done to boost the sales:

- Planning of inventory to meet high demand, hiring extra staff or outsourcing to ensure smooth execution
- Promotions and discounts

8.3. As it is observed that Brazilian customers tend to buy more during Afternoon and almost twice as compared to buying during evening, and following can be recommended:

- Scheduling email campaign, social media posts during peak buying hours
- As during afternoon, most customers prefer browsing on mobile devices, and thus making sure to optimize the website for mobile devices
- Offering "Happy Hours" promotions during evening time/less buying hours to encourage customers to shop during this time

8.4. Following efforts can be made to increase the customer in a state:

- Target digital marketing or localized print ads to increase the visibility in those regions
- Localizing the website i.e. using localized language as well as customer assistance chatbot in local language
- Developing partnerships with local businesses

8.5.To increase the % cost of orders or Average price of orders, following recommendation can be made:

- Offering quantity discounts when customer purchase multiple quantities of a product
- Incentives to customers who make repeat purchases
- Offering bundle products i.e. offering a discount when customers buy multiple products together
- Offering free shipping above a threshold value

8.6. To reduce the average days taken for order to deliver once purchase is made, following recommendation can be made:

- Warehouse located closer to customer to reduce shipping distance and delivery time
- By improving the inventory management
- By automating the shipping process
- Partnership with local vendors and couriers
- Priority shipping that guarantees faster delivery option at increased price

8.7. To decreases the cases when order is delivered after estimated delivery date, following recommendation can be made:

- Improving the inventory management system
- To provide the accurate shipping estimate to customers based on current inventory levels, shipping distance or seasonality
- Opting for reliable shipping carriers
- To monitor the delivery pipeline and take corrective actions as required.
- to shipping carriers for on-time delivery, and penalty for late deliveries

8.8. To decrease the average freight price, following recommendation can be made:

- Optimizing the packaging to reduce the size and weight of shipments
- To find the best shipping rates and shipping carrier options
- Free shipping above a threshold value, which will increase in volume of orders and which in turn offset the freight cost

8.9. Taking the case of state SP, where SP state has the highest number of customers among all states but the lowest average price of orders and maximum number of review scores equal to 1. If worked upon improving the customer experiences by implementing the above recommendation, it can certainly boost the quantity and price of orders .