Discrete Choice Modeling
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Lab Session 5
Binary Choice Modeling with Panel Data and Heterogeneity

This assignment will extend the models of binary choice to modeling heterogeneity in panel data frameworks.

These exercises will use the German manufacturing innovation data, panelprobit.lpj

1. **Random parameters models** In the original study that used these data, the coefficients on IMUM and FDIUM were of particular interest. In his followup studies, Greene treated these two parameters as randomly distributed across firms. Here, you can partially replicate that study by reestimating the random parameters model. Three models are fit: (1) The two parameters are treated as independent normally distributed; (2) The two parameters are allowed to be freely correlated; (3) The two random parameters are assumed to have a mean that varies by industry. In this case, we specify $\beta_k = \beta_{0k} + \delta_{k1}InvGood + \beta_{k2}Consgood + \beta_{k3}Food + \sigma_k v_k$. We could also specify that the two parameters remain correlated. That is left for an exercise. The final PROBIT command contains ; PARAMETERS. This creates a matrix BETA_I that contains the firm specific conditional means of the random parameters. You can double click this matrix to see the values. The remaining commands manipulate this matrix to explore the distribution of parameter values across firms. The kernel density estimator in the last command does this exercise for the coefficient on IMUM. By changing BIMUM to BFDIUM in the KERNEL command, you can repeat the exercise for the coefficient on FDIUM.

```
Sample ; All $
Probit ; Lhs = Ip ; Rhs = X ; RPM ; Fcn = imum(n),fdium(n) ; Pts = 25 ; Pds = 5 $
Probit ; Lhs = Ip ; Rhs = X ; RPM ; Correlated
    ; Fcn = imum(n),fdium(n) ; Pts = 25 ; Pds = 5 $
Probit ; Lhs = Ip ; Rhs = X ; RPM = InvGood,ConsGood,Food
    ; Fcn = imum(n),fdium(n) ; Pts = 25 ; Pds = 5 ; Parameters $
Create ; Bimum = 0 ; Bfdium = 0 $
Namelist ; Bi = Bimum,Bfdium $
Sample ; 1 - 1270 $
Create ; Bi = Beta_i $
Kernel ; Rhs = Bimum $
```

2. **Latent class model**. In this exercise, we fit a three class latent class LOGIT model. This is an alternative method of building heterogeneity into the panel data model. In the third command, we produce a listing of the estimated conditional class probabilities, with a listing of the best guess as to which class each firm is in. (The number of observations is reduced just for purpose of a compact example.) You might try changing the specification of the equation, and examining how the results change.

```
Sample ; All $
Logit  ; Lhs = IP ; Rhs = X ; LCM ; Pts = 3 ; Pds = 5  ; Parameters $
Logit  ; Lhs = IP ; Rhs = X ; LCM = InvGood,Consgood,Food
              ; Pts = 3 ; Pds = 5  ; Parameters $
Sample;1-500$
Logit  ; Lhs = IP ; Rhs = X ; LCM = InvGood,Consgood,Food
              ; Pts = 3 ; Pds = 5  ; Parameters ; List $
```