

**Industrial Organization Field Course**  
**Assignment Demand Estimation for Heterogeneous Demand Models**

**Scope and Model Description**

In this assignment, you will learn how to simulate market data and estimate simple random coefficient demand models. The assignment should serve as an introduction to the structural estimation in heterogeneous products demand models.

**(a) Model description and slide references**

Let's first define the model.

todo: Here you need to insert all the model definition and reference to the slides

$$u_{ijt} = \beta'_{it} x_j + \alpha_{it} p_{jt} + \xi_{jt} + \varepsilon_{ijt}$$

Where:

$$\begin{aligned}\alpha_{it} &= \mu_{\alpha} + \sigma_{\alpha} \nu_{it}^{\alpha} \\ \beta_{it} &= \mu_{\beta} + \sigma_{\beta} \nu_{it}^{\beta}\end{aligned}$$

And  $\nu_{it}^{\alpha}$  and  $\nu_{it}^{\beta}$  are standard normally distributed.

TO DO: Define all the other parameters and how they are constructed in the simulation for the students

**(b) Opening the assignment file and model**

Try to use Google Colab/ Jupyterlite

**(c) Scope**

To be discussed: decision to make: - how much programming should they do?

- should they simulate data themselves? or just import my module?
- should they write the GMM estimator themselves or just apply pyBLP more times until convergence?
- maybe it is enough for them to write the structural function parameters?

## Part 1: Data Exploration

1. Look into the data characterizing your market. Print the dataframe object. Describe what you see. Is it all realistic? Which values are you likely to not have as an econometrician working on real datasets?
2. Exercise 2: Create a histogram with:
  - The distribution of prices
  - The distribution of market shares

## Part 2: Simple Logit Model

Estimate the simple logit model disregarding consumer heterogeneity:

$$\ln(s_0) - \ln(s_n) = \beta' x_j + \alpha p_{jt}$$

Check if this estimation leads to the correct coefficients and discuss what we can do to improve it

Here need to discuss if they estimate it themselves with GMM and write the function for utility or if they should learn to use the package by Colon

## Part 3: Estimation with the PyBLP package (without supply side problem)

Part 4 - Here either writing linear estimation themselves or put in the supply side cost structure and disable optimal instruments