Empirical IO: HW4

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Estimate Brenehan and Reiss (1990, 1991) model of firm entry using airline data.

Aggregate data to market level

```
dt <- unique(dt[tkcarrier %in% c("AA", "CO", "DL", "NW",  "TW", "UA", "US"),
                .(market, tkcarrier, marketdistanceticket)])
dt[, nFirms := .N, by = .(market)]

dt.market <- unique(dt[, .(nFirms, market, marketdistanceticket)])
```

Estimate profit function paramters via maximum likelihood

Define the reduced form profit function

$$\pi_{im}(N_m) = X_m\alpha + g(N_m) + \epsilon_{0m}$$

where

$$g(N_m) = \sum_{j=1}^{7} \theta_j \mathbf{1}\{N_m = j\}$$

1. The α parameter captures how the profitability of serving a market varies with the flight distance. The θ parameters measure how the entry of additional firms affect per-firm profits.

2. We make several assumptions to estimate this model:

- All firms experience an identical market-level profitability shock, $\epsilon_{im} = \epsilon_{0m}$
- All firms have the same loss in profits due to flight distance, $\alpha_i = \alpha$
- All firms have an identical effect on their rivals' profits when they enter any market, $\theta_{ijm} = \theta_j$
- More entrants reduce firm profitability, $\theta_j > \theta_k$ for $j < k$.

These symmetry assumptions allow the econometrician to model the number, rather than the identity, of entering firms.

3. Model estimates:

```
dt.optim <- data.table(Parameter = c("alpha", paste0("theta", 1:7)), Estimate = optim$par)
kable(dt.optim)
```

Parameter	Estimate
alpha	0.0000693
theta1	2.3383445
theta2	-0.0933232
theta3	-0.4862804
theta4	-0.6352768
theta5	-0.6999298
theta6	-1.0160213
theta7	-1.5746759
alpha	-1.9829207