PROBLEM SET 6

2018

This problem set asks you to replicate Berry's (1992) analysis of airline entry into city-pair markets but for a different sample.

A. Questions

1. Present tables of informative descriptive statistics on airline entry and on the variables that you use in the models.

- Berry classified a carrier as a potential entrant if it has a presence at least one of the two endpoints. Verify that when a carrier does not have a presence at either endpoint city in the prior period, entry by that carrier is a rare event.

2. Estimate the three Probit models of entry reported in Table 5 of Berry (1992).

- What are the advantages and disadvantages of this estimation technique for studying the probability of entry?
- For what types of entry decisions is this estimation technique most appropriate?
- Why isn't the number of entering firms used as an independent variable?
- Focusing on the third equation of Table 5, what is the marginal effect of distance on the probability of entry? What is the marginal effect of having a presence in both city pairs on the probability of entry?

3. Estimate an Ordered Probit model of entry for city pair markets without firm heterogeneity (first column of Table 6). Note: this model can be estimated in Stata using the command *oprobit*.

- What functional form restrictions does Berry impose on the effect of additional entrants on a carrier's probability of entry? Specifically, as the number of entrants increases, what does Berry's restriction assume about the effects of additional entrants? Test this restriction by estimating separate effects for each additional entrant.
- What are the advantages and disadvantages of this estimation technique for examining the profitability of entry?

4. Estimate the "observed heterogeneity" maximum likelihood model reported in the second column of Table 6 of Berry (1992).

- On page 899, Berry (1992) states that the "observed heterogeneity" places strong restrictions on which firms should enter and, in discussing the results of this

model on page 910, finds that that they are frequently violated by the observed data at the parameter estimates. Check to see if this is also true for your sample.

5. Estimate the full model using simulated method of moments. Focus on getting estimates and do not bother with computing standard errors.

- You can estimate the model using only information on the number of firms (i.e., minimize the difference between the observed and predicted number of entrants in the city-pair markets) since the predicted number of entrants is unique.
- However, by imposing an order of entry, you can identify, for each draw of the simulation, which firms enter and turn these predictions at the carrier, city-pair market into additional moments to help identify the parameters of the model. Unfortunately, Berry does not go into any details on how he incorporates the additional moments into his estimation procedure.

B. DATA DESCRIPTION

The sample consists of 184 city-pair markets in the second quarter of 1996 and the second quarter of 1997. As in Berry, you can use the earlier period to distinguish between new entrants and incumbents for the 1997 period. There are more variables listed than are used by Berry. You should use the Berry variables in answering the questions but feel free to try any of the other variables to see if the results are robust.

Sample Characteristics:

- *citypair*: unique identifier for city-pair market, j = 1,..,184.
- *yr_q*: year and quarter, either 19962 or 19972.
- *car*: carrier identifier, i = 1,….,31.

Carrier Characteristics:

- pax: number of carrier passengers on city-pair route for that quarter
- pot96: indicator variable = 1 if carrier is a potential entrant for that period[1]
- pot97: indicator variable = 1 if carrier is a potential entrant for that period.
- enter: indicator variable = 1 if carrier entered the city-pair market
- city2: indicator variable = 1 if carrier has a presence in both cities of the city pair market.
- enter96: indicator of whether the carrier was serving that route in 1996
- numroute: mean number of destinations served out of the origin-destination pair.
- sharepax: average share of traffic across the two airports.
- sharepaxdist: average share of traffic across the two airports, where passengers are weighted by distance traveled.

City-pair Market Characteristics:

- distance: distance between cities of the city-pair market in thousands of miles.
- dist2: distance squared.
- paxtot: total number of passengers on city pair route across all airlines
- tourist: indicator variable = 1 if at least one of the cities in the city-pair is a popular tourist destination.
- basepop: population of base city of the city-pair
- refpop: population of reference city of the city-pair
- pop: main population variable = (refpop/10,000,0000)*(basepop/10,000,000)
- totenter: total number of carriers serving that route in the period.
- cityN2: total number of carriers operating out of both cities in the period.
- cityN1: total number of carriers operating out of only one of the two cities in the period.
- HerfCityPair: Herfindahl index of city output shares
- incumbents: number of airlines that serviced the market in the previous year
- totpotential: number of airlines operating out of at least one of the two cities of the city-pair.
- totsinglepot: number of airlines that were potential entrants in previous year, but only operated out of one airport.

Note: city972 is a garbage variable and should be dropped.