A LIMITED SCOPE OF THE COST OF AIR TRAVEL

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Full Title: EVERYTHING IS AWFUL. OR IS IT? - A LIMITED SCOPE OF THE COST OF AIR TRAVEL THROUGH THE YEARS (ONE THING THAT MAY NOT* BE OBJECTIVELY AWFUL)

Short Title: LIMITED SCOPE ANALYSIS OF Q2 AIRFARE IN THE U.S. OVER THE LAST 4 DECADES

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Introduction:

Today's political, economic, and social climate seems to be, on a good day, a succession of inconveniences, and at worst, a never-ending cascade of unprecedented challenges and horrors. Especially thanks to recent economic inflation, everyday necessities are taking a greater and greater toll on the average consumer's wallet. The overall cost of food, gas and shelter experienced an increase over the summer, measured via the consumer price index (CPI) (NBC news, 2023). This increase was certainly felt acutely here in Los Angeles, where gas rose as high as $6 in some areas, and food prices continued to climb. Purchasing my airfare home this year, I felt the sting on my wallet, and I found myself wondering "were airplane tickets always this high?". I am not inexperienced in air travel, having flown frequently prior to college for athletics, as well as during undergrad and now as an adult to visit family. For some reason, when I think back to purchasing in the past, I cannot conjure up the same feelings of unenthusiastic and reluctant resignation that I felt this year. For this reason, I thought it would be an interesting investigation; "How has airfare changes in the past few decades". The present report aims do answer this very question, using the United States Bureau of Transportation Statistics (BTS) data on airfare to analyze trends in airfare throughout the past few decades.

Methods:

The following analysis was conducted using the United States Bureau of Transportation Statistic's (BTS) record of Average Domestic Itinerary Fares. This dataset is compiled each financial quarter (Q1-Q4), and the most recent financial quarter data available is from Q2 of 2023. For each quarter, the dataset compiles average flight fares by airport by year, year and these fares

by a variable called "2022 Passenger Rank", which is an ordinal variable calculated by comparing the value equivalent to 10% of all passengers served in 2022 (a variable also included in each dataset).

Due to the data limitations for the current financial year, data from the second financial quarter of 4 years, 1993, 2003, 2013, and 2023 was utilized for analysis. A 10-year spread was thought to be ideal for assessing the general trends in airfare data. The datasets from this chosen time frames were downloaded directly from the Transportation Bureau's website, using the above link, into .csv filed. Most of the data processing and cleaning was done using the dplyr, tidyverse and baseR packages. As part of data processing, variables names were altered to aid in the coding process. Variable types were changed to the appropriate type (continuous or character). Included in each dataset was '2022 Passengers', a variable which compares the number of domestic passengers each airport sees in 2022. A missing value or a value of 0 indicate these airports don't provide commercial domestic flights, so I'm removing missing values and values of 0 because the corresponding airports wouldn't be ones I would fly from.

To additional analysis, coordinate data was taken from The Humanitarian Data Exchange which compiled a dataset of longitude and latitude values for 508 major US airports. This coordinate dataset was merged with the BTS datasets. Cross-validation was done by comparing the inflation adjusted fare variable for each year (Adjusted_Avg_Fare_Q2) provided originally with my dataset with an actual dollar to dollar conversion between that year and 2023(Table 1: Results of cross-validation). A new variable, "check.adj.xx" was created for each year of analysis by multiplying the (Average_xxxx) for each year by the inflation adjustment to the 2023 dollar value (1993: 2.13, 2003: 1.67, 2013: 1.32, 2023: 1). States were categorized into "East" and "West" by U.S. census geographic zones, with Northeast, south and Midwest considered "East" and all remaining states considered "West".

Given that the research question centers around LAX and BOS airports, the overall dataset was queried for trends in relation to these two airports. Due to the great geographic distance between these airports, the overall dataset was stratified by location to better understand region-specific baseline trends. Scatterplots were used to visualize trends between continuous variables. Bar plots were used to visualize continuous variables by geographic location.

Results

The Passenger Rank of LAX and BOS remained constant across all four time frames sampled; BOS ranking 6^{th}, and LAX ranking 1^{st} (Table 3), indicating that both airports see an extremely high number of US domestic flights per time frame sampled. However, neither LAX nor BOS were in states found to have the most expensive airport to fly out of in any of the Q2 data sampled: The state with the highest average adjusted airfare in 1993 was Georgia (477.24, Table 1), the state with the highest average adjusted airfare in 2003 was New Mexico (531.44, Table 1), and the state with the highest adjusted average airfare in 2013 and 2023 was Alaska (596.00 and 641.09, Table 1). In comparison, the average airfare for California for 1993, 2003, 2013, and 2023 was 354.04, 342.62, 401.70 and 403.09, and the average airfare in Massachusetts

for the same timepoints was 305.94, 426.40, 363.57, 392.25. The most expensive airport to fly out of in 2023 was Cold Bay Airport in Alaska, and the least expensive to fly out of was Santa Maria in California (Figure 4).

Comparing Passenger Rank to Inflation Adjusted Fare, it appears that as passenger rank increases in the Western states, Inflation Adjusted Average fare tended to increase for all time points (Figure 1). This trend was largely mirrored in the Eastern U.S. States, for all years except 1993, where there did not appear to be a strong association between passenger rank and fare (Figure 2). Importantly, it appears that adjusted airfare is lower in 2023 than it has been for the other time points in both the east and the west. Comparing the dollar amount of the average ticket at Logan and LAX between 1993 and 2023, one would be paying around $369 less for a ticket out of BOS, and around $279 less for a ticket out of LAX.

Conclusion

Evidently, by inflation adjusted values, I am on average paying less for a trip between LAX and BOS than I have in the past. This begs the question of why it feels as if I am not. This can probably be answered best by looking at the unadjusted fare comparisons in Figure 3. Looking specifically at unadjusted fares out of Logan and LAX by year, it appears that the average ticket out of Logan stagnated between 1993 and 2003, then up trended between 2013 and 2023 (Figure 3). The average ticket out of LAX up trended slightly between 1993 and 2003, then increased more significantly between 2013 and 2023. On average, the price of a ticket out of Logan was higher than a ticket out of LAX in 1993 and 2003, but below a ticket out of LAX in 2013 and 2023 (Figure 3). While inflation adjusted values provide a good gauge of the "true" cost of a purchase in relation to the strength of the dollar, unadjusted amounts are the "ouch" one feels when actually paying for something in the moment. Since the unadjusted values are higher than they have been in the past, this is likely why it anecdotally feels like airfare prices are going up.

Citations:

Jay, M. (2023, September 13). *Inflation ticks upward to 3.7% for August 2023: Here's how it could affect interest rates.* NBCNews.com. https://www.nbcnews.com/business/economy/inflation-august-2023-number-will-interest-rates-keep-going-up-rcna104655

Figures and Tables:

Table 1: Comparison of Internal Variables with External Source

"Adjusted_Avg_Fare_Q2_1993"	"check.adj.93"	"Adjusted_Avg_Fare_Q2_2003"	"check.adj.03"	"Adjusted_Avg_Fare_Q2_2013"	"check.adj.13"	"Adjusted_Avg_Fare_Q2_2023"	"check.adj.23"
1406.449	1420.071	1576.759	1589.84	1171.006	1183.908	1858	1858
908.314	917.11197	1186.289	1196.13082	1315.897	1330.395	1448.922	1448.922
1137.956	1148.97738	1506.982	1519.48457	1226.6	1240.11492	1029	1029
1236.47	1248.44625	915.912	923.51	816.662	825.66	898	898

NC	387.89	401.95	434.95	493.59
ND	345.27	496.36	499.60	552.68
NE	471.22	431.36	510.53	512.60
NH	444.03	405.49	395.24	467.40
NJ	301.62	354.15	270.59	247.97
NM	439.70	531.44	524.37	559.40
NV	268.45	299.22	388.47	454.72
NY	406.22	406.45	424.83	398.37
OH	359.67	326.74	381.70	350.06
OK	251.79	338.50	441.79	473.81
OR	371.41	347.70	420.63	455.67
PA	421.07	426.67	451.42	441.34
RI	407.14	304.84	342.25	383.72
SC	420.83	437.45	397.54	426.86
SD	393.34	418.49	479.80	530.33
TN	393.22	392.61	457.41	477.48
TX	275.00	355.89	414.09	485.62
UT	422.01	385.07	469.25	512.07
VA	399.89	415.11	456.25	509.84
VT	400.18	346.73	426.32	456.74
WA	335.97	329.48	376.31	467.20
WI	385.89	374.58	492.23	493.88
WV	403.64	471.02	502.82	453.20
WY	383.11	514.14	558.88	630.24

Figure 1:Trend of Inflation Adjusted Fare vs Passenger Rank of Western US Ai

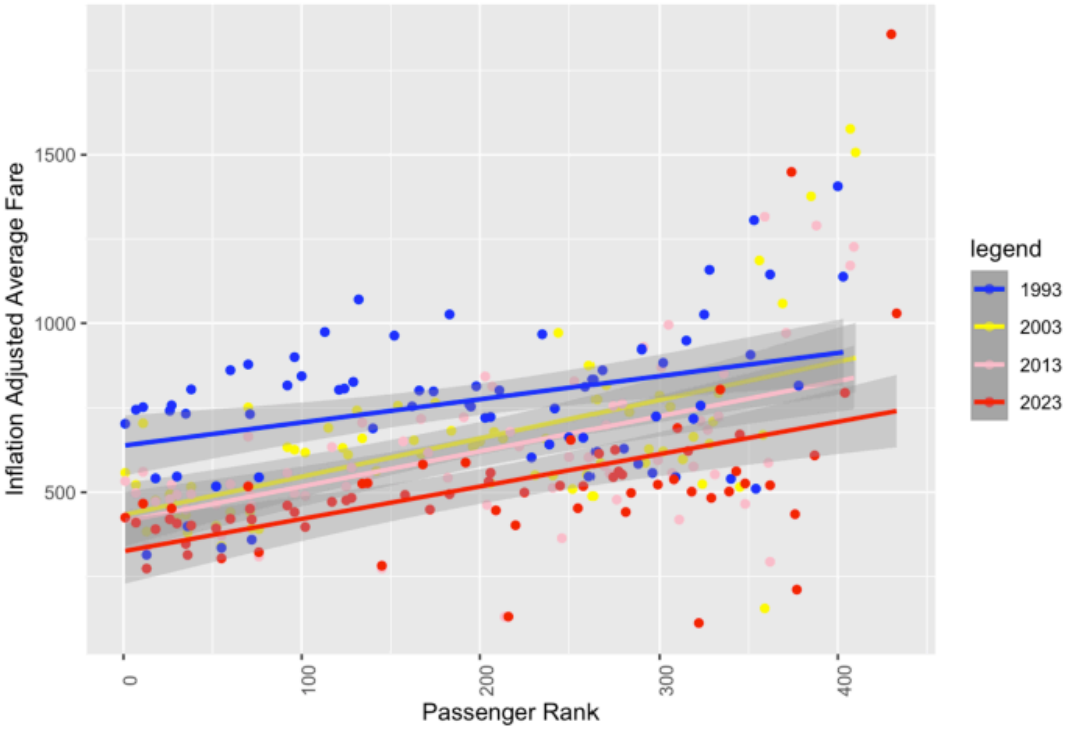


Figure 2:Trend of Inflation Adjusted Fare vs Passenger Rank of Eastern US Air

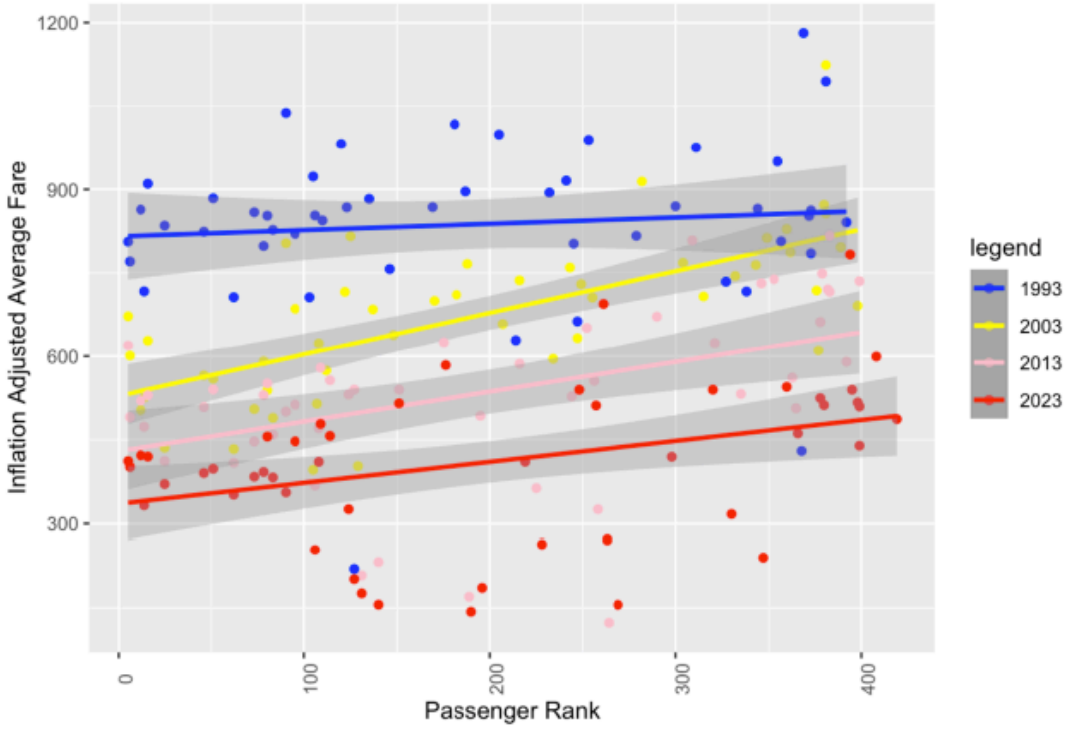
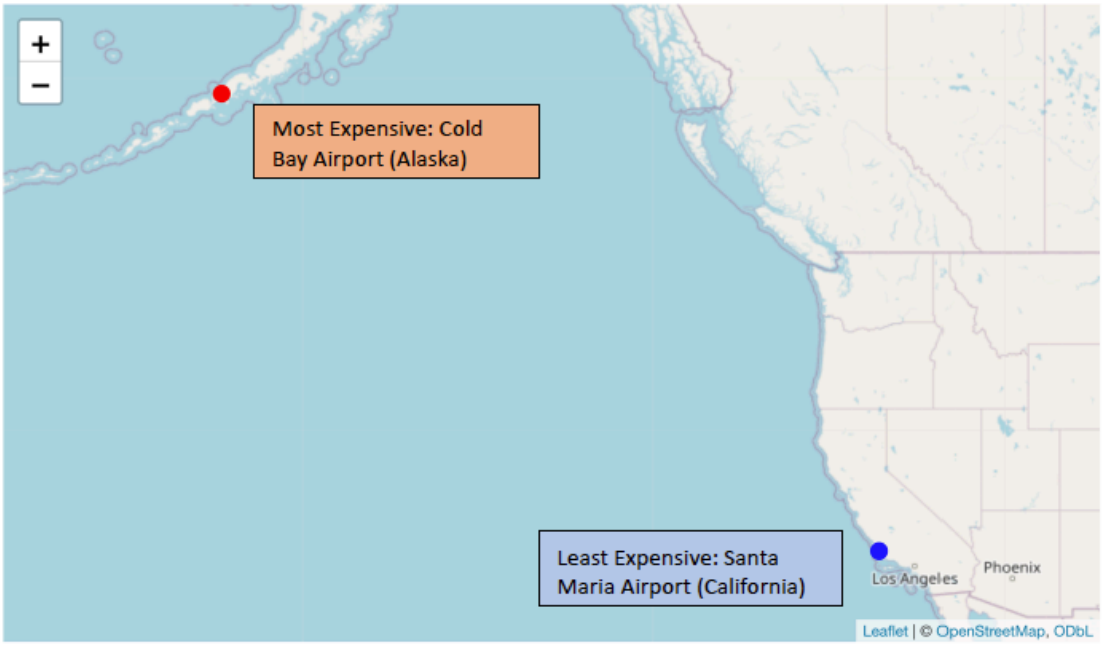


Figure 4: Geographic Location of Most And Least Expensive Airports

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  Avg_2023     lat      lon Airport     Airport Name
1     1858 55.2061 -162.725     CDB Cold Bay Airport

  Avg_2023     lat      lon Airport
1  111.813 34.8989 -120.457     SMX
                                    Airport Name
1 Santa Maria Public/Capt. G. Allan Hancock Field
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