

# The U.S. Domestic Airline Sector

## What We Know, What We Think We Know

Steve Lawford

(joint work with a lot of collaborators!)

ENAC

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# Manipulation of Massive Datasets

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## **PYTHON FOR UNIFIED RESEARCH IN ECONOMETRICS AND STATISTICS**

**Roseline Bilina<sup>1</sup> and Steve Lawford<sup>2</sup>**

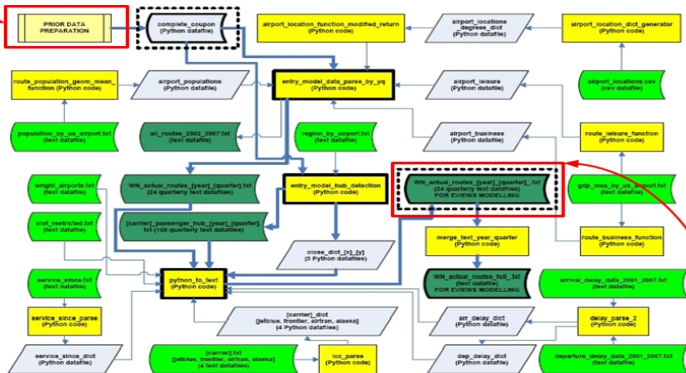
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(Understanding Python as a Tool for Empirical Work)

# Data Treatment is Rarely Straightforward

Start



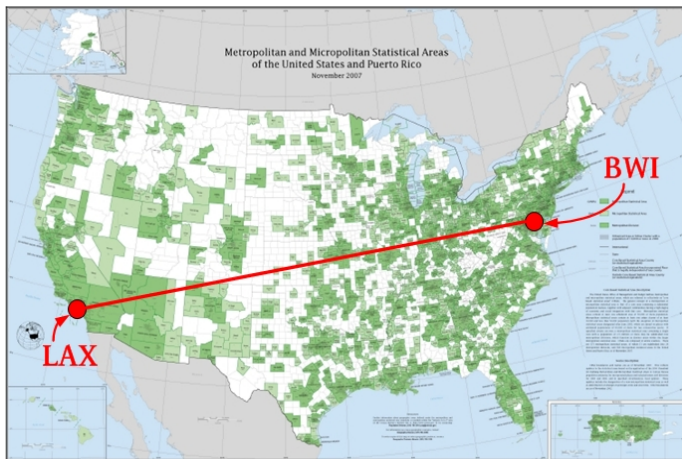
End

Python Data Management Flowchart (One Project!)

## Seven Things We Know

- Neighbouring routes are likely to be similar
- Carriers only cut fares when they face competition
- Network structures continually change with entry and exit
- Statistical forecasting models are not very useful
- Passengers are compensated for big flight delays
- There is little heterogeneity in the aggregate
- Airline accidents affect financial markets

# Variable Construction – A Geographical Example



Linking Tickets and GDP by MSAs  
(Metropolitan Statistical Areas)

# Discrete Choice Models of "Entry"



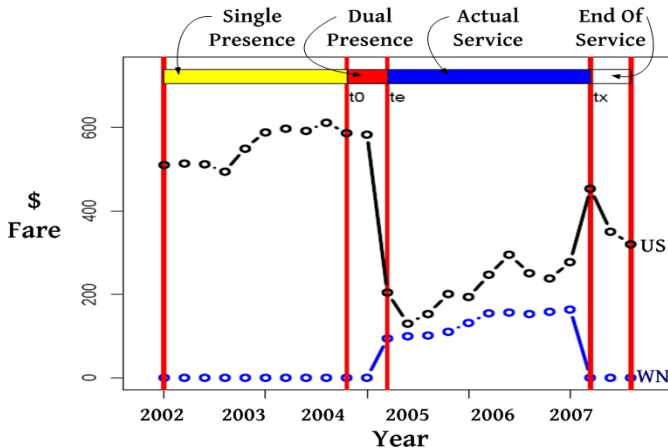
Estimated Model Probabilities of Southwest Route Presence



## ~~Seven~~ Six Things We Know

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# Preemptive Strategic Behaviour

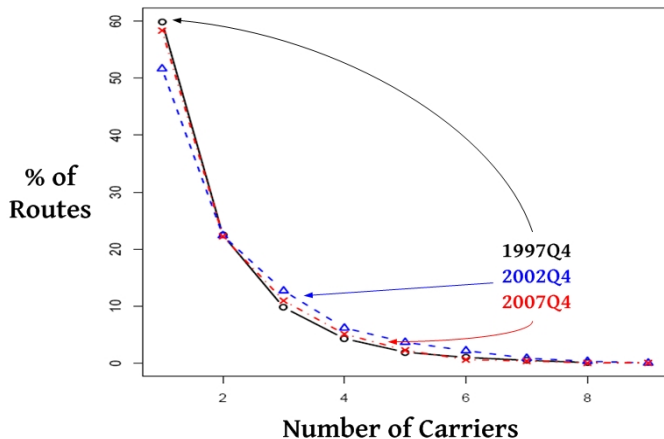


US Airways Price Reaction to Southwest Airlines (WN) Entry on the Bradley International (BDL) – Philadelphia International (PHL) Route

## ~~Seven~~ Five Things We Know

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# Modelling Market Concentration



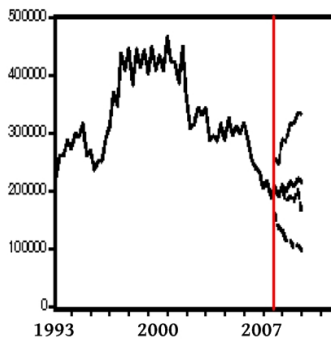
Global Invariance of U.S. Domestic Network Structure over 1997–2007

## ~~Seven~~ Four Things We Know

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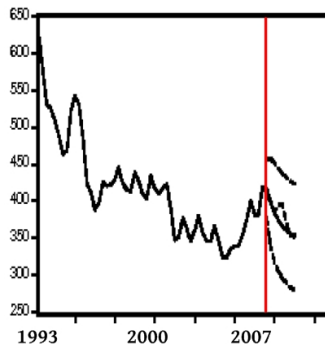
# Estimation is NOT Inference

## Number of Passengers



Year

## Average \$ Fare



Year

In-Sample Dynamic Forecasts, Delta Air Lines, 2007Q2–2009Q1

## ~~Seven~~ Three Things We Know

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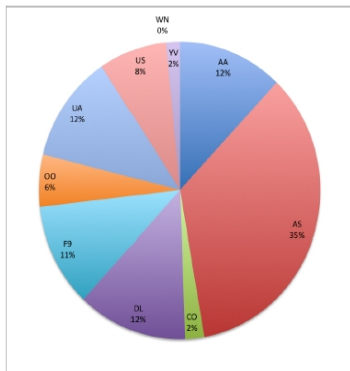
# Relationship of Fares to Delays



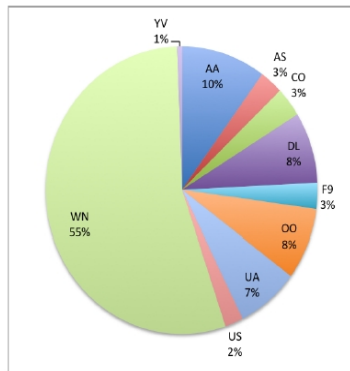
Aerial View of John Wayne Airport (SNA), Orange County, California



# The Causes of Delays



(a) Proportion of carriers below the 10% quantile of departure delays in January 2011.



(b) Proportion of carriers above the 90% quantile of departure delays in January 2011.

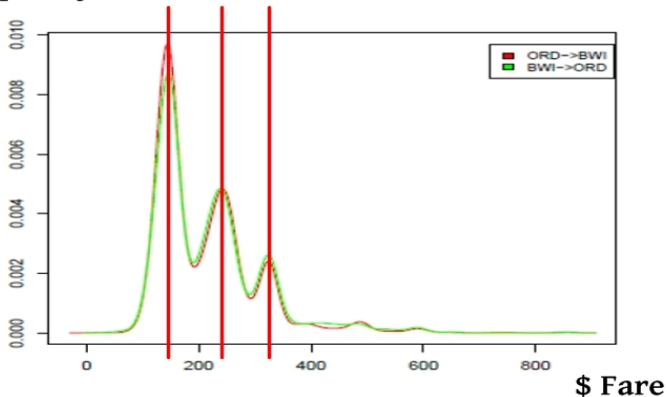
## Good and Bad On-Time Performance, by Carrier

## ~~Seven~~ Two Things We Know

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# Considerable Fare Variation, but NOT Directional

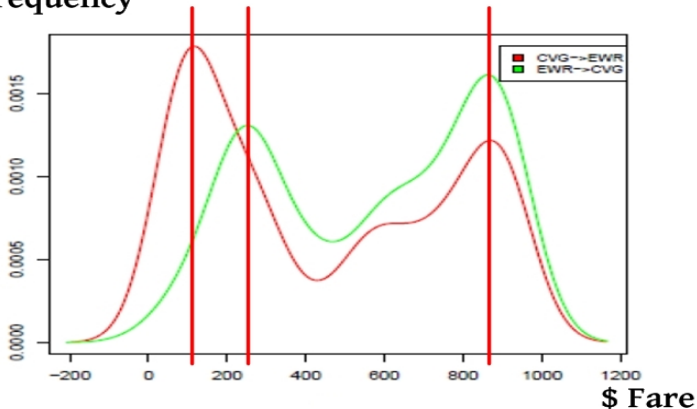
## Frequency



Estimated Fare Densities by Direction, Chicago O'Hare International (ORD) – Baltimore/Washington International (BWI) Route

# Considerable Fare Variation, AND Directional!

## Frequency



Estimated Fare Densities by Direction, Cincinnati/Northern Kentucky International (CVG) – Newark Liberty International (EWR) Route

## ~~Seven~~ One Thing We Know

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# Are Markets Moved by Good (or Bad) News?



US Airways Flight 1549, Hudson River (NY), 15 January 2009

## Airline Accidents Affect Individual Stocks

*“The dramatic survival of all 155 passengers and crew on a downed US Airways jetliner helped give the airline’s stock a bump Friday. US Airways Group Inc. shares rose 13% to \$8.53 Friday in New York Stock Exchange trading [...] outpacing gains in other carriers’ stocks. Accidents with fatalities can dent airline’s reputations in the short term. But an outcome like the one with Flight 1549, which is being praised as an example of superior airmanship and crew training, appears to have prompted a rally. Flight emergencies get lots of attention but usually have only fleeting effects on airlines’ businesses. Paradoxically, airlines often see an increase in passenger traffic after accidents because they’re in the news so much [...]” (Wall Street Journal, 16 January 2009)*

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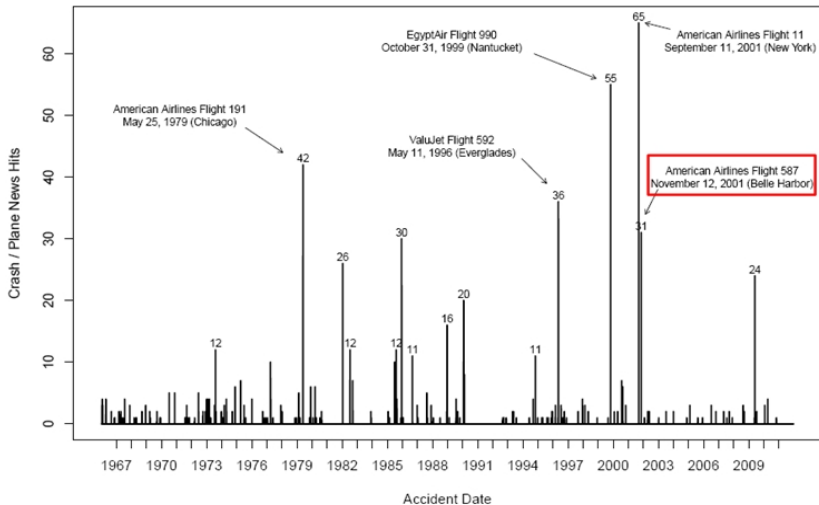
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2. [CANADIANS INVESTIGATING A REPORT AIR-INDIA PILOT CARRIED A PACKAGE](#)

NYT Search Results, "AIR INDIA CRASH CORK IRELAND", 1981–2012



# Quantitative Measure of Media Coverage



# What Do We Know?

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