

ECON-L1350 - Empirical Industrial Organization PhD II: Entry exercise

1 Objective

Your task is to use data from [Toivanen and Waterson \(2005\)](#) and study BK and McD entry decisions using incomplete entry models. Choose 2 out of 3 tasks. However, if you do all three, the two best ones will be taken into account.

2 Data

The data can be found in the file *PhD_II_Beef_2023.xls* in MyCourses. The file contains the following variables:

- *countyNo* = index for the county.
- *DistrictNo* = index for the district (=market m).
- *year* = 1991, ..., 1995.
- *iStock* = the number of outlets of firm i , $i \in \{BK, McD\}$ at the beginning of year t in market m .
- *iEntry* = the number of outlets of firm i , $i \in \{BK, McD\}$ opens during year t in market m .
- *population* = population in market m in year t .
- *miles_i* = miles from headquarters of firm i to market m .

The file contains 2 265 observations, 5 each for 453 markets.

3 Estimation task #1

Estimate an incomplete information model where the profit function of firm i is given by

$$\pi_{imt} = x_{jmt}\beta_i + \delta_i a_{jmt} + u_{jmt} \quad (1)$$

Firm i enters market m in year t if and only if it expects entry to be profitable in equilibrium. The firms know their own profit shocks but not those of their rival. The equilibrium concept is Perfect Bayesian Equilibrium.

- As the dependent variable, use a dummy variable taking value 1 if firm i opens at least one new outlet in market m in year t and is zero otherwise.
- As exogenous explanatory variables, use *population* and stock of outlets of both firms, year dummies and distance to firm i 's HQ to market m .

- Assume the profit shocks are distributed Extreme Value Type I (i.e., logit).

Tasks:

1. Write down all your estimation equations and explain step-by-step what you do.
2. Explain your exclusion restriction and motivate it.
3. Display and discuss your results, in particular the effects of both own and rival stock as well as rival entry.

Note: you need not bootstrap the standard errors; it is sufficient that you estimate the model once (i.e., let's pretend the "regular" standard errors are correct).

4 Estimation task #2

This exercise is otherwise the same as the above, but now we assume the profit function of firm i to take the form

$$\pi_{imt} = S_{imt} V_{imt} - (\bar{F}_{imt} + u_{imt}) \quad (2)$$

Specify the model further as follows:

- Market size S_{imt} is a function of *population* and $jStock$ where $j \neq i$.
- Variable profits V_{imt} are a function of own and rival stocks.
- Fixed costs \bar{F}_{imt} are a function of time, modelled using year dummies.
- Use the same dependent variables as in the above task.

Tasks

1. Explain and motivate how you model the competitive effect of rival entry in period t .
2. Write down all your estimation equations and explain step-by-step what you do.
3. Display and discuss your results.

5 Estimation task #3

Using equation (1) as your starting point, generate a simulated data from a model where

- the shocks come from standard normal distributions and are uncorrelated with each other.
- the vector of explanatory variables for each firm consists of one variable only. Generate the using a normal distribution with mean of 0 and a standard deviation of 2.

- Choose your parameter values so that without competition, both firms would enter half of the time.
- Make profits a positive function of the firm-specific variable.
- Experiment with the value of the competition parameters δ_i so that competition has an effect on entry but that the share of duopoly markets stays "moderate" in your data.
- Make sure your model generates a PBE.
- Set the sample size at 10 000 markets.

Tasks

1. Simulate the data.
2. Explain how you ensure that your simulation model generates data in line with a PBE.
3. Estimate your model and check whether you can reproduce your parameter values. Discuss your results.
4. You need not repeat the estimation; one time is enough. However, if you want to practice coding a Monte Carlo, run the model 1 000 times. Discuss the performance of your model.

References

Toivanen, O. and M. Waterson: 2005, 'Market Structure and Entry: Where's the Beef?'. *The RAND Journal of Economics* **36**(3), 680–699.