

# Econ 3385: Measuring Market Power

## Problem Set 5

In this problem set, we'll analyze `arlines_long_2.csv`. This is an extended version of `airline_long.csv`. There are 8 airlines (including "Other"). Variables are similar to Problem Set 5.

You can use the code from the lecture 6 folder for hints.

### Questions

1. Generate a table describing the distribution of the number of firms per market. Which pairs of airlines have the most overlapping markets?
2. Let's estimate a logit demand system where the utility to consumer  $i$  from flying with  $j$  in route-quarter  $(c, j)$  is:

$$u_{ijct} = \beta_j + \alpha p_{jct} + \xi_{jct} + \epsilon_{ijct}$$
$$u_{i0ct} = 0 + \epsilon_{i0ct}$$

- Where  $j$  is an airline,  $c$  is a route, and  $t$  is a quarter.
- Consumers choose the highest utility alternative, including the outside option  $j = 0$ .
- Assume  $\epsilon_{ijct}$  is iid standard Gumbel. Write down the demand equation implied by this utility specification.

3. Using  $avg\_hub_{jct}$  as an instrument, estimate the coefficients of the utility function (i.e. estimate demand).
  - Assume market size is given by the variable  $mkt\_size_{ct}$ .
  - First generate market shares for each  $(j, c, t)$ .
  - Next, generate the share for the outside good.
  - Run a "Berry-style" 2SLS regression to estimate  $\beta_j$  and  $\alpha$ .
4. Generate a histogram of the own price elasticities.
5. Generate a histogram of the AA-DL cross price elasticities (2 for each market where AA and DL are present)
  - What do you notice about the cross-price elasticities?
6. Compute implied marginal costs from the firm's FOC.
7. Simulate a merger of AA and DL.
  - First write down the merged firm's FOCs.
  - Report average price changes for the merged firms. What do you notice?
  - To do the simulation, you'll need to generate variables for the "other" firm's price, mc, and market share. Why? Because AA's price, mc and market share go into DL's FOC. Here is a hint:

```
data_cf$merge <- as.integer(data_cf$airline_id == 1 | data_cf$airline_id == 3)

data_cf$merge_mc = data_cf$mc*data_cf$merge
data_cf <- data_cf %>%
  group_by(quarter, route_id) %>%
  mutate(mc_other = sum(merge_mc) - mc) %>%
```

```
ungroup()
data_cf$mc_other <- data_cf$mc_other*data_cf$merge

data_cf$merge_price = data_cf$price*data_cf$merge
data_cf <- data_cf %>%
  group_by(quarter, route_id) %>%
  mutate(price_other = sum(merge_price) - price) %>%
  ungroup()
data_cf$price_other <- data_cf$price_other*data_cf$merge

data_cf$merge_share = data_cf$share*data_cf$merge
data_cf <- data_cf %>%
  group_by(quarter, route_id) %>%
  mutate(share_other = sum(merge_share) - share) %>%
  ungroup()
data_cf$share_other <- data_cf$share_other*data_cf$merge
```