Airfare Markets Under Pressure

Students in Data Science and Statistics

Introduction

Domestic air travel plays a vital role in economic connectivity, enabling business activity, tourism, and personal travel across the United States. For consumers, airfare is one of the most visible and variable costs of travel, shaped by factors such as distance, demand, airline competition, and market concentration. Persistent fare differences across routes and cities raise important questions about consumer welfare, pricing power, and market structure.

The U.S. Department of Transportation's Domestic Airline Consumer Airfare Report provides detailed, market-level data on fares, passenger volumes, and competitive dynamics across domestic routes. Unlike anecdotal travel advice (e.g., "book on Tuesdays"), this data captures systematic, structural drivers of airfare differences, offering an opportunity to rigorously analyze how route characteristics and city-level market power relate to observed prices.

Challenge

To better understand the factors driving ticket affordability across domestic U.S. air travel, use evidence-based insights that focus on market fundamentals such as competition, hub dominance, route demand, and distance.

Using the provided dataset—constructed from U.S. Department of Transportation airfare reports from 2021 to 2025 (Q2)—analyze when, where, and why airfares differ across markets, and how city-level characteristics influence route-level prices. The ultimate goal is to translate these findings into actionable insights that can inform travelers, industry stakeholders, and policymakers.

Participants are encouraged to explore the dataset creatively. Possible analytical directions include, but are not limited to:

1. Market structure and pricing: How do fares differ between routes that touch highly dominant hub cities versus more competitive markets? Do routes with greater low-cost carrier (LCC) penetration exhibit systematically lower fares?
2. Temporal and spatial patterns: How do average fares evolve across quarters and years? Are fare changes uniform across markets, or concentrated in specific city-pairs or hubs?
3. Competition and affordability: How do dominant-carrier market share and lowest-fare carrier presence relate to average market fares? Are students and budget-constrained travelers more exposed to higher fares in certain city markets?
4. Modeling and prediction: Can route-level fares be predicted using distance, demand, competition, and endpoint hub characteristics? Which features contribute most to explaining fare variation across markets?

Usage

The results of this project have implications for a wide range of stakeholders. Consumers benefit from clearer, evidence-based guidance on which routes and city markets tend to be more or less affordable, enabling more informed travel decisions. Travel platforms and agencies can leverage these insights to enhance pricing transparency tools, route comparisons, and affordability indicators that improve user trust and decision-making. Airlines may use the findings to evaluate their competitive positioning across markets and better understand how hub dominance and low-cost carrier presence influence pricing strategies. Finally, policymakers and consumer advocacy groups gain a data-driven perspective on airfare equity and competition, supporting more informed discussions around accessibility, consumer protection, and the fairness of domestic air travel markets.

Deliverables

- **Code Submission:** All scripts or notebooks. Must be well-organized, executable, and reproducible. Include a README.md file and a fully executed Jupyter Notebook (.ipynb) or RMarkdown file (.rmd)
- **Presentation Slides** (**maximum 15 slides**)**:** Focus on problem framing, data insights, model approach, key results, and impact.
- **Video Presentation** (**maximum 6 minutes**)**:** A narrated walkthrough of presentation slides and/or an optional demo or dashboard. Judges will view this first. Should simulate

a live presentation and. All team members are encouraged (but not required) to participate. Must include:

- Problem overview
- Data approach
- Model explanation
- Key results
- Final insights

Submissions may include other materials that support reproducibility.

Award Categories

- **Best Overall Project**
- **Best Visualizations:** Awarded to the team that produces the most insightful and visually compelling representations of airfare dynamics, making complex relationships, like hub dominance or competition effects, easy to understand.
- **Best Insights:** Recognizes teams that uncover the most actionable and meaningful insights, especially those that challenge common myths or highlight structural affordability barriers for students and families. Strong entries will move beyond surface trends to explain why prices behave the way they do, whether due to airline strategy, route competition, demand surges, or booking behavior. Findings that challenge common myths or illuminate affordability barriers for students and families are especially encouraged. The emphasis is on the clarity, originality, and real-world usefulness of the insights, not just their statistical significance.
- **Best Model:** This prize goes to the team that develops the most accurate, reliable, and innovative model for understanding or predicting airfare dynamics. Examples include models that forecast ticket prices, identify the optimal booking window, or simulate airline pricing strategies under different market conditions. Evaluation will focus on technical rigor, creativity in feature engineering, and interpretability of results. Bonus recognition will go to teams that translate their models into user-friendly tools or recommendations that could help travelers make smarter, data-driven booking decisions.