**CONGESTION IN THE SKY ➤ Visualizing Domestic Airline Traffic with SAS® Software**

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**THE DATA**

Twenty years of data (720+ million observations) on commercial domestic flights in the US and Europe.

**Initializations**
- Dates: day, week, month, year
- Airports and departure times: actual and scheduled
- Flight times: actual and scheduled
- Flights: domestic and intercontinental
- Cities: America, Asia, Europe... United, US Air

**GOALS**

- **Summarize data by time periods, airport, and carrier**
  - Temporal effects
    - Are some time periods more prone to delays than others?
    - Relationships between delays and seasonal factors: winter, summer, holidays
    - Relationships between delays and weather factors: blizzards and severe weather
    - Relationships between delays and daily factors: time of day, day of week
  - Spatial effects
    - Are some airports more prone to delays than others?
    - Are there differences between flying into an airport and flying out?
  - Carrier effects
    - Are some carriers more prone to delays than others?

**LESSONS LEARNED:**

**TIPS FOR TRAVELERS**
- Avoid flying during holidays and summer
- Fly in April, May, and September
- Watch the weather!
- Avoid airports (Chicago-O’Hare, JFK, Newark) with consistent delays
- Use carriers (Southwest, Delta, Airline...) with superior on-time performance
- Fly early in the day
- Avoid flights that depart between 4 and 7 p.m.

**OVERVIEW**

**SPATIAL EFFECTS**

**TEMPORAL EFFECTS**

**CARRIER EFFECTS**

**SUMMERS ARE BAD TIMES TO FLY**

**HOLIDAYS ARE BAD TIMES TO FLY**

**WINTER ENDS IN APRIL**

**SEPTEMBER AND OCTOBER ARE GREAT TIMES TO FLY!**

**WINTER LEADS TO CANCELLATIONS**

**AVOID CANCELLATIONS – FLY IN SEPTEMBER/OCTOBER OR APRIL/MAY**

**IN GENERAL, EXPECT DELAYS**

**9/11 CHANGED EVERYTHING**

**1995: DOT BEGINS TRACKING DELAYS AND INSTITUTES UNIFORM REPORTING**

**Temporal Effects**

**Weekly Cycles**
- Few flights: Sundays and Saturdays
- Most flights: Mondays, Thursdays, and Fridays
- Fewer flights on holidays

**Historical Comparisons**

**Multiple Comparison of Means shows significant differences between certain years**

**Delay Profiles**
- For each carrier, fit a smoother to the plot of arrival delay vs. scheduled departure
- Similar profiles for most airports

**Typical Delay**
- Early morning: few delays
- Late morning: increasing delays
- 5–7 pm: peak delays
- Late night: decreasing delays

**Less than 15 min for both inbound (arriving) and outbound (departing) flights**
- The percentage of flights delayed at least 15 minutes for both inbound and outbound flights
- The median delay for those flights

**Good and Bad Airports**
- Consistent delays at Newark, JFK, Chicago
- Salt Lake City, Dallas Love, and Memphis are consistently good

**Longer Delays in Summer**

**Longer Delays During Holidays**

**The “Valentine Day Blizzard” of 2007 is clearly visible in the delays of carriers that fly mid-Atlantic and Northeast routes.**

**Southwest (WN) and some regional carriers are also mostly on-time**

**Longer Delays in the Fall**

**Alaska (AQ) and Hawaiian (HA) show superior on-time performance**