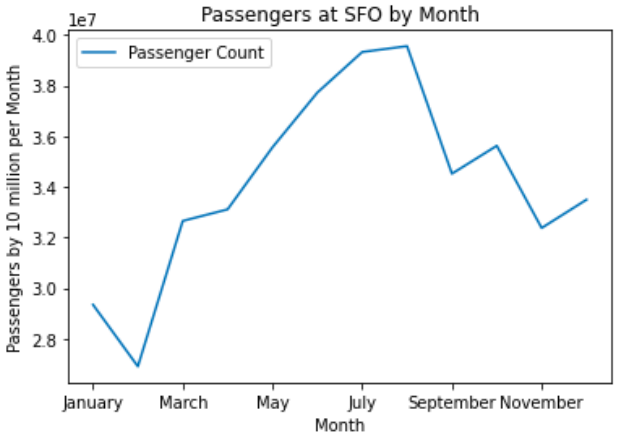
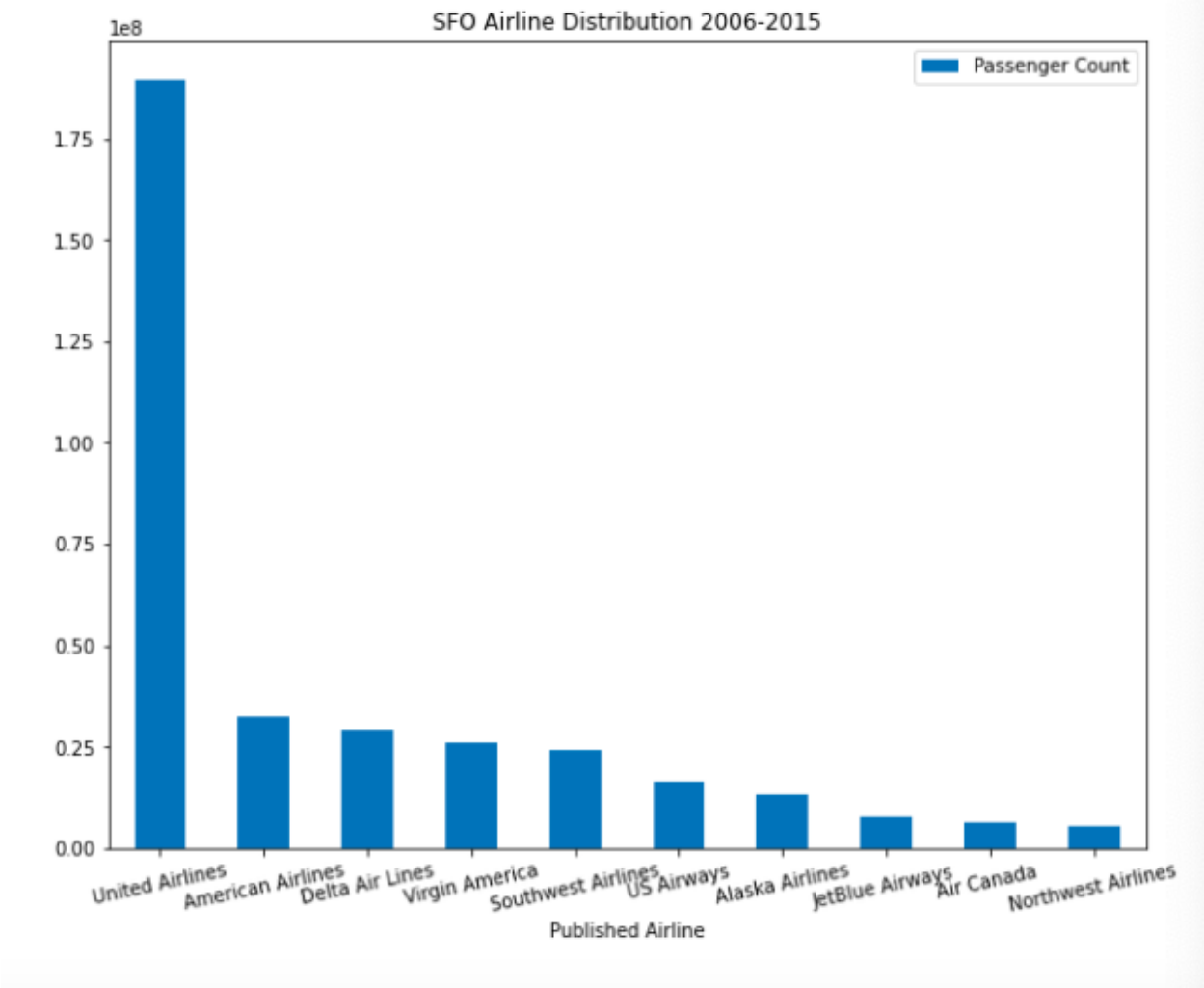
In this hypothetical business problem, I analyzed real airline and international airport data from San Francisco International Airport data and US Department of Transportation in order to answer the question of which airlines a potential novel company with a traveling package located in San Francisco should partner with and which foreign airports it should advertise in. I limited the question to picking five airlines to partner with and three international airports (and their surrounding markets) to advertise in.

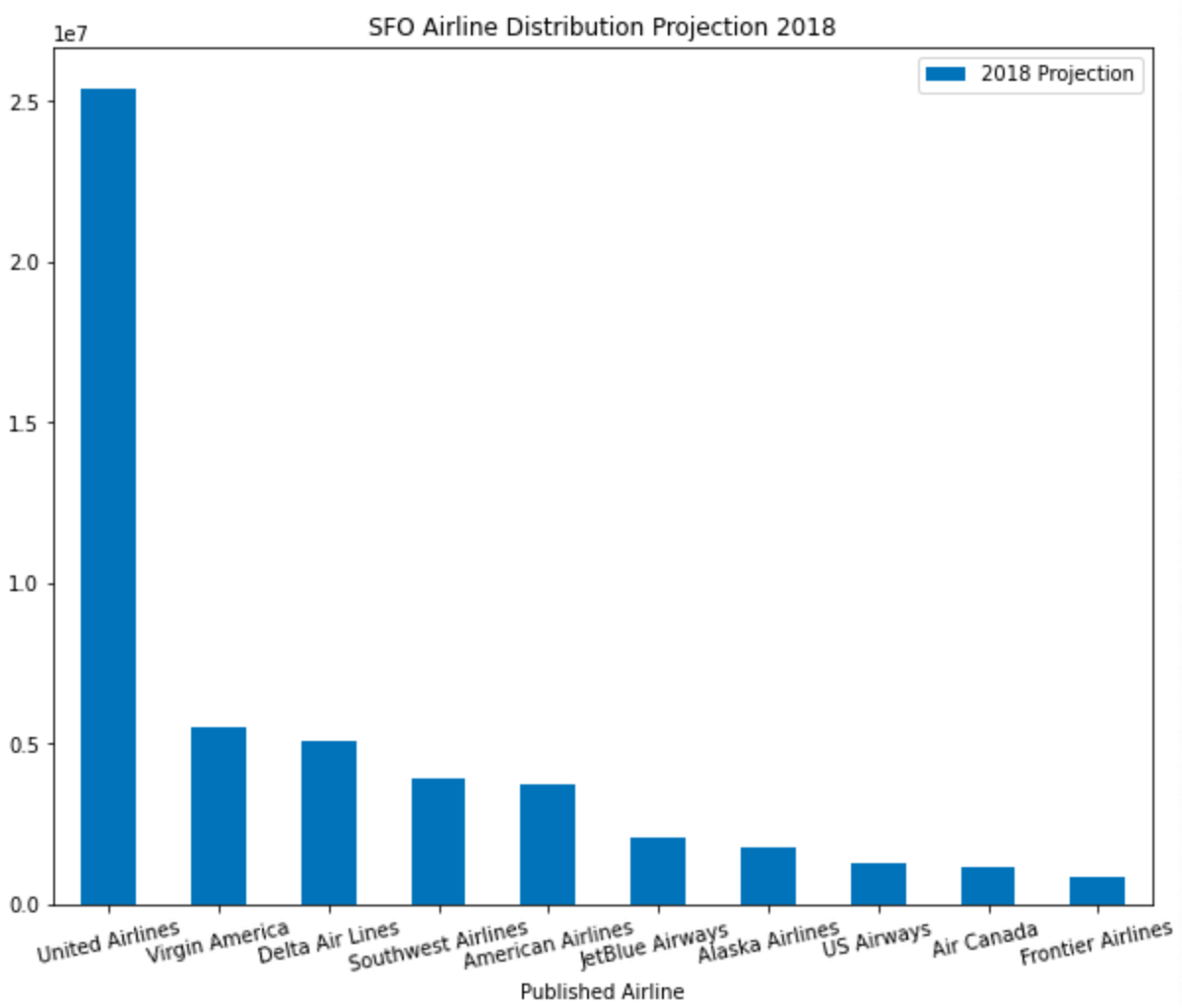
First off, I started with data from City of San Francisco Open Data Air Traffic Data, data provided by the city itself of the passengers each airline used through the years of 2005 to 2016. I cut out 2005 and 2016 since they were only partly in the data and I wanted the data to be clean with full years. I cleaned up the data by checking if there were any nulls and changing some names to make it easier to read and then started my analysis to find which airlines this company should choose. Firstly, for some insights, I measured the total passengers at SFO by year. It seems there was steady growth with a dip in the year 2008 and 2012

Next was total passengers at SFO by month throughout all years to show which months contain the most travelers. As expected, the summer months contained the most passengers with the least being in February



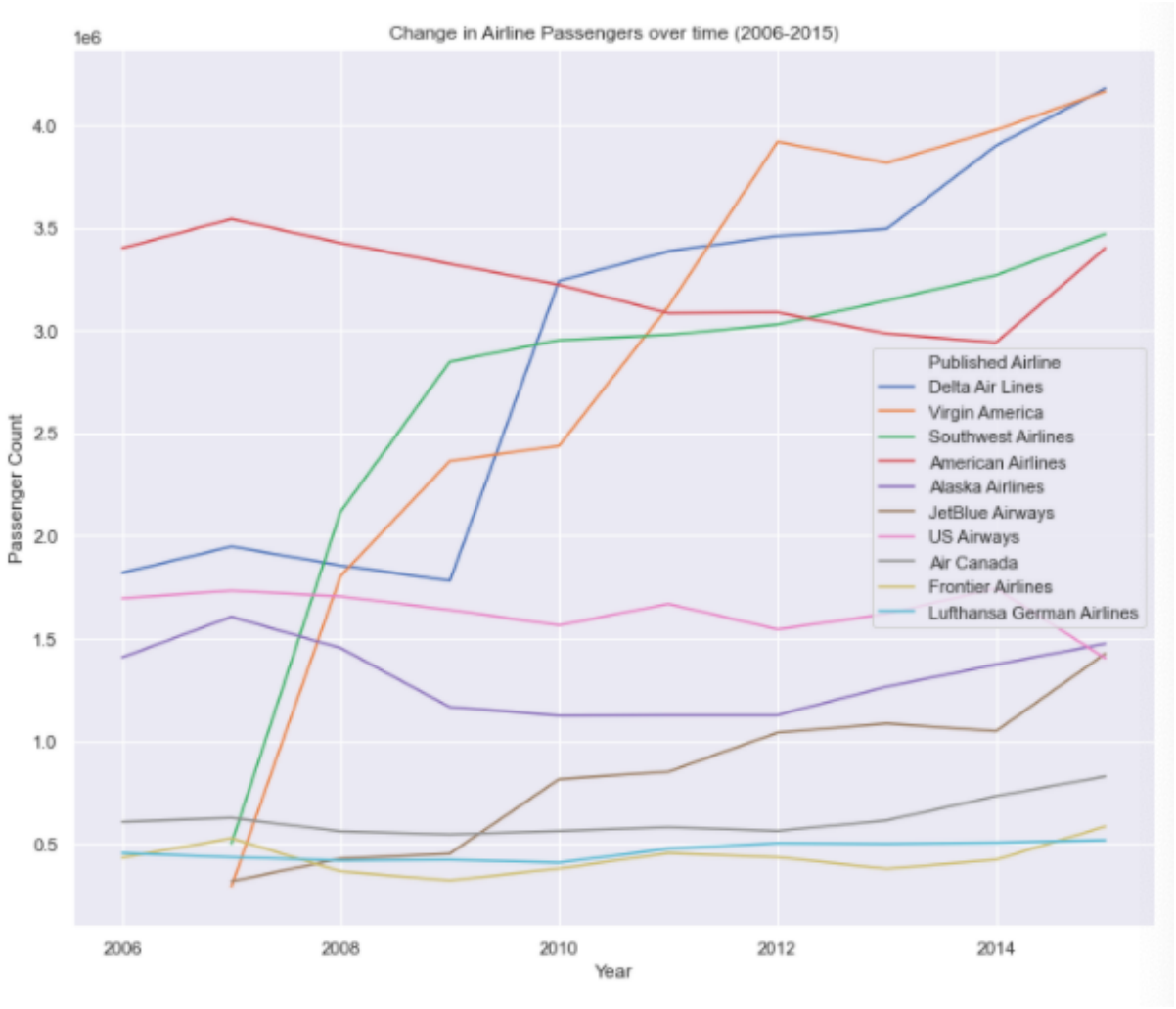
Next, I created another dataframe from the existing one, summing passengers by year and airlines, creating a multi-index dataframe. I then used groupby to show the top 10 airlines by year. I did the same for GEO Region and ranking the most populous regions by year. I then began my growth projections analysis. For the growth projections, I created a loop to calculate one year growth, two year growth, and five year growth for each country. I divided each of these to make them an annual number. My projected growth for each airlines was the average of their annual one year, two year, and five year growths, and using that I projected three years out to 2018. Some of my findings from the projections were as followed:





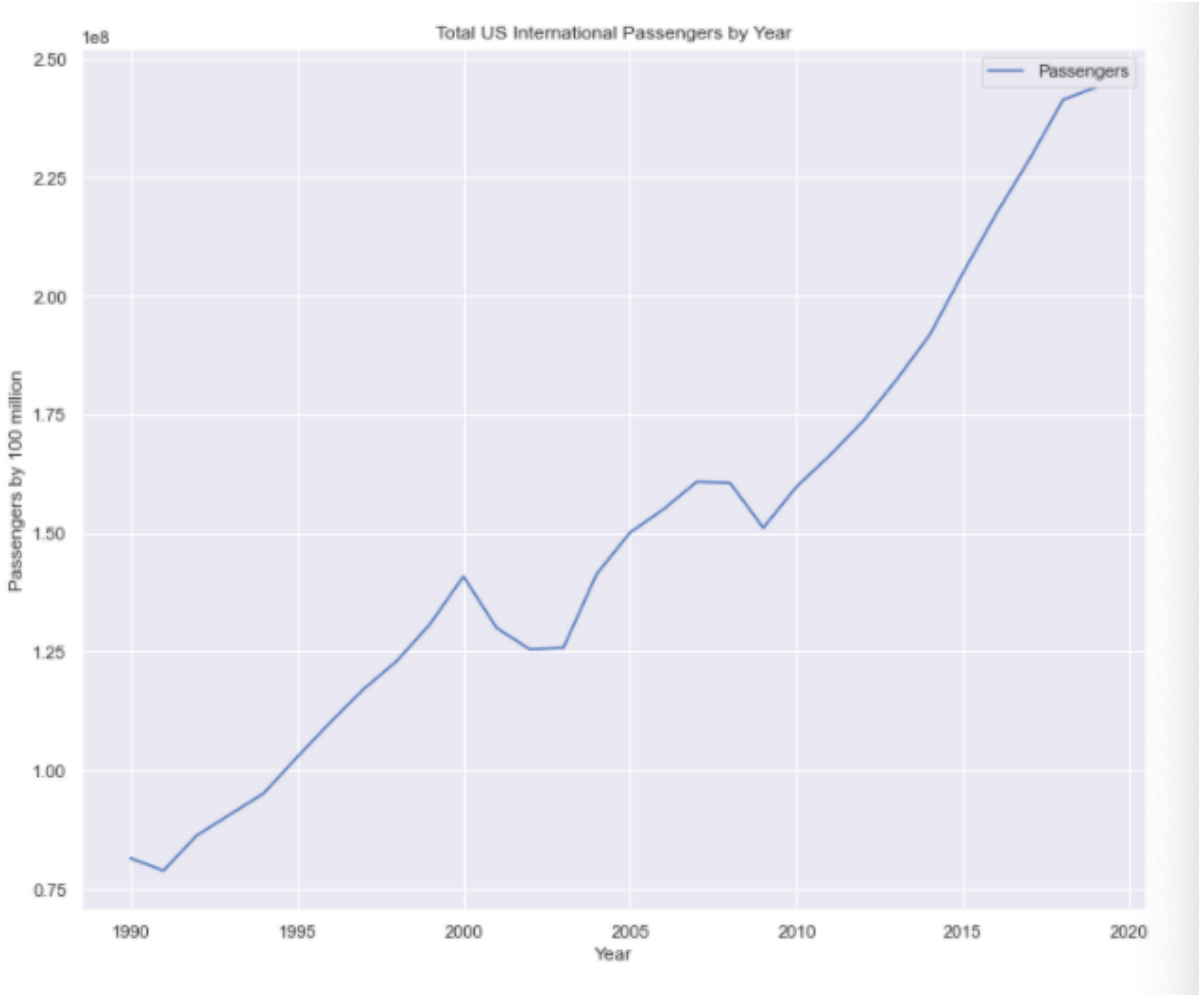
I then wanted to show the growth over time of the top 10 airlines represented on a single line chart. When I plotted this, United Airlines was dominating the chart and made it impossible to see the growth of other trends. So I removed United, and received the growth trends for the top

10 airlines from 2006-2015.



Next, I incorporated the international air travel part of the data. This data was a bit different since it contained all US airports and not just SFO and time frame was from 1990-2019. To solve our business problem I had to filter for SFO and the specific years of 2006-2015 but

beforehand I also did some exploratory analysis for year and month as I did earlier.



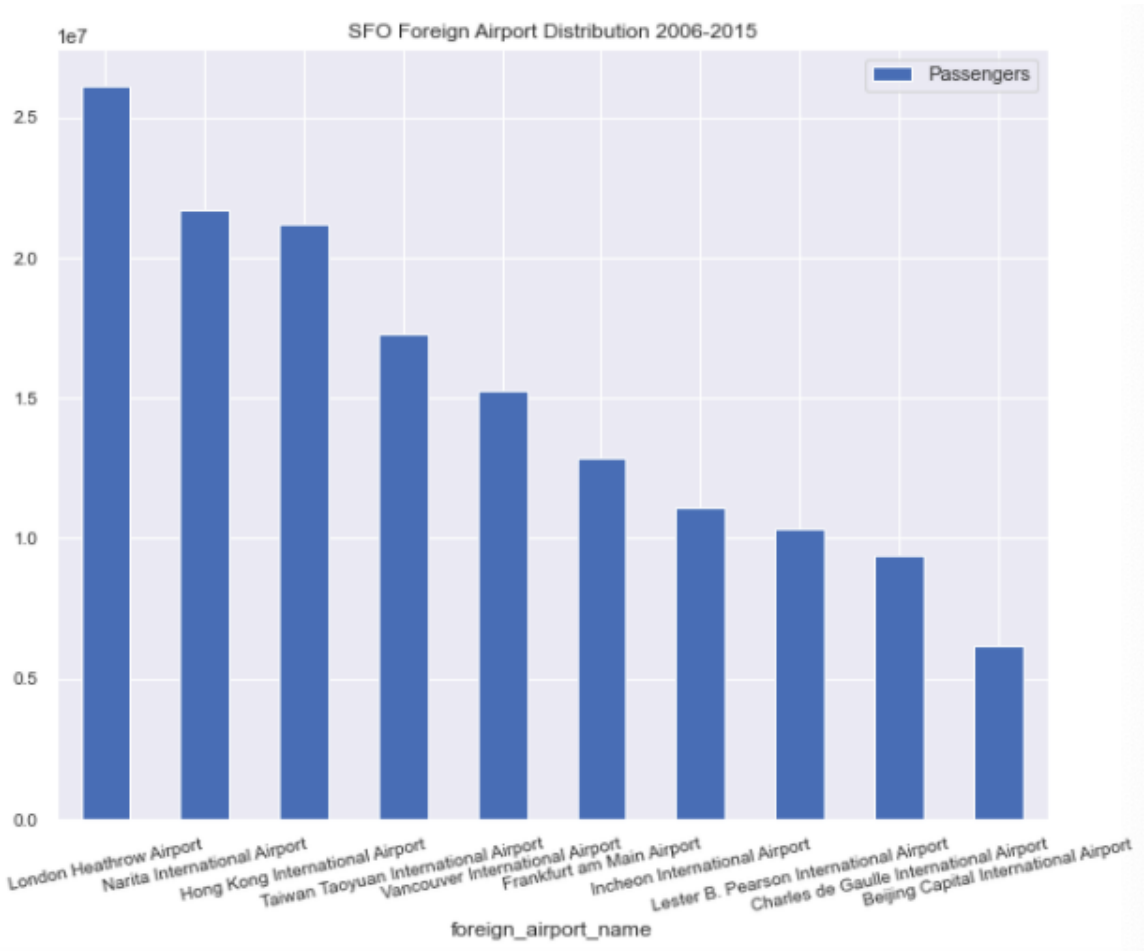
It seems like there was a constant upward trend apart from a dip around 2001 which can be explained by 9/11 and 2008 which can be explained by the recession. The month trend was near identical to the earlier shown. THe most foreign airports traveled to by US airports in 2015 were as followed:

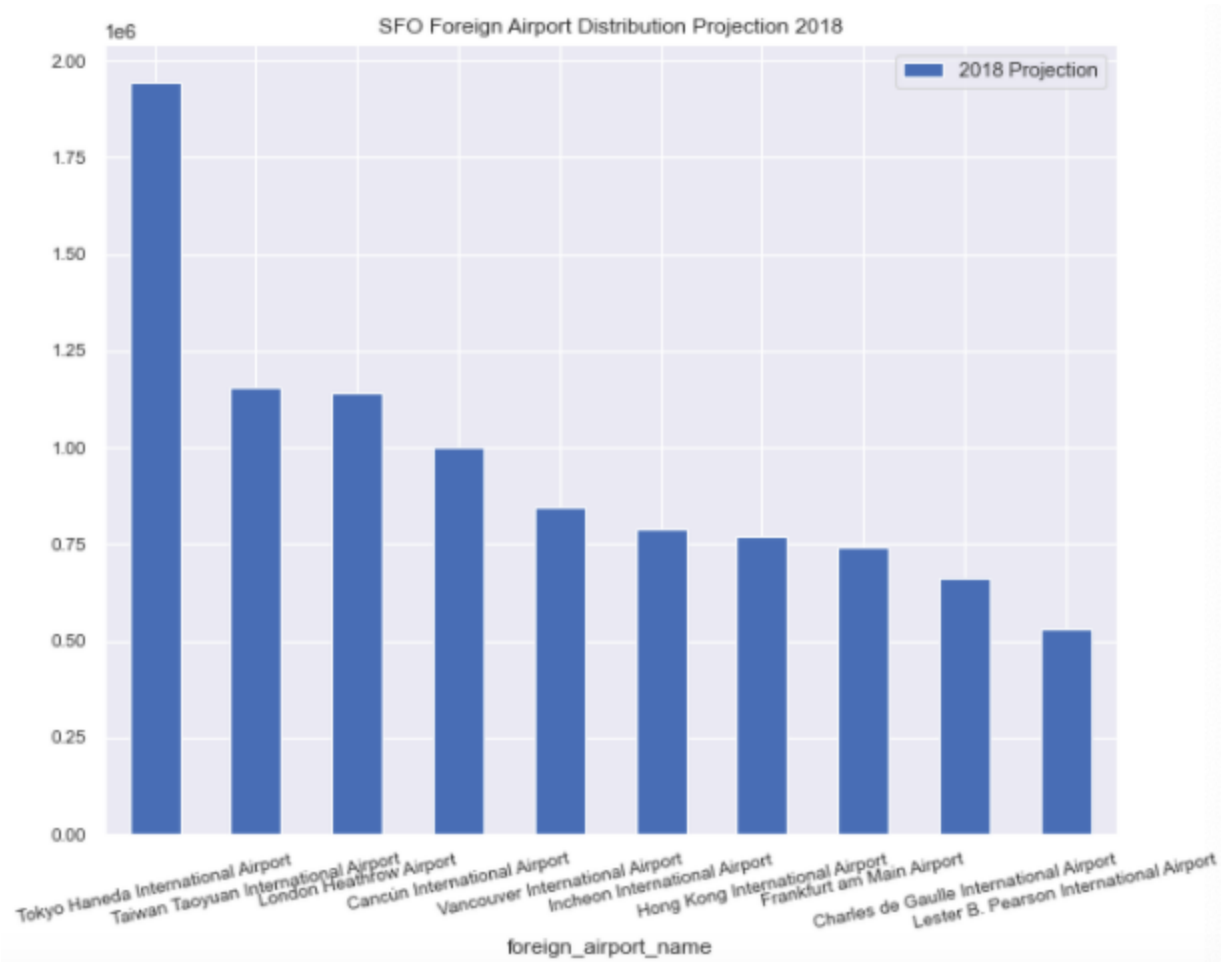
foreign_airport_name	Passengers
London Heathrow Airport	14586821
Lester B. Pearson International Airport	11078003
Cancún International Airport	8044668
Narita International Airport	7855326
Charles de Gaulle International Airport	6770203
Licenciado Benito Juarez International Airport	6753729
Frankfurt am Main Airport	6643333
Incheon International Airport	5496197
Vancouver International Airport	5118249
Amsterdam Airport Schiphol	4865128
Montreal / Pierre Elliott Trudeau International Airport	3632271
Guarulhos - Governador André Franco Montoro International Airport	3140077
Dubai International Airport	3063052
Calgary International Airport	3040486
Beijing Capital International Airport	3014310

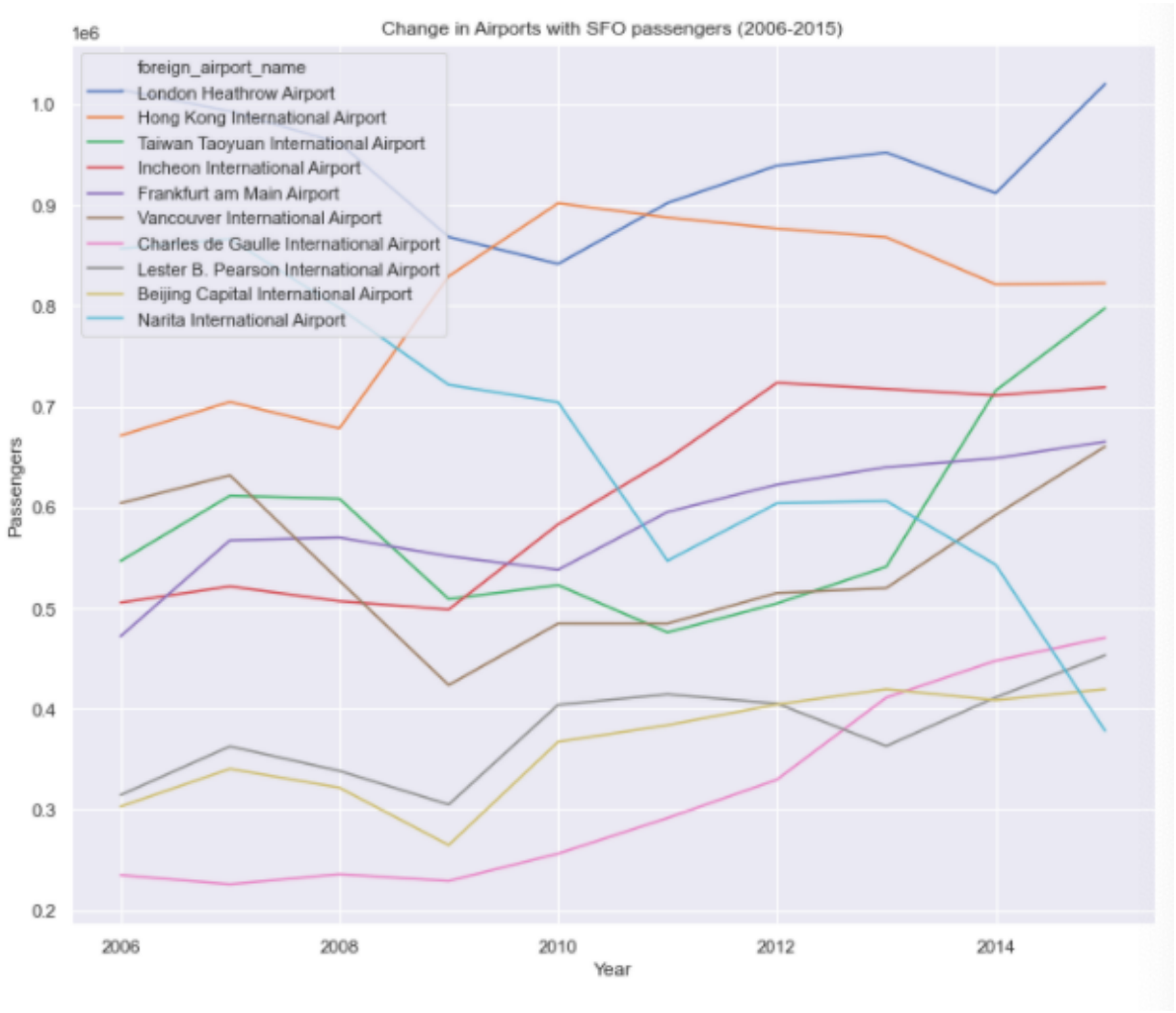
I then filtered for SFO. THe most foreign airports from SFO in 2015 were as followed:

foreign_airport_name	Passengers
London Heathrow Airport	1020149
Hong Kong International Airport	822436
Taiwan Taoyuan International Airport	797622
Incheon International Airport	719117
Frankfurt am Main Airport	665096
Vancouver International Airport	660186
Charles de Gaulle International Airport	470508
Lester B. Pearson International Airport	453110
Beijing Capital International Airport	419363
Narita International Airport	378073
Shanghai Pudong International Airport	365909
Licenciado Benito Juarez International Airport	343486
Dubai International Airport	294416
Tokyo Haneda International Airport	278194
Licenciado Gustavo Díaz Ordaz International Airport	232611

Then, I essentially used the same techniques as the first part of the capstone to calculate growth of airports and 2018 projection and for this part I was able to test it with actual 2018 as well, and it turns out most of them were quite similar. The results were as followed:


SFO Foreign Airport Distribution 2006-2015
1e7
Passengers
2.5
2.0
1.5
1.0
0.5
0.0
London Heathrow Airport
Narita International Airport
Hong Kong International Airport
Taiwan Taoyuan International Airport
Vancouver International Airport
Frankfurt am Main Airport
Incheon International Airport
Lester B. Pearson International Airport
Charles de Gaulle International Airport
Beijing Capital International Airport
foreign_airport_name


SFO Foreign Airport Distribution Projection 2018
1e6
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
2018 Projection
Tokyo Haneda International Airport
Taiwan Taoyuan International Airport
London Heathrow Airport
Cancun International Airport
Vancouver International Airport
Incheon International Airport
Hong Kong International Airport
Frankfurt am Main Airport
Charles de Gaulle International Airport
Lester B. Pearson International Airport
foreign_airport_name



Given the analysis provided, the answer to the question of airlines to pair with would be of course United Airlines which dominates the market, Virgin America with second priority, Delta Airlines, followed by Southwest Airlines and American Airlines. JetBlue Airlines could also be considered instead of American depending on how long the program will last since it is growing much faster but not fast enough to catch American in three years.

For foreign airports, I would advertise in London Heathrow, Taiwan Taouyuan, and Tokyo Haneda since it is growing extremely rapidly though not currently in the top 10. The suggestions may vary based on the time frame and whether growth or short term value is more important.

Future Questions for this capstone would be:
Why do some airlines go up and then down as shown in the graphs?
How will the airline / airport industry recover post Covid?
Would targeting airports with less travel to SFO also be beneficial to attract new customers?