47-813 Econometrics III
Assignment 1

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1 Introduction

In this assignment, we will go over an application of conditional choice probabilities (CCP) estimation by replicating Kang et al. [2015].

2 Model and Assumptions

The economic agent we consider is the FDIC. Given a state variable x_{it}, the FDIC chooses $d_{it} \in \{0, 1\}$ where

$$d_{it} = \begin{cases} 0 & \text{if FDIC chooses to let the bank continue in period } t \\ 1 & \text{if FDIC chooses to close the bank in period } t. \end{cases}$$

The per-period payoff to the FDIC is:

$$u_j(x_{it}, \varepsilon_{it}) = -\mathbf{1}_{d_{jt}=1} c(x_{it}) + \varepsilon_{jit} = \begin{cases} \varepsilon_{0it} & \text{if } d_{it} = 0 \\ -c(x_{it}) + \varepsilon_{1it} & \text{if } d_{it} = 1 \end{cases}$$

where $\varepsilon_{it} := (\varepsilon_{0it}, \varepsilon_{1it})$. The objective function that the FDIC maximizes is:

$$(1 - d_{it})\, u_0\left(x_{it}, \varepsilon_{it}\right) + d_{it} u_1\left(x_{it}, \varepsilon_{it}\right) + \sum_{s=t+1}^{T} \beta^{s-t} \mathbb{E}\left[(1 - d_{is})\, u_0\left(x_{is}, \varepsilon_{it}\right) + d_{is} u_1\left(x_{is}, \varepsilon_{it}\right) \mid x_{it}, d_{it}\right].$$

The value function follows naturally by Bellman representation. The conditional value function given choice j at state x_{it} is:

$$\begin{aligned} v_j\left(x_{it}\right) &= \max_{\{d_{ik}\}_{k=t+1}^{T}} u_j\left(x_{it}\right) + \sum_{s=t+1}^{T} \beta^{s-t} \mathbb{E}\left[(1 - d_{is})\, u_0\left(x_{is}\right) + d_{is} u_1\left(x_{is}\right) \mid x_{it}, d_{it} = j\right],\ j \in \{0, 1\} \\ &= u_j(x_{it}) + \sum_{s=t+1}^{T} \beta^{s-t} \mathbb{E}\left[V(x_{i,t+1}, \varepsilon_{i,t+1}) | x_{it}, d_{it} = j\right],\ j \in \{0, 1\} \end{aligned}$$

Note that in conditional value function, we have slightly different notation to be consistent with the lecture notes: $u_0(x_{it}) = 0$ and $u_1(x_{it}) = -c(x_{it})$.

1. Derive equation (4) under the assumption that ε_{it} follows i.i.d. type-1 extreme value distribution with mean 0 and standard deviation σ (page 1967): $v_0(x_{it}) - v_1(x_{it}) = \sigma \log \frac{p_0(x_{it})}{p_1(x_{it})}$.

2. Equation (6) uses notation $p_1^{(1)}(x_{0it})$ and $c^{(1)}(x_{0it})$. Explain what they mean by using the definition $A^{(k)}(x_{jit})$ in the paper (page 1067). Then, what exactly is the expectation operator in equation (6) doing?

3. Let's take a look at the cost function $c(x_{it})$. The authors separate monetary costs $MC(x_{it})$ and non-monetary costs (parameterized by $\tilde{x}_{it}'\theta_{nmc}$). Tables 3 and 7 present the parameter estimates for θ_{mc} and θ_{nmc}. What are the 'independent variables' for monetary costs and non-monetary costs? What are the assumptions that must be satisfied for these estimates to be identified? Do you agree with the assumptions you find?

4. How do the authors estimate the transition processes? Considering the model, would you use some different approach? Why or why not?

3 Alternative Conditional Choice Probabilities

Let's consider some alternative conditional choice probabilities:

1. Include a time trend in the estimation of the choice probabilities (this is Model II in the paper).

2. Omit the effect of the House of Representatives (denoted as House in the paper) and/or Senate in the estimation of the choice probabilities.

3. Add squared terms on time, House and/or Senate in the estimation of the choice probabilities.

Run the codes with the changes and compare the results with those from the original study. For detailed explanation of the steps, read "estimation_procedure.txt". Explain how you modified the code in the appendix. For each changes you make to the conditional choice probabilities, think about the functional form of monetary costs and non-monetary costs of FDIC on closing a bank. Do you also need make changes to the cost function for the changes you make to the conditional choice probabilities? Why or why not?

References

A. Kang, R. Lowery, and M. Wardlaw. The costs of closing failed banks: A structural estimation of regulatory incentives. *The Review of Financial Studies*, 28(4):1060–1102, 2015.