

Airline Challenge

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Data Quality

The given datasets have been validated for the following data quality issues

- Duplicated rows
- Blank data
- Incorrect values
- Absence of primary key

File	Column Name	Data Quality Issue	Data Quality Issue Remediation
Airport_Codes.csv	IATA code	Blank values found	The non-IATA codes are sufficient for the analysis of the Flights and Tickets datasets. Hence, the rows with blank IATA codes were removed
Airport_Codes.csv	IATA code	Duplicate values found	Duplicate rows removed
Flights.csv	ARR_DELAY	Blank values found	Replaced with 0
Duplicate values found	Duplicate rows removed		
Flights.csv	AIR_TIME	Blank values found	Replaced with MEAN_AIRTIME for the route
Flights.csv	AIR_TIME	Incorrect values found	Replaced a) 'Two' with 2 b) '\$\$\$' with MEAN_AIRTIME for the route
Flights.csv	Distance	Incorrect values found	Replaced a) 'Hundred' with 100 b) 'Twenty' with 20 c) '****' with 500
Tickets.csv	ITIN_ID	Duplicate values found	Duplicate rows removed
Tickets.csv	PASSENGERS	Incorrect values found	Replaced '0' with MEAN_PASSENGERS for the route

Tickets.csv	PASSENGERS	Blank values found	Replaced with MEAN_PASSENGERS for the route
Tickets.csv	ITIN_FARE	Blank values found	Replaced with MEAN_ITIN_FARE for the route Removed rows where MEAN_ITIN_FARE for the route is 0
Tickets.csv	ITIN_FARE	Incorrect values found	Replaced a) '\$ 100.00' with 100 b) '820\$\$\$\$' with 820 c) '200 \$' with 200

All the US IATA codes have been verified to be valid against the external source
https://www.nationsonline.org/oneworld/IATA_Codes/IATA_Code_Z.htm

Data Scoping:

- Only the flights and tickets with both origin and destination as an US large/medium airport have been considered for analysis
- Only Roundtrip tickets have been considered for analysis
- Only the Operated flights have been considered for analysis. Cancelled flights have been excluded wherever necessary

Metadata:

Metadata for all new fields have been added to the Airline_Challenge_Metadata excel file

Flights Dataset

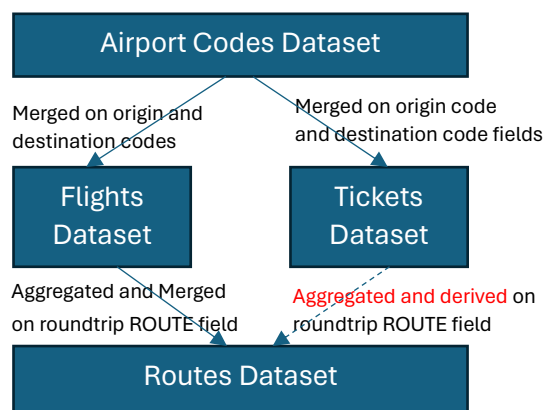
Field Name	Description
ROUTE	Origin Airport Code-Destination Airport Code (XXX-XXX)
ID	FL_DATE + TAIL_NUM + OP_CARRIER_FL_NUM + ORIGIN + DESTINATION as identifier
LEG_COSTING_DELAY	COSTING_DEP_DELAY + COSTING_ARR_DELAY. A costing delay is (delay-15 mins) where first 15 mins of delay is not charged
OCCUPANCY	OCCUPANCY rate of the flight * 200 passengers capacity of the flight

Routes Dataset: (new dataset created)

Field Name	Description
ROUTE	Origin Airport Code-Destination Airport Code (XXX-XXX). This field is the unique identifier
POINT_A	One of the origins of the roundtrip route
POINT_B	Other origins of the roundtrip route
POINT_A_TO_B	One leg of the roundtrip route (XXX-XXX)
POINT_B_TO_A	Other leg of the roundtrip route (XXX-XXX)
ISO_COUNTRY	The country of the airport
POINT_A_IATA_TYPE	The type of the airport, valid value like: small_airport, medium_airport, heliport, etc.
POINT_B_IATA_TYPE	The type of the airport, valid value like: small_airport, medium_airport, heliport, etc.
POINT_A_NAME	The name of the airport
POINT_B_NAME	The name of the airport
POINT_A_CITY_NAME	City name of the airport
POINT_B_CITY_NAME	City name of the airport
CNT_FLIGHTS_A_TO_B	Count of flights operated (excludes cancelled flights)
CNT_FLIGHTS_B_TO_A	Count of flights operated (excludes cancelled flights)
CNT_CAN_FLIGHTS_A_TO_B	count of cancelled flights
CNT_CAN_FLIGHTS_A_TO_B	count of cancelled flights
FOMC_COST_A_TO_B	Fuel, Oil, Maintenance, Crew costs
FOMC_COST_B_TO_A	Fuel, Oil, Maintenance, Crew costs
DIO_COST_A_TO_B	Depreciation, Insurance, Other costs
DIO_COST_B_TO_A	Depreciation, Insurance, Other costs
TOTAL_FOMC_COST	Total Fuel, Oil, Maintenance, Crew costs for the roundtrip route
TOTAL_DIO_COST	Total Depreciation, Insurance, Other costs for the roundtrip route
POINT_A_AIRPORT_OPS_COST	Airport operational costs
POINT_B_AIRPORT_OPS_COST	Airport operational costs
TOTAL_AIRPORT_OPS_COST	Total Airport operational costs for the roundtrip route
LEG_DELAY_A_TO_B	sum of all arrival and departure delays in the leg point A to B, in Minutes
LEG_DELAY_B_TO_A	sum of all arrival and departure delays in the leg point B to A, in Minutes
AVG_DELAY_LEG_A_TO_B	Avg of all arrival and departure delays in the leg point A to B, in Minutes
AVG_DELAY_LEG_B_TO_A	Avg of all arrival and departure delays in the leg point B to A, in Minutes
TOTAL_ROUTE_DELAY	LEG_DELAY_A_TO_B + LEG_DELAY_B_TO_A , in Minutes
TOTAL_DELAY_OPS_COST	\$75 for each minute of the TOTAL_ROUTE_DELAY
TOTAL_COST	Sum of TOTAL_FOMC_COST, TOTAL_DIO_COST, TOTAL_AIRPORT_OPS_COST, TOTAL_DELAY_OPS_COST
OCCUPANCY_A_TO_B	Number of passengers
OCCUPANCY_B_TO_A	Number of passengers
ROUNDTRIP_PASSENGERS	Count of roundtrip passengers

ROUNDTRIP_FLIGHTS	Count of roundtrip flights (excludes cancelled flights)
ROUNDTRIP_CAN_FLIGHTS	Count of roundtrip flights that were cancelled
TICKET_REVENUE	Revenue generated from the ITIN FARE of the roundtrip passengers
BAGGAGE_PASSENGERS	Roundtrip passengers carrying atleast one checked bag
BAGGAGE_REVENUE	Revenue generated from checked bags
TOTAL_REVENUE	TICKET_REVENUE + BAGGAGE_REVENUE
TOTAL_PROFIT	TOTAL_REVENUE - TOTAL_COST
BREAKEVEN_FLIGHTS	Number of flights required to breakeven on the cost(including the upfront airline)
PROFIT_COST_RATIO	Indicates the return on investment/cost
AVG_OCCUPANCY_RATE_A_TO_B	percentage occupancy
AVG_OCCUPANCY_RATE_B_TO_A	percentage occupancy
AVG_DISTANCE_A_TO_B	Avg distance covered by the flights
AVG_DISTANCE_B_TO_A	Avg distance covered by the flights
ROUTE_DISTANCE	Total distance covered by the roundtrip flight on an average, AVG_DISTANCE_A_TO_B + AVG_DISTANCE_B_TO_A

Data Munging:



Code Reusability - Functions used:

1) Function to determine airport operations cost

```
def get_airport_ops_cost(airport_type):
    if airport_type == 'large_airport':
        return 10000
    elif airport_type == 'medium_airport':
        return 5000
    else:
        return 0
```

2) Function to determine costing delay

```
def get_leg_delay(delay):
    if (delay>15):
        return (delay-15)
    else:
        return 0
```

3) Function to determine route recommendations

```
def get_short_distance_route_category(COLOR_CATEGORY):  
    if COLOR_CATEGORY == 'green':  
        return 'HIGHLY RECOMMENDED ROUTES'  
    elif COLOR_CATEGORY == 'orange':  
        return 'FUTURE CONSIDERATION ROUTES'  
    else:  
        return 'NOT RECOMMENDED ROUTES'
```

4) Function to determine cost and revenue

```
def get_total_revenue(roundtrip_flights):  
    return round(int((roundtrip_flights/257)*113340150)/1000000,2)  
  
def get_total_cost(roundtrip_flights):  
    return round(int((roundtrip_flights/257)*1763742)/1000000,2)
```

5) Function to determine absolute value

```
def absolute_value(val):  
    return round(val,2)
```

Key Findings (Answers to the given questions) with Data Visualizations

Question #1

The 10 busiest round trip routes in terms of number of round trip flights in the quarter. Exclude canceled flights when performing the calculation.

Answer:

ROUTE	POINT_A_NAME	POINT_A_IATA_TYPE	POINT_A_CITY_NAME	POINT_B	POINT_B_NAME	POINT_B_IATA_TYPE	POINT_B_CITY_NAME	ROUNDTRIP_FLIGHTS
LAX-SFO	Los Angeles International Airport	large_airport	Los Angeles, CA	SFO	San Francisco International Airport	large_airport	San Francisco, CA	4164
LGA-ORD	La Guardia Airport	large_airport	New York, NY	ORD	Chicago O'Hare International Airport	large_airport	Chicago, IL	3576

LA S- LA X	McCarran International Airport	large_airport	Las Vegas, NV	LAX	Los Angeles International Airport	large_airport	Los Angeles, CA	3254
JFK - LA X	John F Kennedy International Airport	large_airport	New York, NY	LAX	Los Angeles International Airport	large_airport	Los Angeles, CA	3158
LA X- SEA	Los Angeles International Airport	large_airport	Los Angeles, CA	SEA	Seattle Tacoma International Airport	large_airport	Seattle, WA	2497
BO S- LGA	General Edward Lawrence Logan International Airport	large_airport	Boston, MA	LGA	La Guardia Airport	large_airport	New York, NY	2405
HN L- OGG	Daniel K Inouye International Airport	large_airport	Honolulu, HI	OGG	Kahului Airport	medium_airport	Kahului, HI	2395
PD X- SEA	Portland International Airport	large_airport	Portland, OR	SEA	Seattle Tacoma International Airport	large_airport	Seattle, WA	2376
ATL - MCO	Hartsfield Jackson Atlanta International Airport	large_airport	Atlanta, GA	MCO	Orlando International Airport	large_airport	Orlando, FL	2351

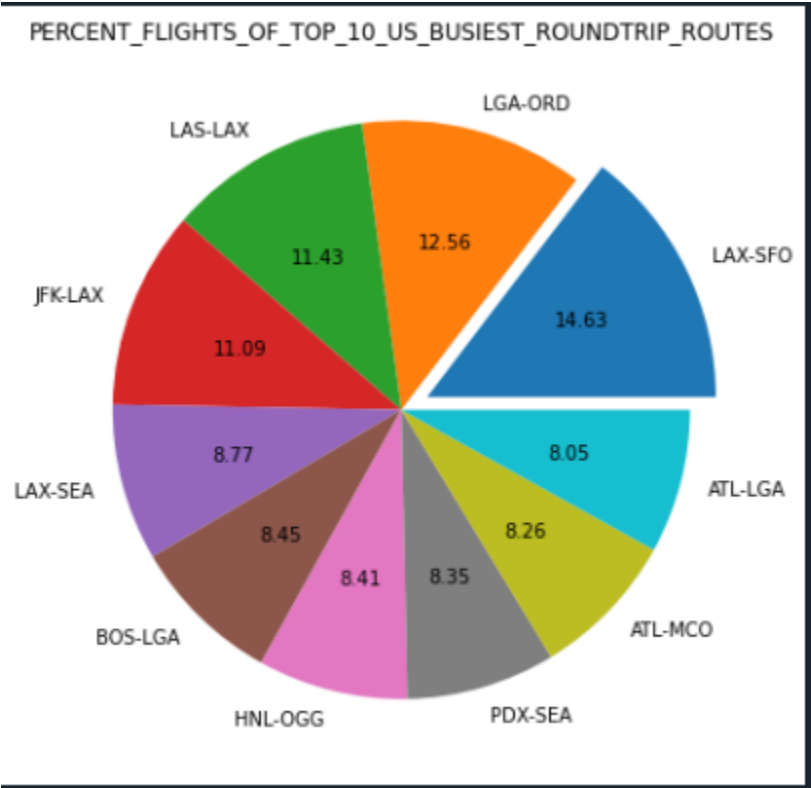
ATL-LGA	Hartsfield Jackson Atlanta	large_airport	Atlanta, GA	LGA	La Guardia Airport	large_airport	New York, NY	2293
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Code Result Screenshot:

busiest_round_trip_routes - DataFrame

	Index	ROUTE	ISO_COUNTRY	POINT_A	POINT_A_NAME	POINT_A_IATA_TYPE	POINT_A_CITY_NAME	POINT_B	POINT_B_NAME	POINT_B_IATA_TYPE	POINT_B_CITY_NAME	ROUNDTrip_FLIGHTS
	1	LAX-SFO	US	LAX	Los Angeles I...	large_airport	Los Angeles, CA	SFO	San Francisco...	large_airport	San Francisco, CA	4164
	3	LGA-ORD	US	LGA	La Guardia Airport	large_airport	New York, NY	ORD	Chicago O'Har...	large_airport	Chicago, IL	3576
	10	LAS-LAX	US	LAS	McCarran Inte...	large_airport	Las Vegas, NV	LAX	Los Angeles I...	large_airport	Los Angeles, CA	3254
	0	JFK-LAX	US	JFK	John F Kenned...	large_airport	New York, NY	LAX	Los Angeles I...	large_airport	Los Angeles, CA	3158
	21	LAX-SEA	US	LAX	Los Angeles I...	large_airport	Los Angeles, CA	SEA	Seattle Tacom...	large_airport	Seattle, WA	2497
	8	BOS-LGA	US	BOS	General Edwar...	large_airport	Boston, MA	LGA	La Guardia Airport	large_airport	New York, NY	2405
	14	HNL-OGG	US	HNL	Daniel K Inou...	large_airport	Honolulu, HI	OGG	Kahului Airport	medium_airport	Kahului, HI	2395
	15	PDX-SEA	US	PDX	Portland Inte...	large_airport	Portland, OR	SEA	Seattle Tacom...	large_airport	Seattle, WA	2376
	12	ATL-MCO	US	ATL	Hartsfield Ja...	large_airport	Atlanta, GA	MCO	Orlando Inter...	large_airport	Orlando, FL	2351
	6	ATL-LGA	US	ATL	Hartsfield Ja...	large_airport	Atlanta, GA	LGA	La Guardia Airport	large_airport	New York, NY	2293

BUSIEST ROUTE is LAX-SFO



Question #2

The 10 most profitable round trip routes (without considering the upfront airplane cost) in the quarter. Along with the profit, show total revenue, total cost, summary values of other key components and total round trip flights in the quarter for the top 10 most profitable routes. Exclude canceled flights from these calculations.

Answer:

ROUTE	POINT_A_CITY_NAME	POINT_B_CITY_NAME	TOTAL_PROFIT (\$)	TOTAL_REVENUE (\$)	TOTAL_COST (\$)	ROUND_TRIP_FLIGHTS	ROUNDTRIP_PASSENGERS	BREAK_EVEN_FLIGHTS	PROFIT_COST_RATIO
JFK-LAX	New York, NY	Los Angeles, CA	253919978.00	405686178.00	151766200.00	3158	408546	1119	1.67
LAX-SFO	Los Angeles, CA	San Francisco, CA	129381190.00	177269400.00	47888210.00	4164	537180	2896	2.7
JFK-SFO	New York, NY	San Francisco, CA	117598187.00	214051456.00	96453269.00	1860	239968	1423	1.22
LGA-ORD	New York, NY	Chicago, IL	113618278.00	183728952.00	70110674.00	3576	463962	2832	1.62
SLC-TWF	Salt Lake City, UT	Twin Falls, ID	111576408.00	113340150.00	1763742.00	257	34650	207	63.3
EWRSFO	Newark, NJ	San Francisco, CA	111004308.00	175011386.00	64007078.00	1212	157526	982	1.73
ATL-LGA	Atlanta, GA	New York, NY	107154289.00	146129144.00	38974855.00	2293	296408	1925	2.75

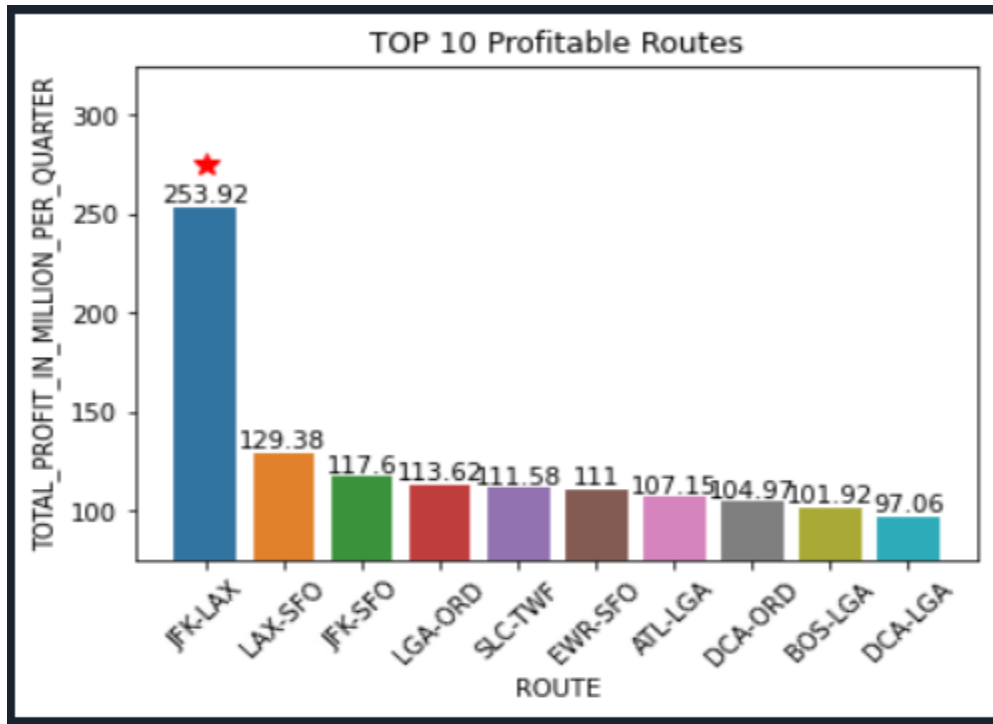
D C A- O R D	Washing ton, DC	Chicago, IL	1049 6542 6.00	13211 8336. 00	2715 2910 .00	1847	238912	1583	3.87
B O S- L G A	Boston, MA	New York, NY	1019 2461 1.00	12408 5016. 00	2216 0405 .00	2405	313346	2123	4.6
D C A- L G A	Washing ton, DC	New York, NY	9706 4725. 00	11061 6210. 00	1355 1485 .00	1677	219042	1554	7.16

Code Result Screenshot:

ROUTE	ISO_COUNTRY	POINT_A	POINT_A_NAME	POINT_A_IATA_TYPE	POINT_A_CITY_NAME	POINT_B	POINT_B_NAME	POINT_B_IATA_TYPE	POINT_B_CITY_NAME
JFK-LAX	US	JFK	John F Kenned...	large_airport	New York, NY	LAX	Los Angeles I...	large_airport	Los Angeles, CA
LAX-SFO	US	LAX	Los Angeles I...	large_airport	Los Angeles, CA	SFO	San Francisco...	large_airport	San Francisco, CA
JFK-SFO	US	JFK	John F Kenned...	large_airport	New York, NY	SFO	San Francisco...	large_airport	San Francisco, CA
LGA-ORD	US	LGA	La Guardia Airport	large_airport	New York, NY	ORD	Chicago O'Har...	large_airport	Chicago, IL
SLC-TWF	US	SLC	Joslin Field ...	medium_airport	Salt Lake City, UT	TWF	Salt Lake Cit...	large_airport	Twin Falls, ID
EWB-SFO	US	EWB	Newark Libert...	large_airport	Newark, NJ	SFO	San Francisco...	large_airport	San Francisco, CA
ATL-LGA	US	ATL	Hartsfield Ja...	large_airport	Atlanta, GA	LGA	La Guardia Airport	large_airport	New York, NY
DCA-ORD	US	DCA	Ronald Reagan...	large_airport	Washington, DC	ORD	Chicago O'Har...	large_airport	Chicago, IL
BOS-LGA	US	BOS	General Edwar...	large_airport	Boston, MA	LGA	La Guardia Airport	large_airport	New York, NY
DCA-LGA	US	DCA	Ronald Reagan...	large_airport	Washington, DC	LGA	La Guardia Airport	large_airport	New York, NY

ROUTE	COUN	DIA	T_A_N	A_IAT	CITY	DINT	T_B_N	B_IAT	CITY	TOTAL_PROFIT	TOTAL_REVENUE	TOTAL_COST	ROUNDRIP_FLIGHTS	ROUNDRIP_PASSENGERS	BREAKEVEN_FLIGHTS	PROFIT_CO
ATL-LGA	US	ATL	Har...	lar...	Atl...	LGA	La ...	lar...	New...	187154289	146129144	38974855	2293	296408	1925	2.75
BOS-LGA	US	BOS	Gen...	lar...	Bos...	LGA	La ...	lar...	New...	181924611	124085016	22160405	2405	313346	2123	4.6
DCA-ORD	US	DCA	Ron...	lar...	Was...	ORD	Chi...	lar...	Chi...	184965426	132118336	27152910	1847	238912	1583	3.87
DCA-LGA	US	DCA	Ron...	lar...	Was...	LGA	La ...	lar...	New...	97064725	110616210	13551485	1677	219042	1554	7.16
EWB-SFO	US	EWB	New...	lar...	New...	SFO	San...	lar...	San...	111004308	175011386	64007078	1212	157526	982	1.73
JFK-LAX	US	JFK	Joh...	lar...	New...	LAX	Los...	lar...	Los...	253919978	405686178	151766200	3158	408546	1119	1.67
JFK-SFO	US	JFK	Joh...	lar...	New...	SFO	San...	lar...	San...	117598187	214051456	96453269	1860	239968	1423	1.22
LAX-SFO	US	LAX	Los...	lar...	Los...	SFO	San...	lar...	San...	129381190	177269400	47888210	4164	537180	2896	2.7
LGA-ORD	US	LGA	La ...	lar...	New...	ORD	Chi...	lar...	Chi...	113618278	183728952	70110674	3576	463962	2832	1.62
SLC-TWF	US	SLC	Jos...	med...	Sal...	TWF	Sal...	lar...	Twi...	111576408	113340150	1763742	257	34650	207	63.26

HIGH PROFIT PER QUARTER ROUTE is JFK-LAX



Question #3

The 5 round trip routes that you recommend to invest in based on any factors that you choose.

Answer:

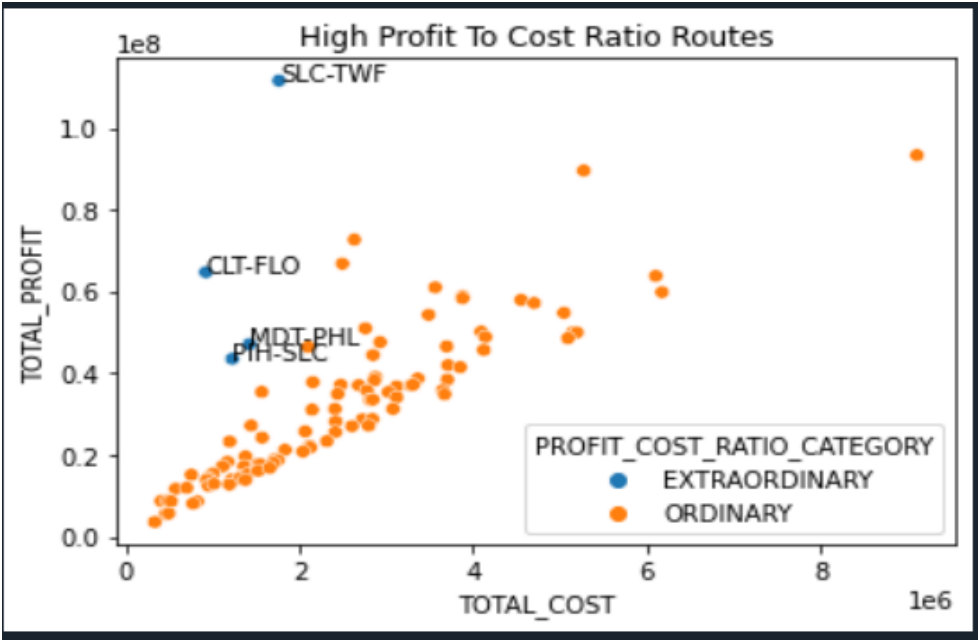
RATIONALE_F OR_RECOMME NDATION	ROUTE	ROUTE _DISTA NCE	AVG_O CCUPA NCY_R ATE_A TO_B	AVG_O CCUPA NCY_R ATE_B TO_A	PROFIT _COST _RATIO	TOTAL_PROFIT	ROUNDTRI P_FLIGHTS	ROUNDTRI P_PASSEN GERS	TOTAL_REVENUE	TOTAL_COST
BUSIEST ROUTE	LAX-SFO	674	0.65	0.65	2.7	129381190.00	4164	537180	177269400.00	47888210.00
HIGH PROFIT PER QUARTER ROUTE	JFK-LAX	4950	0.65	0.65	1.67	253919978.00	3158	408546	405686178.00	151766200.00
HIGH PROFIT TO COST RATIO ROUTE	CLT-FLO	198	0.65	0.64	70.23	64711626.00	251	32268	65633112.00	921486.00
QUICK BREAKEVEN ROUTE	SLC-TWF	350	0.67	0.66	63.26	111576408.00	257	34650	113340150.00	1763742.00
SHORT DISTANCE FLIGHT WITH HIGH OCCUPANCY,H IGH PROFIT TO COST RATIO AND QUICK BREAKEVEN	MDT-PHL	168	0.65	0.65	33.09	47100114.00	396	51402	48523488.00	1423374.00

Code Screenshot:

RATIONALE_FOR_RECOMMENDATION	ROUTE	COUN	DIINT	POINT_A_NAME	T_A_IATA	NT_A_CITY_NA	DIINT	POINT_B_NAME	T_B_IATA	INT_B_CITY_NAI
BUSIEST ROUTE	LAX-SFO	US	LAX	Los Angeles International Airport	large...	Los Angeles, CA	SFO	San Francisco International Airport	large...	San Francisco, CA
HIGH PROFIT PER QUARTER ROUTE	JFK-LAX	US	JFK	John F Kennedy International Airport	large...	New York, NY	LAX	Los Angeles International Airport	large...	Los Angeles, CA
HIGH PROFIT TO COST RATIO ROUTE	CLT-FLO	US	CLT	Florence Regional Airport	medium...	Charlotte, NC	FLO	Charlotte Douglas International Airport	large...	Florence, SC
QUICK BREAKEVEN ROUTE	SLC-TWF	US	SLC	Joslin Field Magic V...	medium...	Salt Lake City, UT	TWF	Salt Lake City International Airport	large...	Twin Falls, ID
SHORT DISTANCE FLIGHT WITH HIGH OCCUPANCY,HIGH PROFIT TO COST RATIO AND QUICK BREAKEVEN	MDT-PHL	US	MDT	Philadelphia International Airport	large...	Harrisburg, PA	PHL	Harrisburg International Airport	mediu...	Philadelphia, PA

ROUTE_DISTANCE	AVG_OCCUPANCY_RATE_A_TO_B	WVG_OCCUPANCY_RATE_B_TO_A	PROFIT_COST_RATIO	TOTAL_PROFIT	ROUNDTRIP_FLIGHTS	DTRIP_PASSE	TOTAL_REVENUE	TOTAL_COST
674	0.65	0.65	2.7	129381190	4164	537180	177269400	47888210
4950	0.65	0.65	1.67	253919978	3158	408546	405686178	151766200
198	0.65	0.64	70.23	64711626	251	32268	65633112	921486
350	0.67	0.66	63.26	111576408	257	34650	113340150	1763742
168	0.65	0.65	33.09	47100114	396	51402	48523488	1423374

HIGH PROFIT TO COST RATIO ROUTE is CLT-FLO



SHORT DISTANCE FLIGHT WITH HIGH OCCUPANCY, HIGH PROFIT TO COST RATIO AND QUICK BREAKEVEN is MDT-PHL



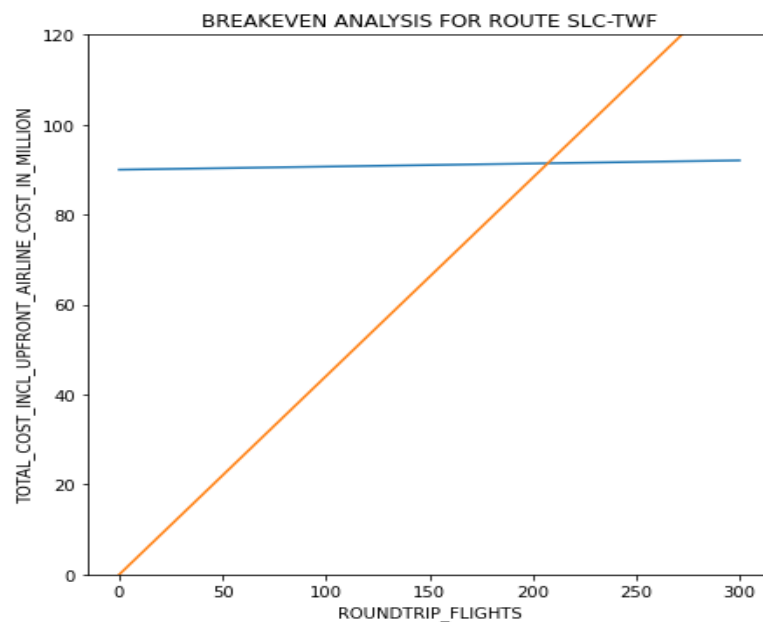
Question 4:

The number of round-trip flights it will take to breakeven on the upfront airplane cost for each of the 5 round trip routes that you recommend. Print key summary components for these routes.

Answer:

RATIONALE_FOR_RECOMMENDATION	ROUTE	BREAKEVEN_FLIGHTS	ROUTE_DISTANCE	AVG_OCCUPANCY_RATE_TO_B	AVG_OCCUPANCY_RATE_TO_B_T	PROFIT_COST_RATIO	TOTAL_PROFIT	ROUNDTRIP_FLIGHTS	ROUNDTRIP_PASSENGERS	TOTAL_REVENUE	TOTAL_COST
HIGH PROFIT PER QUARTER ROUTE	JFK-LAX	1119	4950	0.65	0.7	1.67	253919978.00	3158.00	408546.00	405686178.00	151766200.00
BUSIEST ROUTE	LAX-SFO	2896	674	0.65	0.7	2.7	129381190.00	4164.00	537180.00	177269400.00	47888210.00
QUICK BREAKEVEN ROUTE	SLC-TWF	207	350	0.67	0.7	63.26	111576408.00	257.00	34650.00	113340150.00	1763742.00
HIGH PROFIT TO COST RATIO ROUTE	CLT-FLO	349	198	0.65	0.6	70.23	64711626.00	251.00	32268.00	65633112.00	921486.00
SHORT DISTANCE FLIGHT WITH HIGH OCCUPANCY, HIGH PROFIT TO COST RATIO AND QUICK BREAKEVEN	MDT-PHL	756	168	0.65	0.7	33.09	47100114.00	396.00	51402.00	48523488.00	1423374.00

QUICK BREAKEVEN ROUTE is SLC-TWF with 207 flights to breakeven on the upfront airline cost



Code Result Screenshot:

RATIONALE_FOR_RECOMMENDATION	ROUTE	COUN	DINT	POINT_A_NAME	T_A_IATA	NT_A_CITY_NA	DINT	POINT_B_NAME	T_B_IATA	INT_B_CITY_NAI
BUSIEST ROUTE	LAX-SFO	US	LAX	Los Angeles International Airport	large...	Los Angeles, CA	SFO	San Francisco International Airport	large...	San Francisco, CA
HIGH PROFIT PER QUARTER ROUTE	JFK-LAX	US	JFK	John F Kennedy International Airport	large...	New York, NY	LAX	Los Angeles International Airport	large...	Los Angeles, CA
HIGH PROFIT TO COST RATIO ROUTE	CLT-FLO	US	CLT	Florence Regional Airport	medium...	Charlotte, NC	FLO	Charlotte Douglas International Airport	large...	Florence, SC
QUICK BREAKEVEN ROUTE	SLC-TWF	US	SLC	Joslin Field Magic V...	medium...	Salt Lake City, UT	TWF	Salt Lake City International Airport	large...	Twin Falls, ID
SHORT DISTANCE FLIGHT WITH HIGH OCCUPANCY,HIGH PROFIT TO COST RATIO AND QUICK BREAKEVEN	MDT-PHL	US	MDT	Philadelphia International Airport	large...	Harrisburg, PA	PHL	Harrisburg International Airport	medium...	Philadelphia, PA

BREAKEVEN_FLIGHTS	TE_DISTA	PANCY_R	PANCY_R	T_COST_I	OTAL_PROFI	DTRIP_FL	RIP_PASS	TAL_REVEN	TOTAL_COST
2896	674	0.65	0.65	2.7	129381190	4164	537180	177269400	47888210
1119	4950	0.65	0.65	1.67	253919978	3158	408546	405686178	151766200
349	198	0.65	0.64	70.23	64711626	251	32268	65633112	921486
207	350	0.67	0.66	63.26	111576408	257	34650	113340150	1763742
756	168	0.65	0.65	33.09	47100114	396	51402	48523488	1423374

Question 5:

Key Performance Indicators (KPI's) that you recommend tracking in the future to measure the success of the round trip routes that you recommend.

Answer:

The key performance indicators should be observed on a week-over-week basis to analyze the trend and discuss the root cause and impact (e.g. Week 52 profit > week 32 profit and its rationale) in the stakeholder reporting

RATIONALE_FOR_RECOM MENDATION	ROUTE	BREAK EVEN_ FLIGH TS	AVG_O CCUPA NCY_RA TE_A_T O_B	AVG_OC CUPANCY RATE_B TO_A	PROFIT _COST_ RATIO	TOTAL_PROFI T	ROUNDTRI P_PASSENG ERS	TOTAL_REVE NUUE	TOTAL_COST	ROUNDTRI P_FLIGHTS	ROUNDTRI P_CAN_FLI GHTS	TOTAL_RO UTE_DELAY	AVG_DELAY _LEG_A_TO _B	AVG_DELAY _LEG_B_TO _A
BUSIEST ROUTE	LAX-SFO	2896	0.65	0.65	2.7	129381190	537180	177269400	47888210	4164	246	294190	38	32
HIGH PROFIT PER QUARTER ROUTE	JFK-LAX	1119	0.65	0.65	1.67	253919978	408546	405686178	151766200	3158	28	108744	14	20
HIGH PROFIT TO COST RATIO ROUTE	CLT-FLO	349	0.65	0.64	70.23	64711626	32268	65633112	921486	251	9	5978	8	15
QUICK BREAKEVEN ROUTE	SLC-TWF	207	0.67	0.66	63.26	111576408	34650	113340150	1763742	257	0	10854	13	23
SHORT DISTANCE FLIGHT WITH HIGH OCCUPANCY,HIGH PROFIT TO COST RATIO AND QUICK BREAKEVEN	MDT-PHL	756	0.65	0.65	33.09	47100114	51402	48523488	1423374	396	12	10616	11	14

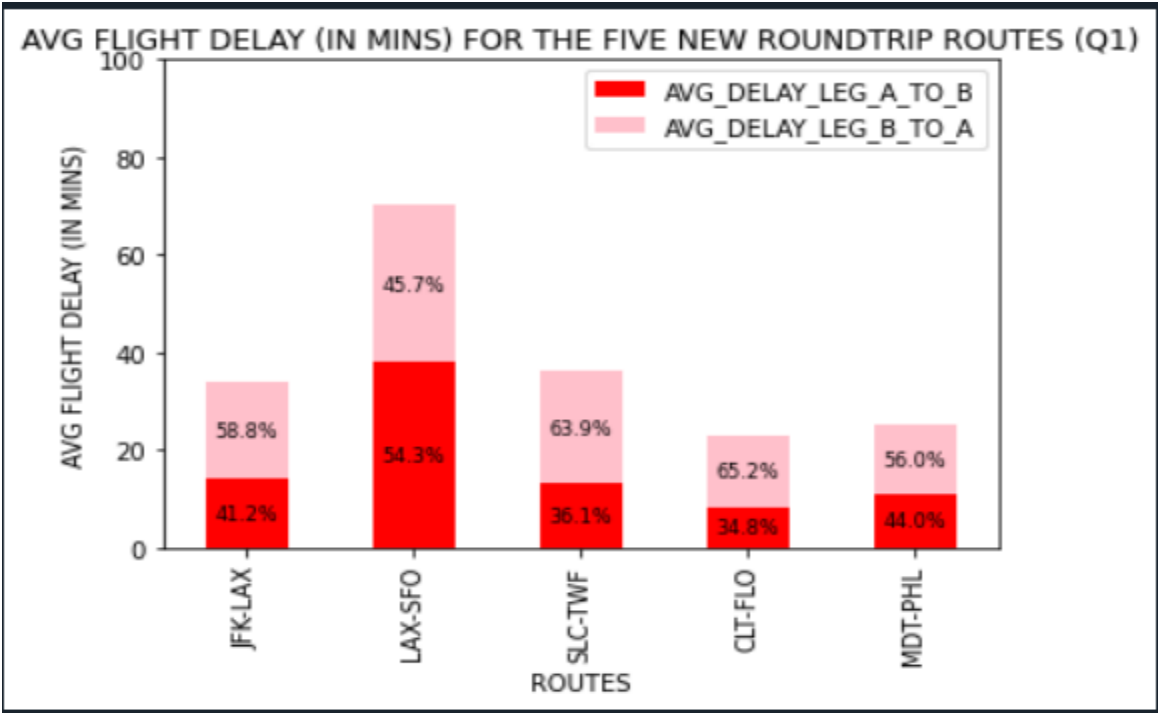
Code Result Screenshot:

RATIONALE_FOR_RECOMMENDATION	ROUTE	COUN	DINT	POINT_A_NAME	T_A_IATA	NT_A_CITY_NA	DINT	POINT_B_NAME	T_B_IATA	INT_B_CITY_NAI
BUSIEST ROUTE	LAX-SFO	US	LAX	Los Angeles International Airport	large...	Los Angeles, CA	SFO	San Francisco International Airport	large...	San Francisco, CA
HIGH PROFIT PER QUARTER ROUTE	JFK-LAX	US	JFK	John F Kennedy International Airport	large...	New York, NY	LAX	Los Angeles International Airport	large...	Los Angeles, CA
HIGH PROFIT TO COST RATIO ROUTE	CLT-FLO	US	CLT	Florence Regional Airport	medium...	Charlotte, NC	FLO	Charlotte Douglas International Airport	large...	Florence, SC
QUICK BREAKEVEN ROUTE	SLC-TWF	US	SLC	Joslin Field Magic V...	medium...	Salt Lake City, UT	TWF	Salt Lake City International Airport	large...	Twin Falls, ID
SHORT DISTANCE FLIGHT WITH HIGH OCCUPANCY,HIGH PROFIT TO COST RATIO AND QUICK BREAKEVEN	MDT-PHL	US	MDT	Philadelphia International Airport	large...	Harrisburg, PA	PHL	Harrisburg International Airport	mediu...	Philadelphia, PA

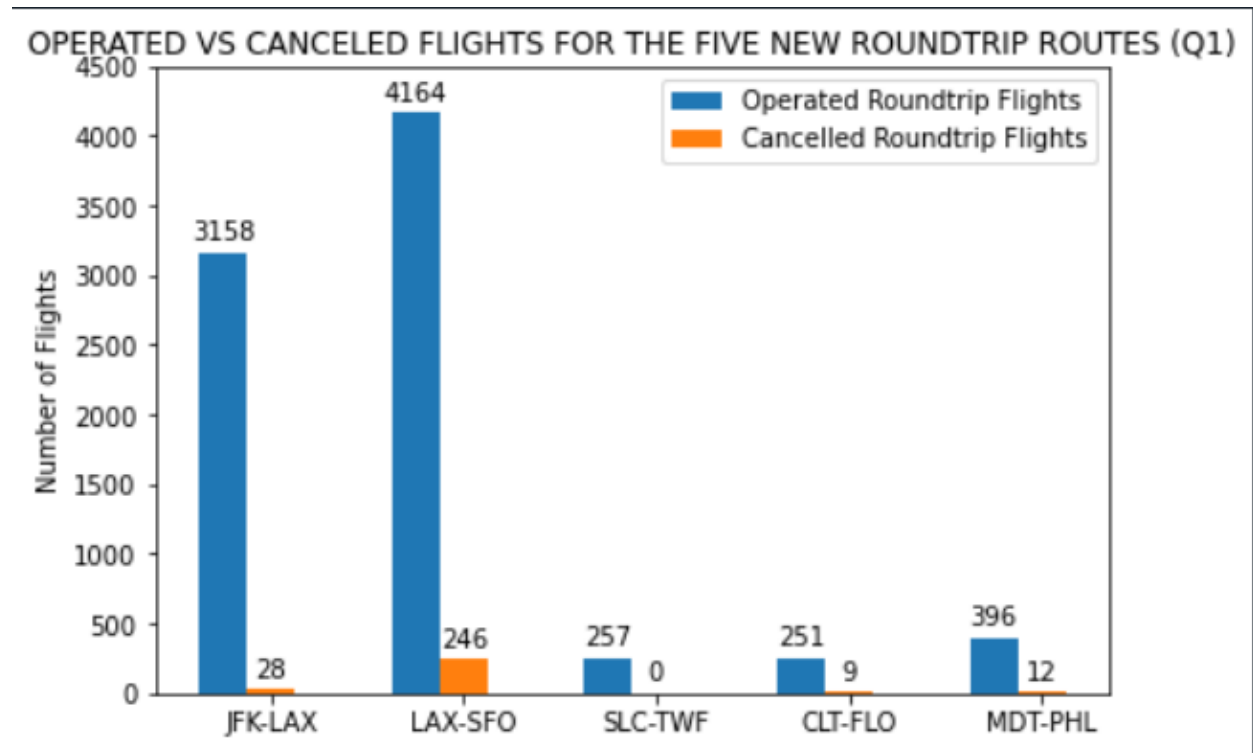
BREAKEVEN_FLIGHTS	AVG_OCCUPANCY_RATE_A_TO_B	AVG_OCCUPANCY_RATE_B_TO_A	PROFIT_COST_RATIO	TOTAL_PROFIT	ROUNDTRIP_PASSENGERS	TOTAL_REVENUE
2896	0.65	0.65	2.7	129381190	537180	177269400
1119	0.65	0.65	1.67	253919978	408546	405686178
349	0.65	0.64	70.23	64711626	32268	65633112
207	0.67	0.66	63.26	111576408	34650	113340150
756	0.65	0.65	33.09	47100114	51402	48523488

TOTAL_COST	ROUNDTRIP_FLIGHTS	ROUNDTRIP_CAN_FLIGHTS	TOTAL_ROUTE_DELAY	AVG_DELAY_LEG_A_TO_B	AVG_DELAY_LEG_B_TO_A
47888210	4164	246	294190	38	32
151766200	3158	28	108744	14	20
921486	251	9	5978	8	15
1763742	257	0	10854	13	23
1423374	396	12	10616	11	14

Route Delay Monitoring:



Flight Cancellation Monitoring:



Final recommendation:

The origination airport and destination airport for each of the five round trip routes that are recommended are the below:

- High Profit Per Quarter Route: **JFK-LAX**
- Busiest Route: **LAX-SFO**
- Quick Break-even Route: **SLC-TWF**
- High Profit to Cost Ratio Route: **CLT-FLO**
- Short Distance route with High Occupancy, High Profit to Cost Ratio and Quick Breakeven: **MDT-PHL**

The recommended key performance indicators whose trend needs to be tracked over time (preferably week over week) to track to measure success are:

KPIs Per route (week over week)

- Total Profit
- Total Revenue
- Total cost
- Total profit to cost ratio
- Avg Delay

- Number of roundtrip flights
- Total flight cancellations
- Total roundtrip passengers
- Avg route occupancy rate
- Ticket Revenue and Baggage Revenue
- Number of flights pending to breakeven

What's Next:

- 1) Design the layout of an all-inclusive dashboard with trend graphs to depict all the above mentioned KPIs in one place
- 2) Optimize the code
- 3) Develop product documentation explaining all the functions
- 4) Track and obtain some more required data to perfectly correlate the tickets records and the flights record
- 5) Test the truth of the current decisions on another sample population of data