Welfare Implications of Recent Horizontal Mergers in the U.S. Airline Industry

Carlos A. Manzanares
Department of Economics
(Vanderbilt and UW)
UW eScience Institute
Fall 2014 Incubator Program

Introduction

- Since 2005, most intense merger activity in U.S. airline history
  - US Airways & America West, Delta & Northwest, United & Continental, Southwest & AirTran, American & US Airways
  - Four major carriers remain (American, United, Delta, Southwest)
- Research question: what would U.S. fares and route structures look like if these mergers had been prevented?
  - Market concentration can raise prices
  - New entry can offset these gains
- Uses newly available dynamic game estimation methods

Data & Estimation Overview

- Primary data source: DB1B data, U.S. Department of Transportation
  - Contains 10% quarterly sample of all U.S. airline tickets and fares, 2003 to current
  - ~11 million tickets per quarter; 44 quarters, 2003q1 to 2013q4
- Estimation goal: estimate demand and marginal costs by route (done), entry costs by route (eScience project)
- Value Function Simulation / Estimation Approach
  1. Augment Data (STATA) - Raw DB1B data → Augmented
  2. Value Function Simulation / Estimation Step (R)
  3. Counterfactual Simulation Step (R)

Data Augmentation

- Raw (6 cols, ~11 M rows/q)

Fare	Origin	Dest	Stop	Carrier	Quarter
180.83	SEA	DFW	SNA	AA	2003q3

- Augmented (STATA; 167 cols, ~88M rows per q)

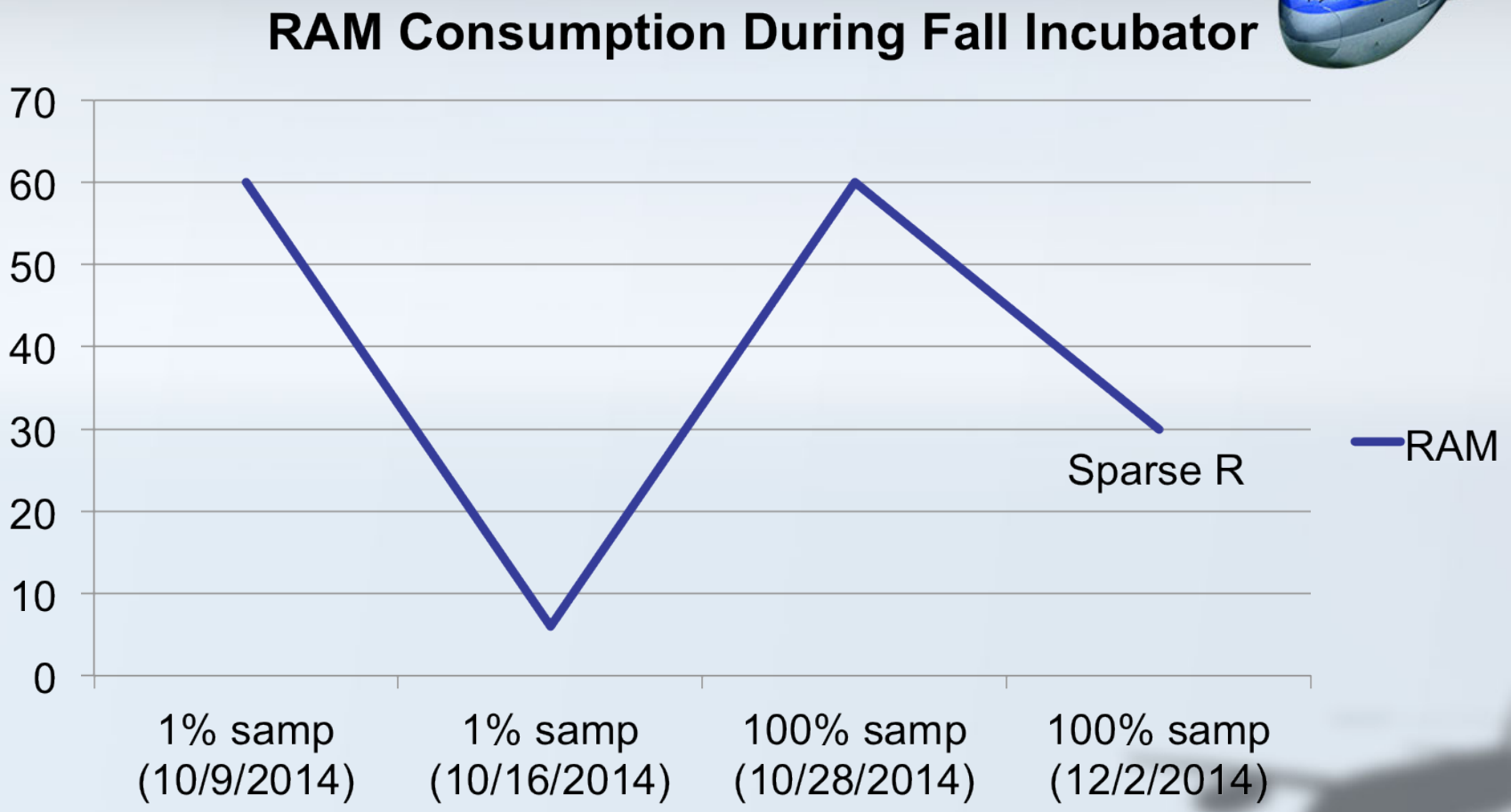
Farebin	Origin	Dest	Stop	Carrier	Dist_L1	…	NS_C
$150 to $200	SEA	DFW	SNA	AA	1173		4

- Currently: Laptop, moving to R, Amazon Cloud

Value Function Estimation

- One run:
  - Augmented Data (20 quarters) → VFE in R → Output 160 csv's, ~ 11 M rows
- Goal: 1000 runs
  - "Merge" step: simple average by row
  - Return one csv, ~11 M rows for estimation in R (laptop)
- Primary limitation: RAM consumption

RAM Consumption



Goals & Results Summary

- Goal: implement VFE on Amazon cloud on 1% sample
  - Result: implement VFE estimation for 2 of 20 quarters on Amazon cloud for 100% sample
  - Incubator help: implement on Amazon EC2, sparse package R advice, python code for parallel runs on cloud, python code for calculating averages over all csv's.
- Extra: began converting all STATA data augmentation code to R, to implement on cloud.
- To do: complete VFE estimation on all quarters, repeat for Counterfactual step to get first results (expected: December)

Thank You!

- UW eScience Institute
  - Formal and informal conversations
- Special thanks: Andrew Whitaker