Comparison between JFK and HOU Airports 2004-2007 (internal flights only)

DATA VISUALIZATION & COMMUNICATION

DATA SCIENCE AUEB 2021-22 | Intsructors: D. Karlis and N. Platis

Rafail Gatos | f3352103

Anastasios Fasoulis |f3352125

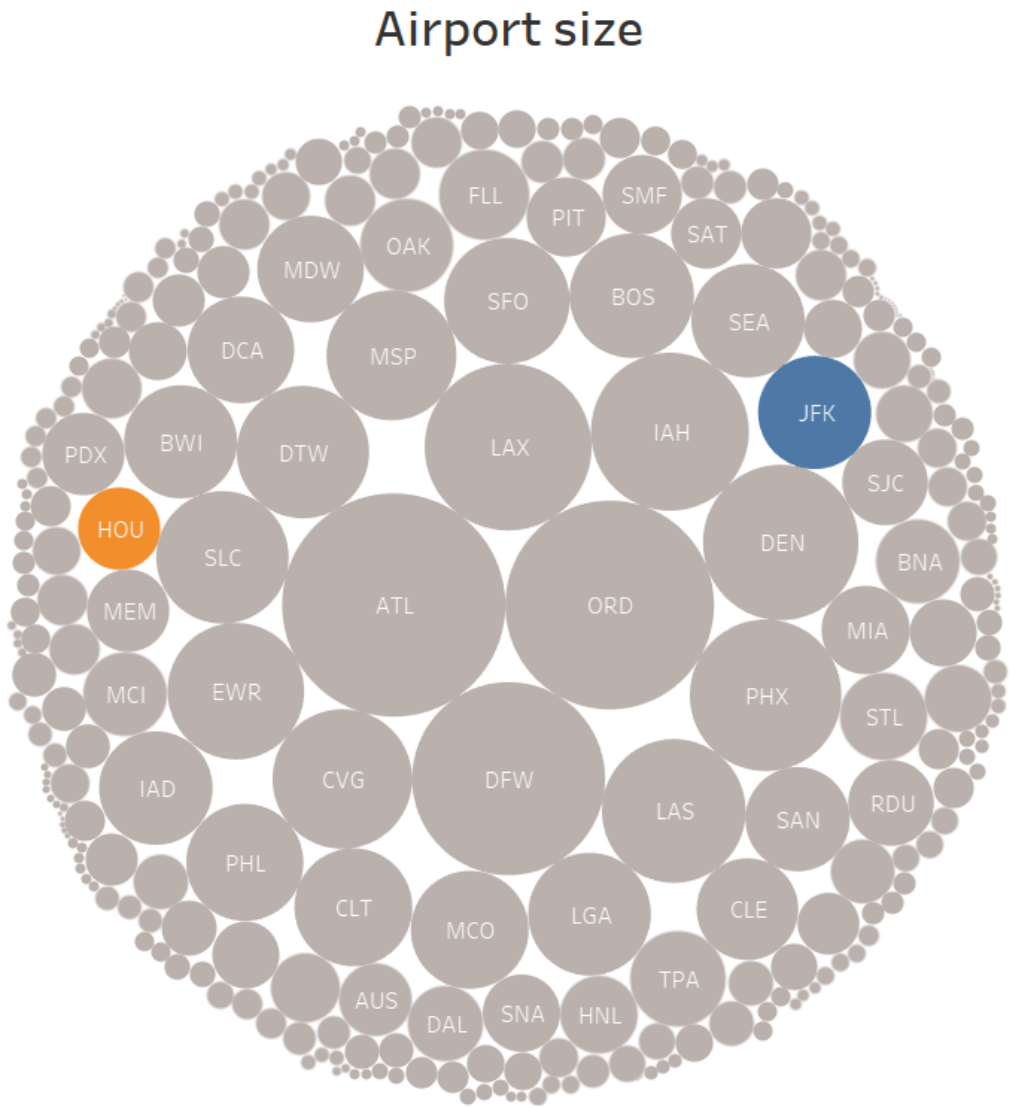
Agis G. Koumentakos | f3352108

Sotirios Legkas | f3352112

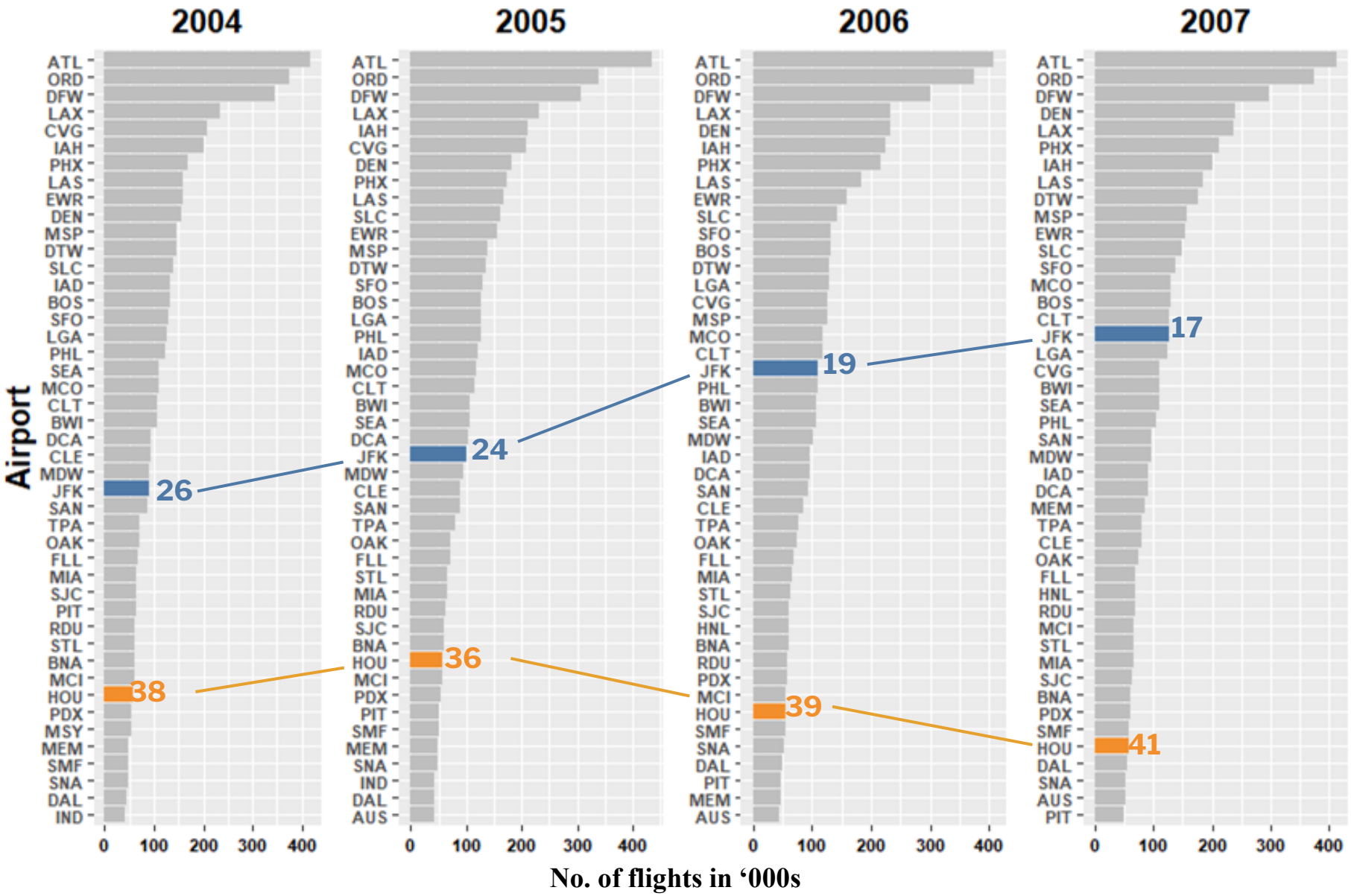
1. General Overview

- An overview of airport size is provided
- The size of each bubble determines the size of each airport
- ATL ORD are the biggest airports

1.1 Size of airports



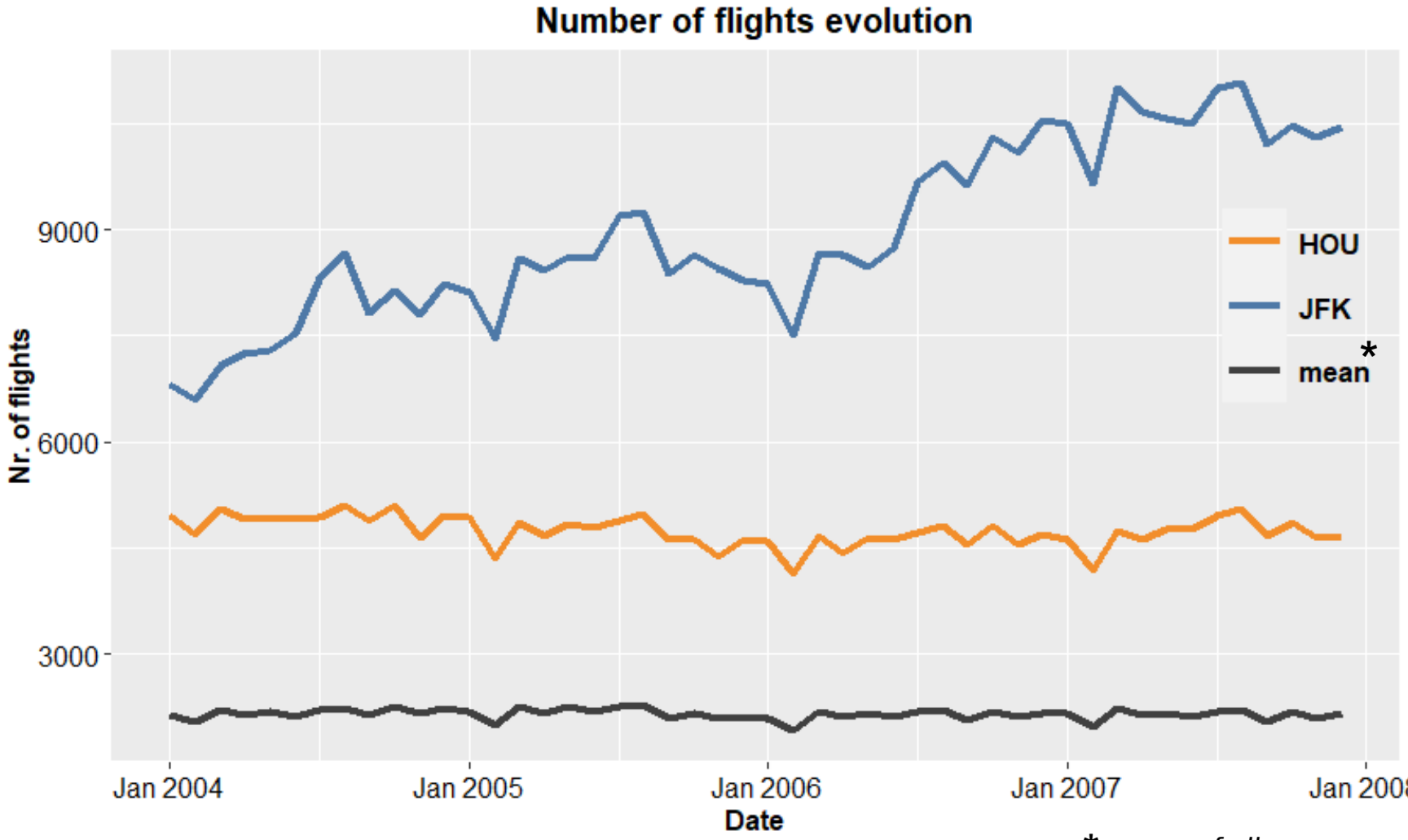
1.2 Airport Rankings of the top 45 annually 2004-07



- The ranking of each airport based on annual number of flights
- JFK upward trend from **26th** in '04 to **17th** in '07
- HOU slightly downward trend from **38th** in '04 to **41st** in '07

1.3 Flights per month for JFK/HOU and average of all airports

- Historical number of flights comparison between JFK, HOU and the average flights of all airports.
- JFK has a **higher number** of flights than HOU and the average flights of airports and follows an **increasing trend**.
- HOU has **higher number** of flights than the average. The number of flights are **stable** through years. It has similar behavior to the average.



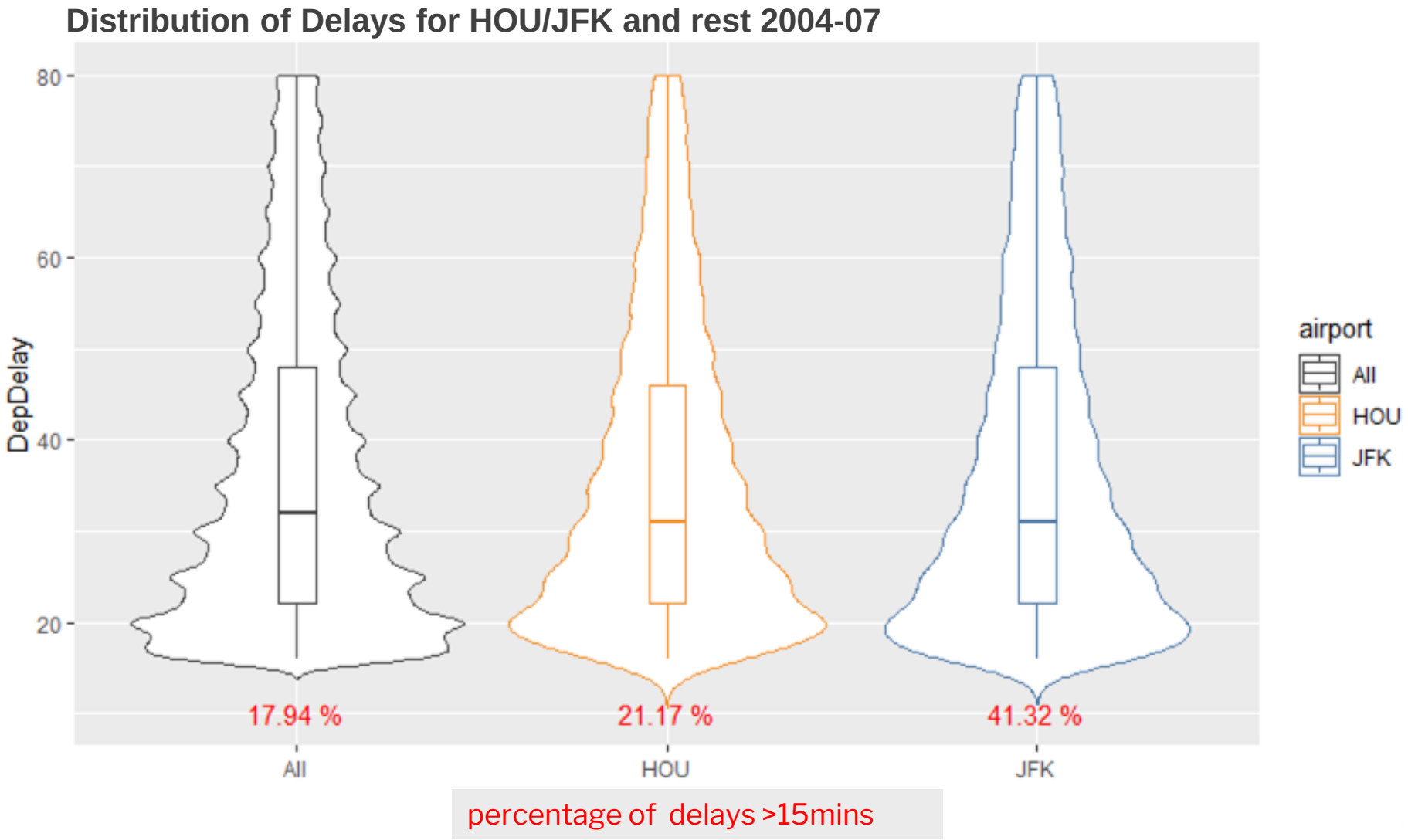
* *mean of all airports*

1.4 Distribution of Delays for All, JFK and HOU

The violin plots show the distribution of Delays greater than 15 mins for All (airports), JFK and HOU.

JFK and HOU showcase Distributions very similar to that of all airports regarding Delays

The main difference lies on the percentage of delays >15 mins where both HOU and JFK are significantly higher than all airports avg.

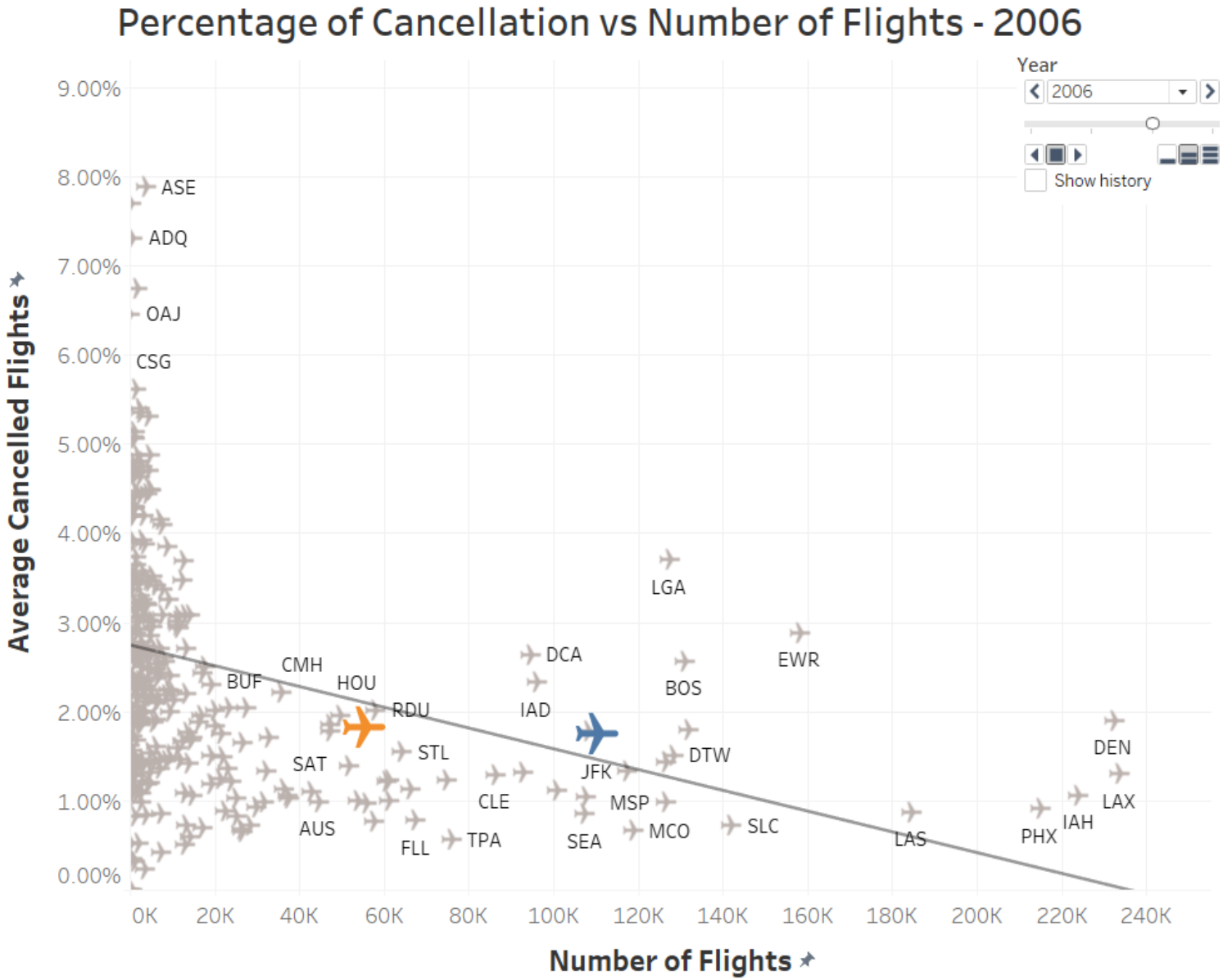


2. Analysis of Flight Cancellation

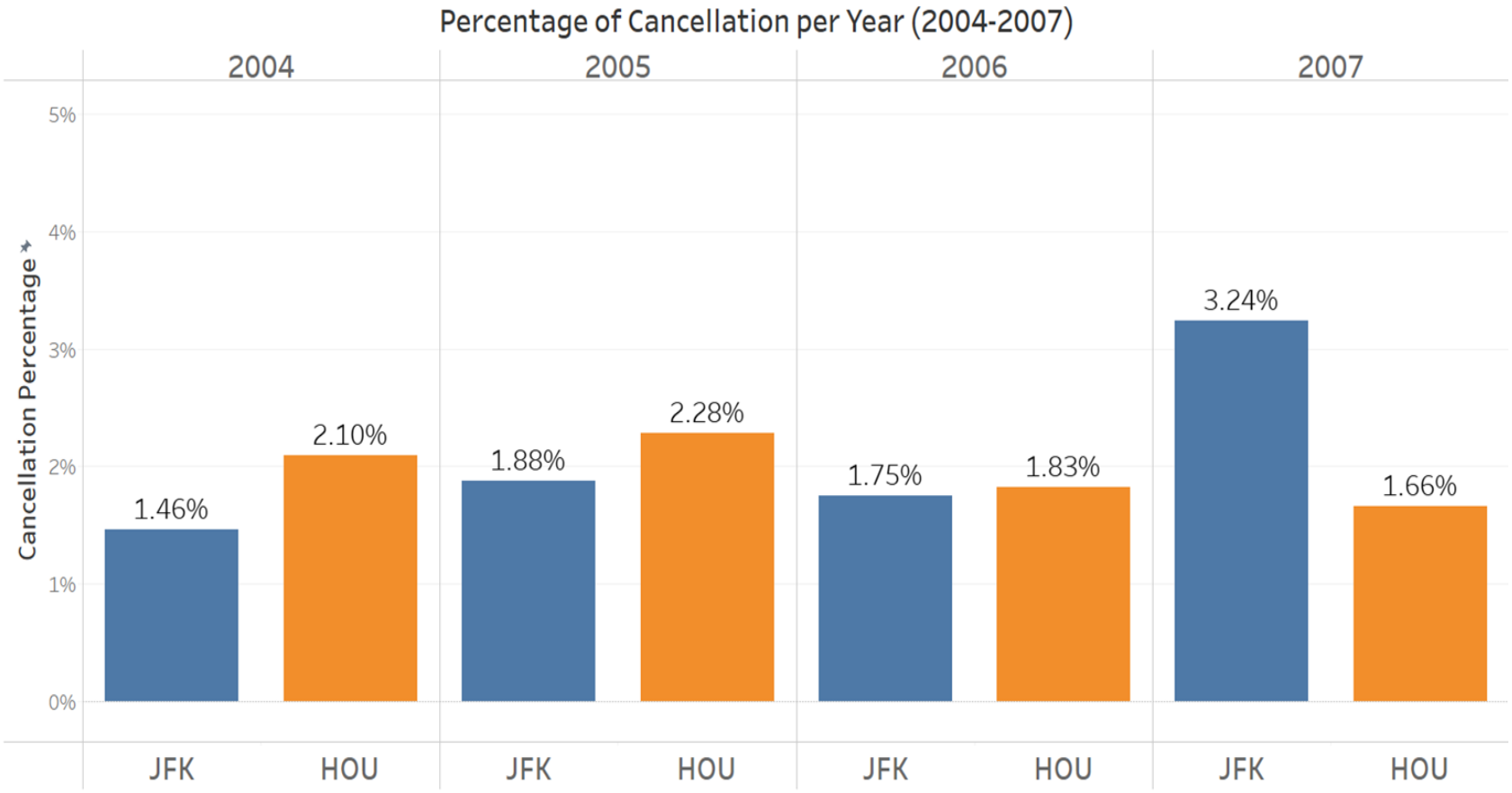
- Airport size is negatively correlated to the percentage of flight cancellation
- HOU and JFK have a cancellation percentage around 2-3% and are close to the trend line
- HOU maintains the cancellation rate
- As JFK increases each year its size, it has an increasing trend in cancellation rate
- There are only a few big airports with very large number of flights.

**** This is a snapshot of the interactive plot in Tableau***

2.1 Cancellations vs flights per year

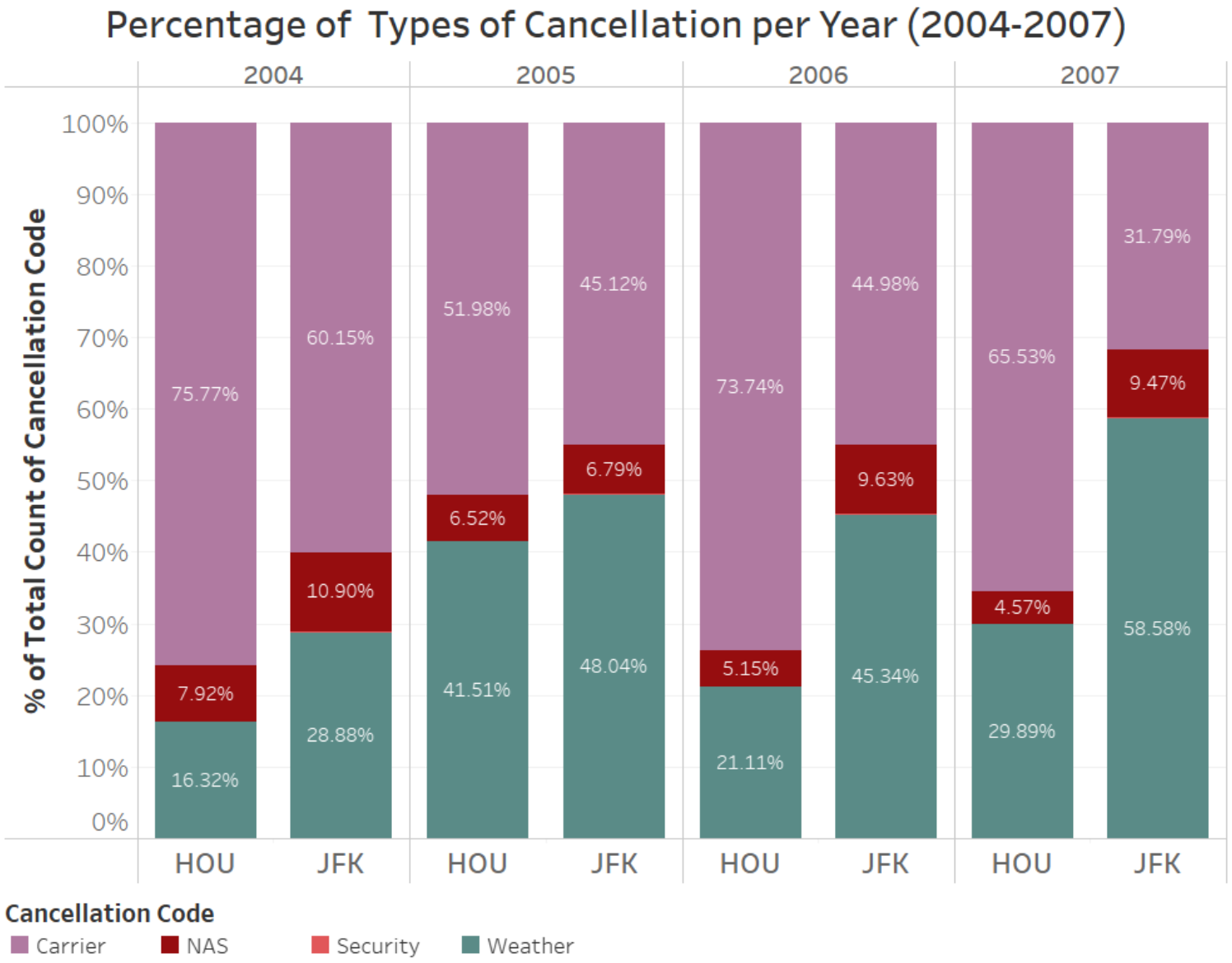


2.2 Cancellations per year



- HOU has higher percentage of cancellation than JFK each year, except 2007.
- JFK has a relatively low percentage of cancellation, although there is a big increase in 2007, where it almost doubled

2.3 Types of Cancellations per year



- Based on the previous graph, the percentages of each **cancellation type** is depicted.
- **Carrier** is the main reason of **cancellation** in both airports
- HOU has higher **carrier cancelation** than JFK in all years
- **Weather** cancellation is the second most significant reason, where JFK has higher percentages each year
- **NAS** cancelations are **higher** in JFK
- **Security cancellation** is insignificant in both airports.

3. Analysis of Flight Delays

- Airport size is slightly positively correlated to the average delay

HOU
- maintains the average delay
- is below 15 all years

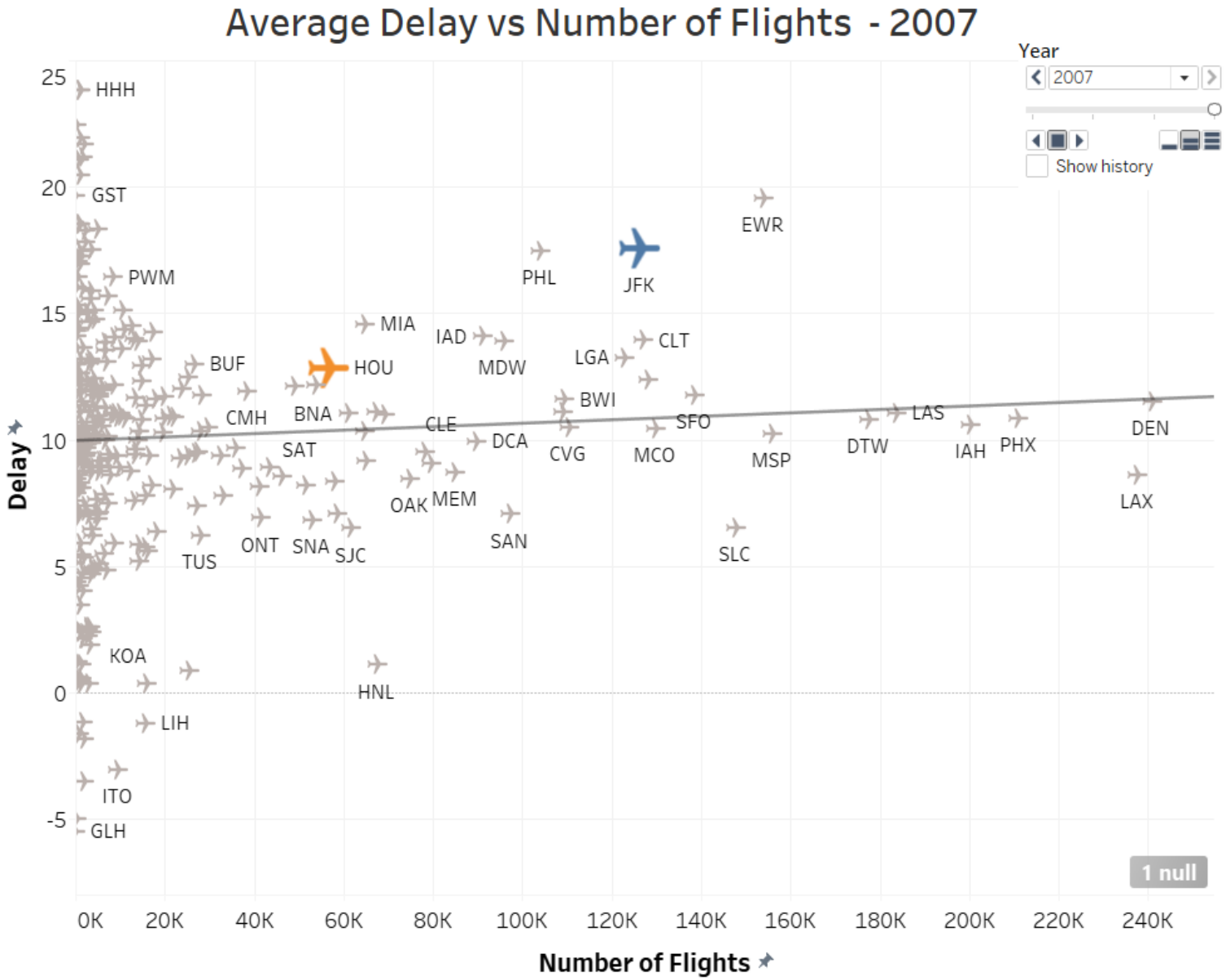
JFK
- increases each year its size, it has an increasing trend in average delay, reaching its peak in 2007

- Both HOU and JFK are above trend line

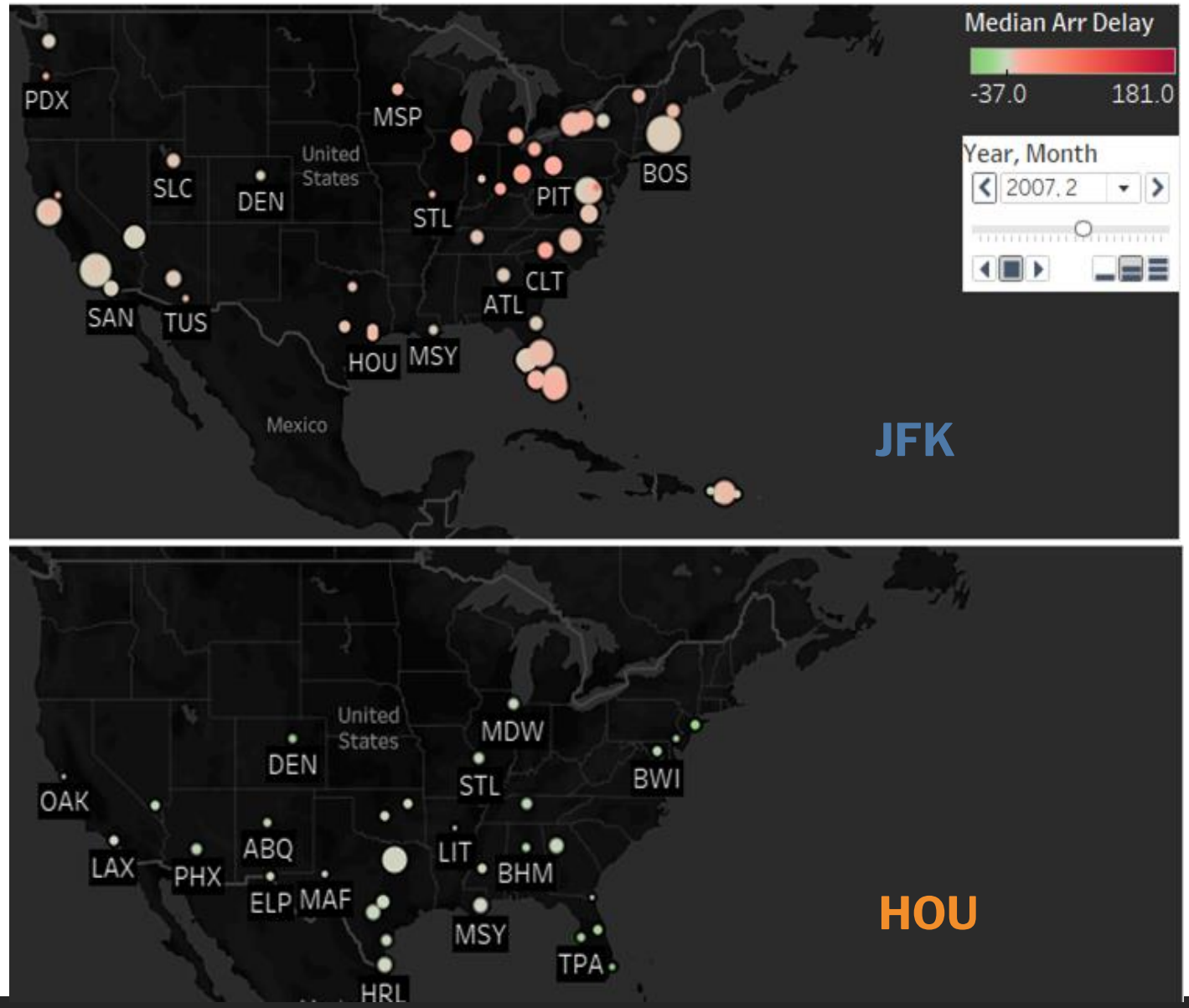
- JFK starts below HOU in average delay and in 2007 it has above 15 minutes in delay on average

**** This is a snapshot of the interactive plot in Tableau***

3.1 Average delay vs flights per year



3.2 Map Delays from JFK or HOU *(snap)*



Geographically depicting the delays in destinations from both airports for each month in 2004-07

- Bubble size: number of flights
- Color: Median Arrival Delay

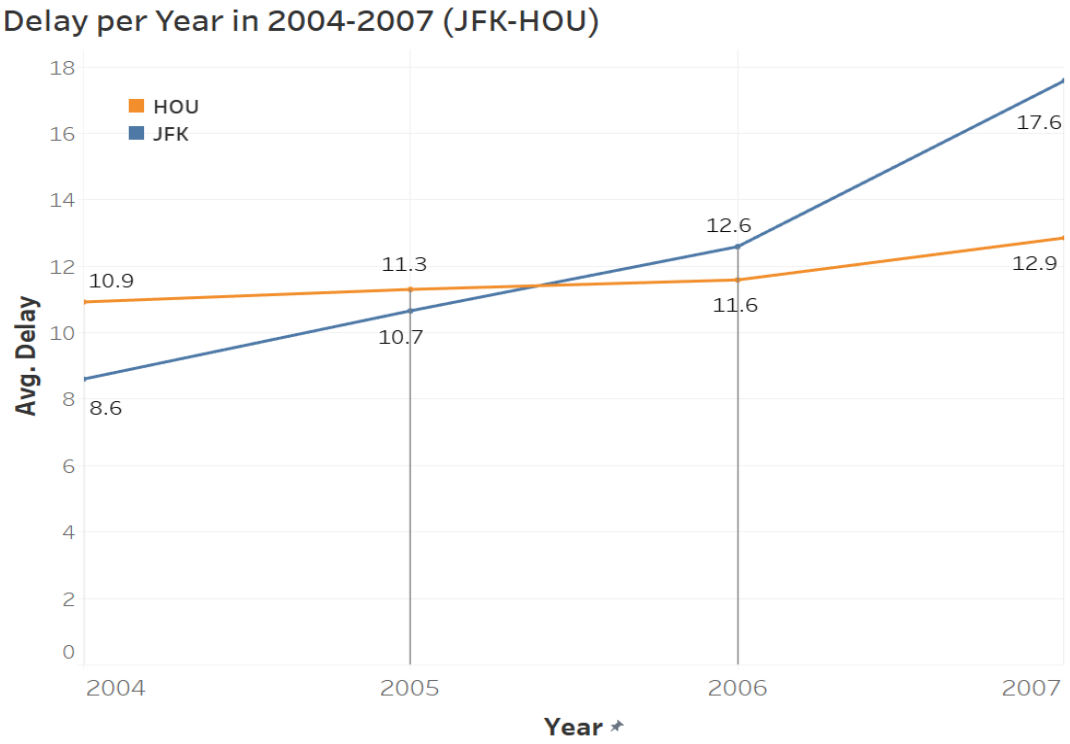
JFK

- Showcases **higher delays** as well as **more flights**.
- Higher delays as the years pass
- Higher delays on closer airports

HOU

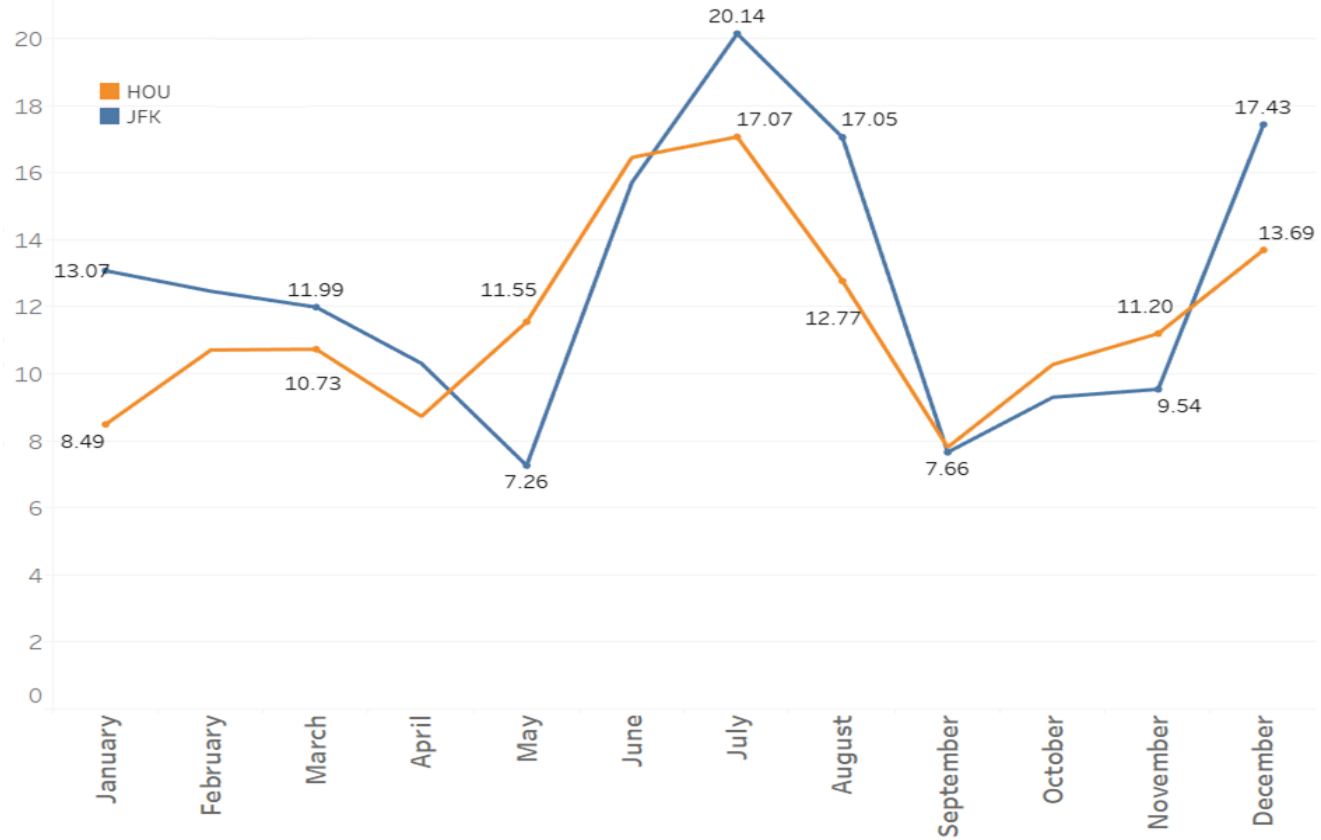
- Less destinations
- Less flights
- Showcases less delays
- The median is generally below zero, meaning that the it arrives earlier in destinations

3.3 Average Delays per year



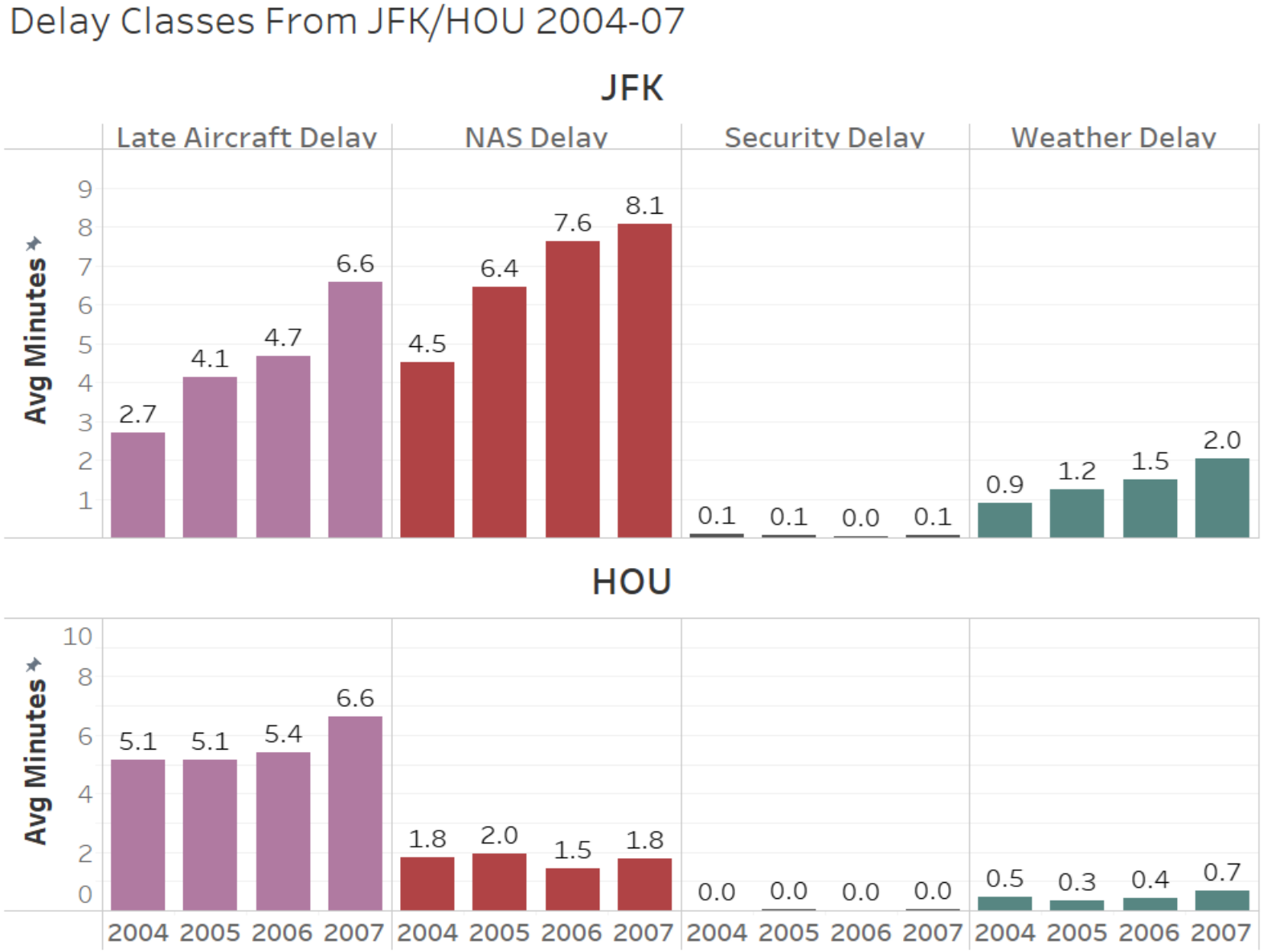
- HOU has an almost steady delay average through years
- JFK has an increasing trend in average. It starts below HOU, but in 2007 it goes over the threshold of 15 minutes

3.4 Average Delays per month (in minutes)



- Seasonality is observed as Christmas and Summer months depict on average higher delays
- JFK has higher delays on average in 8 from 12 months.
- The trend in monthly delays between JFK and HOU is similar.

3.5 Types of delays per year



Greater delays are due to Late Aircraft and NAS. (Security delay is not significant)

JFK

- Suffers from delays from Late Aircraft, NAS and Weather, with all three showcasing upward trend.

HOU

- Greatest delays are due to Late Aircraft.

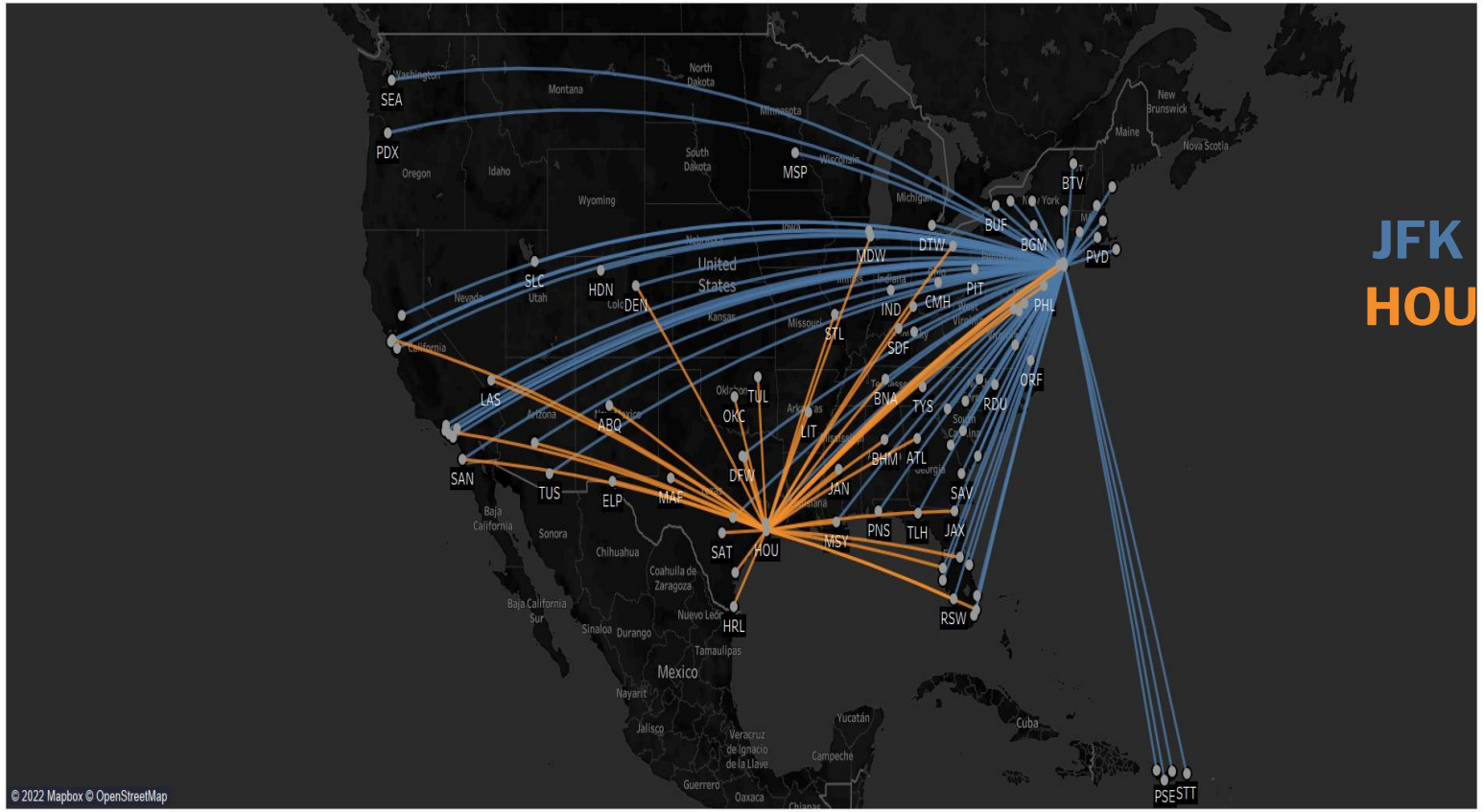
In contrast to other delay types, Late Aircraft delay is similar in both airports.

4. Performance of the two airports

- JFK has a higher number of destinations, which increases through time. Also, the flights cover higher distance.
- On the other hand, HOU has almost the same number of destinations and covers very few long-distance airports.
- In general, JFK covers the same destinations as HOU, but it has some extra ones

4.1 Destinations of JFK/HOU and basic statistics

Map of destinations from JFK and HOU and summary statistics per year



Number of destinations

Year	HOU	JFK
2004	32	60
2005	34	64
2006	33	72
2007	32	70

Total flights

Year	HOU	JFK
2004	59.066	91.501
2005	56.557	101.953
2007	56.540	126.366
2006	55.260	110.367

Median Delay (>15 ′ only)

Year	HOU	JFK
2004	31,00	31,00
2005	32,00	34,00
2006	33,00	38,00
2007	35,00	42,00

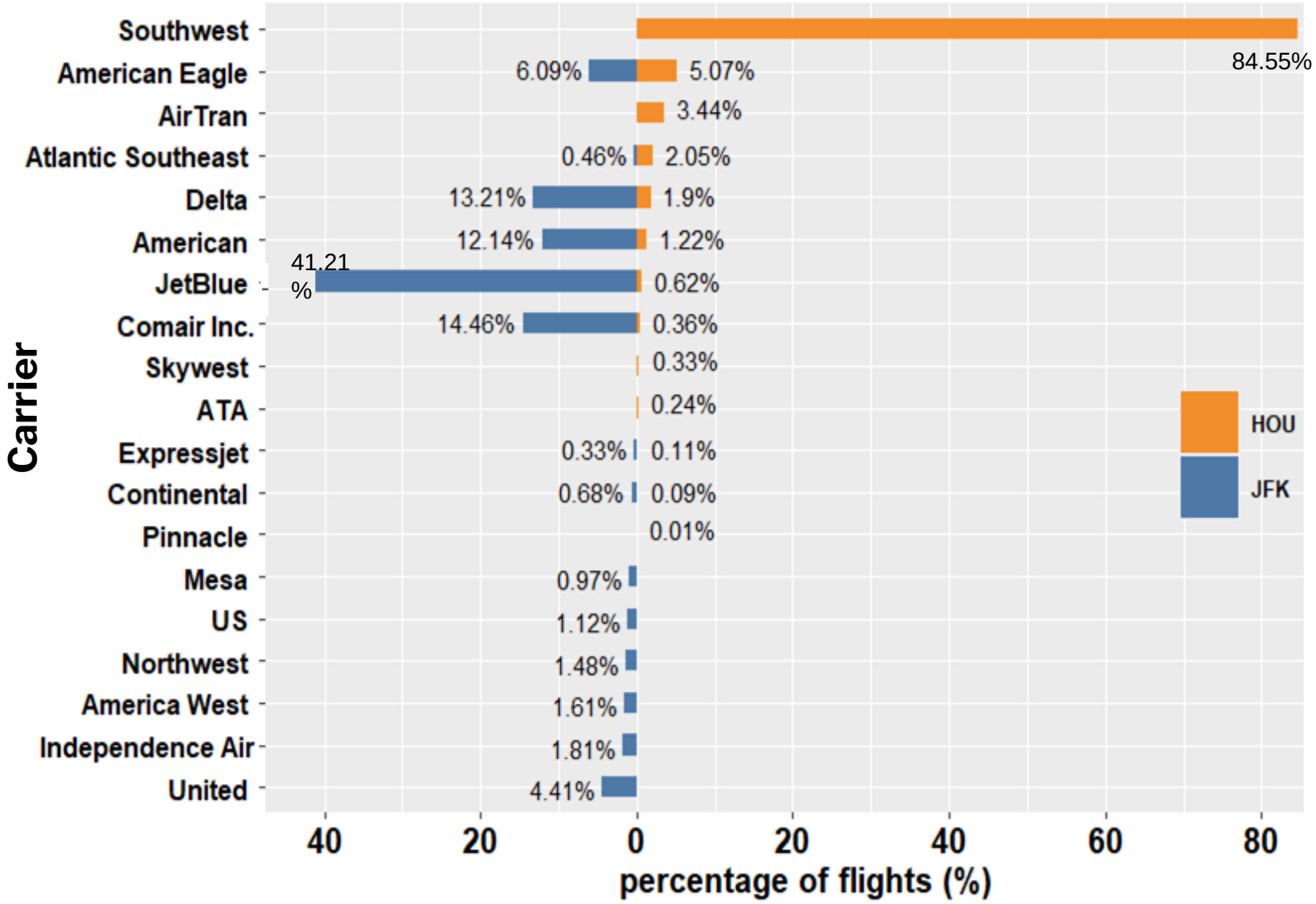
Cancelled flights

Year	HOU	JFK
2004	2,10%	1,46%
2005	2,28%	1,88%
2006	1,83%	1,75%
2007	1,66%	3,24%

Diverted flights

Year	HOU	JFK
2004	0,19%	0,24%
2005	0,29%	0,24%
2006	0,14%	0,42%
2007	0,20%	0,18%

4.2 Flights share per Carrier



- Southwest prevails in HOU with 84.55%
- JetBlue is the leader in JFK with 41.21%

The major operators in the two airports differ, apart from American Eagle whose share is mostly balanced

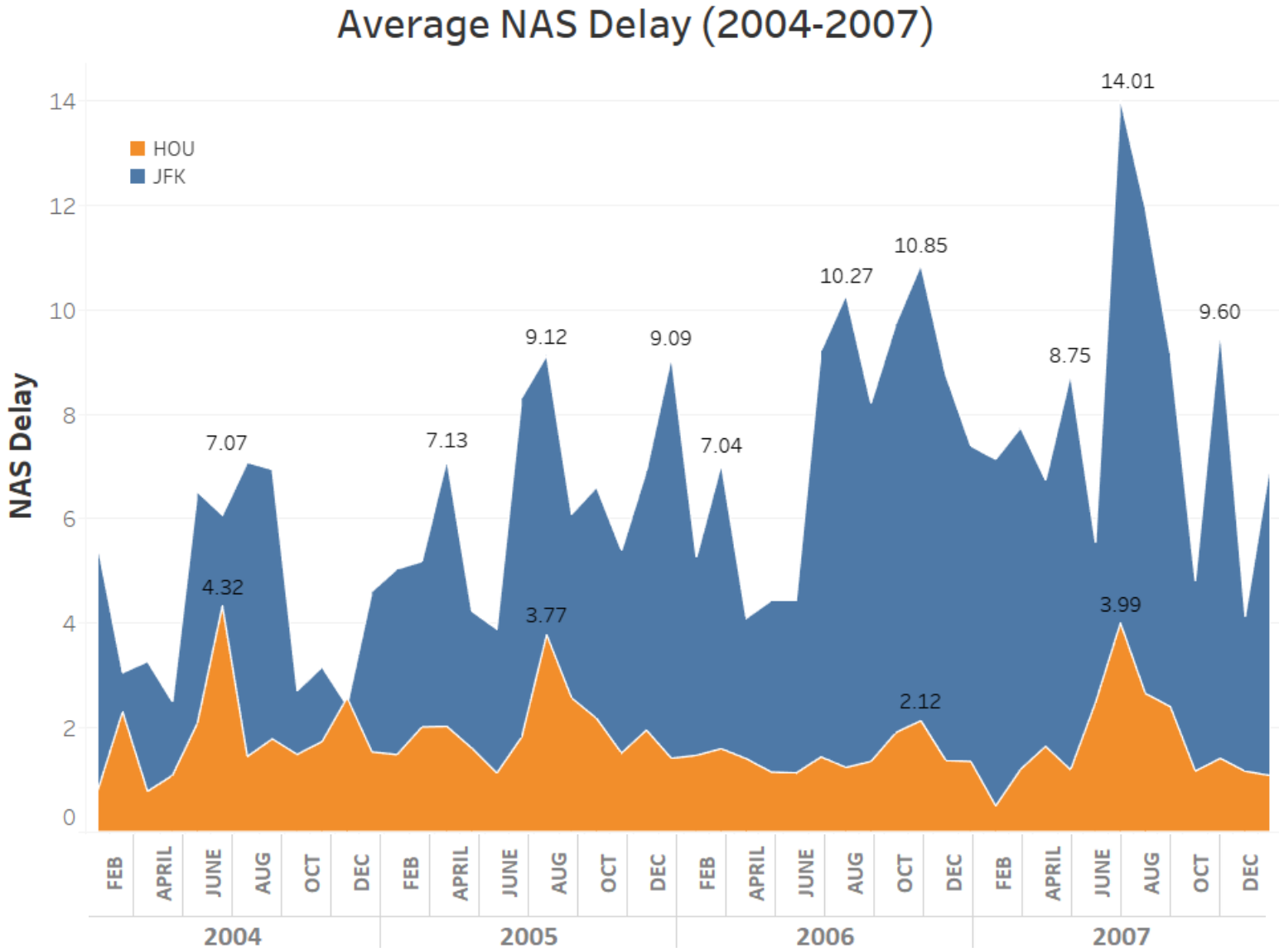
For carriers, the contribution among the two airports is imbalanced. In particular except for American Eagle the rest of the carriers have a share either in HOU or JFK but never in both.

4.3 Average NAS Delays

NAS Delay is the **main difference** regarding delays among the two airports

In contrast to Late Aircraft and Weather delay, NAS is primarily **affected** by the **actions/decisions of the respective Airport**.

- NAS showcases strong seasonality, depicted in July. This stands for all 4 years regarding JFK and HOU (except 2005).
- July 2007 saw the highest NAS delays in JFK clearly as a result of the known events (see link)



5. Conclusions and Suggestions

Conclusions

- JFK managed to increase its size from 2004 to 2007, as both the number of flights and the destinations it covers increased. However, as the size increases, so does the delay time.
- JFK was affected by weather conditions in 2007, as the cancellations were almost doubled, mainly due to weather conditions.
- HOU has almost the same number of flights and destinations through time, with Southwest Airlines covering a very large proportion of its total flights.
- In both airports, the main reasons of cancellations are carrier and weather. Also, the main reason of delays is the late arrival of the aircraft.

Suggestions

- Both airports should cooperate with the carriers to reduce the cancellations related with the carriers.
- JFK should take actions to reduce the delay time, and especially NAS delay, which is related with the operations of the airport.
- HOU should take actions to attract more carriers and not to rely almost entirely to one carrier, as an attempt to increase the number of flights and the destinations it covers, to provide with more options its customers

References

Data Expo 2009 - Airline on-time performance , https://community.amstat.org/jointscsg-section/dataexpo/dataexpo2009

https://www.reuters.com/article/us-airlines-delays-idUSN0444135020070904

Thank you for your attention

I. Appendix

Contribution Matrix

Name	Data	Tableau	R	Report
Rafail Gatos	***	**	**	**
Anastasios Fasoulis	**	**	***	**
Agis G. Koumentakos	**	**	**	***
Sotirios Legkas	**	***	**	**