Assignment 3

To be completed by Tuesday, February 20th

For this assignment use `datassign3.mat`. The variables in the data set are:

- $Firm1$ an $N \times T$ matrix of whether or not a firm is present in market n at time t.

- $State$ an $N \times T$ indicator for the state of the economy in market n at time t that varies over time.

- $PState$ an $N \times 1$ indicator of the permanent state of the economy.

- Y price of the product.

Flow profits for entering (or staying in) a market are given by:

$$\Pi_t = \alpha_0 + \alpha_1 State_t + \alpha_2 PState + \alpha_3(1 - Firm1_{t-1}) + \epsilon_1 \tag{1}$$

where $Firm1_{t-1}$ is an indicator for whether the firm was an incumbent (at $t = 1$ this variable should be set to zero for all markets) and ϵ_1 is distributed Type 1 extreme value. Profits are staying out of a market are given by ϵ_0 which is also distributed Type 1 extreme value. Once a firm chooses to stay out of a market there is no future profits and a new potential entrant arrives at the market in the next period. Firms maximize lifetime profits where the discount factor is set at 0.9. The price process is given by:

$$Y_t = \gamma_0 + \gamma_1 State_t + \gamma_2 PState + \gamma_3 Firm1_t + \zeta \tag{2}$$

where ζ is distributed $N(0, \sigma)$. Firms only have expectations regarding the future values of $State$. The probabilities of transitioning to different values of $State_t$ only depend upon the value of $State_{t-1}$. For all the estimation problems below use CCP's in formulating the differenced value functions.

1. Estimate the dynamic discrete choice process using CCP's for the future value terms. These CCP's should be taken directly from the data. (Note that you will need to estimate the transition process on $State$ and that this should be done outside of the estimation of the dynamic discrete choice model)

2. Estimate the full model (dynamic discrete choice, prices, and transitions on $State$) where $PState$ is now a missing variable. Use both ways of updating the CCP's and compare your results from the two methods.

3. Estimate the full model where $State$ is now a missing variable ($PState$ is known). This will involve also estimating the transitions on the unobserved variable.

4. Estimate the full model with $State$ as a missing variable in two stages. First, estimate the distribution of the unobserved heterogeneity and the parameters of the pricing process using the empirical likelihood of the choices in the EM algorithm. Next, with the conditional probabilities of being a particular type in hand, obtain estimates of the profit parameters.