Example 5: Estimations of the panel logit models explaining female labor participation using a fictitious dataset

The definitions of variables are inherited from those in the manuals "dfelrtna.pdf" and "dfelrtnb.pdf".

Dataset

fls_{it} : fls1986 - fls1992 (female labor supply: 1=supply; 0=no supply, from 1986 to 1992)

$hdbt_{it}$: hdbt1986 - hdbt1992 (log of husband's debt, from 1986 to 1992)

$hinc_{it}$: hinc1986 - hinc1992 (log of husband's income, from 1986 to 1992)

(Number of individuals $N = 15000$)

The model when using the program "dfelrtna.tsp" described later is appropriate for this dataset. True values of parameters generating this dataset are

$\gamma = \gamma_{fls(-1)} = 0.5$

$\beta_{(1)} = \beta_{hdbt} = 0.0$

$\beta_{(2)} = \beta_{hdbt(-1)} = 0.5$

$\beta_{(3)} = \beta_{hinc} = 0.0$

$\beta_{(4)} = \beta_{hinc(-1)} = -0.5$

$TD_{1986} = 0.5$

$TD_{1987} = 1.0$

$TD_{1988} = -0.5$

$TD_{1989} = 0.0$

$TD_{1990} = -0.5$

$TD_{1991} = 0.5$

$TD_{1992} = 0.0$

$TD_{1993} = -1.0$

and accordingly,

$\Delta TD_{1988} = -1.5$

$\Delta TD_{1989} = 0.5$

$\Delta TD_{1990} = -0.5$

$\Delta TD_{1991} = 1.0$.

In both files “prma.tsp” and “prmb.tsp”, the command

```
set sdgp = -99999 ;
```

is used, so that the seed for generating random starting values for the parameters of interest in the optimization trials is automatically created in TSP. Accordingly, we can obtain no reproducible result.

Model, Moment conditions, and parameters to be estimated when using the program "dfelrtna.tsp"

Model

$$y_{it} = \frac{\exp\left(\eta_i + TD_t + \gamma\, y_{i,t-1} + \beta_{(1)} x_{(1)it} + \beta_{(2)} x_{(2)it} + \beta_{(3)} x_{(3)it} + \beta_{(4)} x_{(4)it}\right)}{1+\exp\left(\eta_i + TD_t + \gamma\, y_{i,t-1} + \beta_{(1)} x_{(1)it} + \beta_{(2)} x_{(2)it} + \beta_{(3)} x_{(3)it} + \beta_{(4)} x_{(4)it}\right)} + v_{it},$$

for $t = 1987,\ldots,1991$.

$y_{it} = fls_{it}$

$x_{(1)it} = hdbt_{it}$

$x_{(2)it} = hdbt_{i,t-1}$

$x_{(3)it} = hinc_{it}$

$x_{(4)it} = hinc_{i,t-1}$

Moment conditions

Used moment conditions based on g-form

$\mathrm{E}[\hbar U_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})] = 0$, for $t = 1988,\ldots,1990$,

$\mathrm{E}[y_{is}\, \hbar U_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})] = 0$,

for $s = 1986,\ldots,t-2$; $t = 1988,\ldots,1990$,

$\mathrm{E}[\Delta x_{(1)is}\, \hbar U_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})] = 0$,

for $s = t-2,\ldots,t+2$; $t = 1988,\ldots,1990$,

$\mathrm{E}[\Delta x_{(3)is}\, \hbar U_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})] = 0$,

for $s = t-2,\ldots,t+2$; $t = 1988,\ldots,1990$.

Used moment conditions based on h-form

$\mathrm{E}[\hbar \Upsilon_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})] = 0$, for $t = 1988,\ldots,1990$,

$\mathrm{E}[y_{is}\, \hbar \Upsilon_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})] = 0$,

for $s = 1986,\ldots,t-2$; $t = 1988,\ldots,1990$,

$\mathrm{E}[\Delta x_{(1)is}\, \hbar \Upsilon_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})] = 0$,

for $s = t-2,\ldots,t+2$; $t = 1988,\ldots,1990$,

$\mathrm{E}[\Delta x_{(3)is}\, \hbar \Upsilon_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})] = 0$,

for $s = t-2,\ldots,t+2$; $t = 1988,\ldots,1990$.

As for the last two types of g-form and h-form moment conditions, we should note that we have the lower and upper limits of using instruments for the transformed equations: $(\Delta x_{(1)i,1987}, \Delta x_{(1)i,1988}, \Delta x_{(1)i,1989}, \Delta x_{(1)i,1990})$ and $(\Delta x_{(3)i,1987}, \Delta x_{(3)i,1988}, \Delta x_{(3)i,1989}, \Delta x_{(3)i,1990})$ are instruments for the transformed equations $\hbar U_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})$ and $\hbar \Upsilon_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})$ for $t = 1988$;
$(\Delta x_{(1)i,1987}, \Delta x_{(1)i,1988}, \Delta x_{(1)i,1989}, \Delta x_{(1)i,1990}, \Delta x_{(1)i,1991})$ and
$(\Delta x_{(3)i,1987}, \Delta x_{(3)i,1988}, \Delta x_{(3)i,1989}, \Delta x_{(3)i,1990}, \Delta x_{(3)i,1991})$ are instruments for the transformed equations $\hbar U_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})$ and
$\hbar \Upsilon_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})$ for $t = 1989$;
$(\Delta x_{(1)i,1988}, \Delta x_{(1)i,1989}, \Delta x_{(1)i,1990}, \Delta x_{(1)i,1991})$ and $(\Delta x_{(3)i,1988}, \Delta x_{(3)i,1989}, \Delta x_{(3)i,1990}, \Delta x_{(3)i,1991})$ are instruments for the transformed equation $\hbar U_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})$ and $\hbar \Upsilon_{it}^{+}(\gamma, \beta_{(1)}, \beta_{(2)}, \beta_{(3)}, \beta_{(4)}, \Delta TD_t, \Delta TD_{t+1})$ for $t = 1990$,
because the commands

```
set spu_hdbt = 1986 ; set epu_hdbt = 1991 ;
set spu_hinc = 1986 ; set epu_hinc = 1991 ;
```

and

```
set d_hdbt_sg = 2 ; set d_hdbt_eg = -2 ;
set d_hinc_sg = 2 ; set d_hinc_eg = -2 ;
```

are used.

Parameters to be estimated

$\gamma = \gamma_{fls(-1)}$: g_fls_lag1
$\beta_{(1)} = \beta_{hdbt}$: b_hdbt
$\beta_{(2)} = \beta_{hdbt(-1)}$: b_hdbt_lag1
$\beta_{(3)} = \beta_{hinc}$: b_hinc
$\beta_{(4)} = \beta_{hinc(-1)}$: b_hinc_lag1
ΔTD_{1988}: dtd1988
ΔTD_{1989}: dtd1989
ΔTD_{1990}: dtd1990
ΔTD_{1991}: dtd1991

Model, Moment conditions, and parameters to be estimated when using the program "dfelrtnb.tsp"

Model

$$y_{it} = \frac{\exp\left(\eta_i + TD_t + \gamma\, y_{i,t-1}\right)}{1+\exp\left(\eta_i + TD_t + \gamma\, y_{i,t-1}\right)} + v_{it}, \qquad \text{for } t = 1987,\ldots,1991.$$

$$y_{it} = fls_{it}$$

Moment conditions

Used moment conditions based on g-form

$$\mathrm{E}[\hbar U_{it}^{-}(\gamma, \Delta TD_t, \Delta TD_{t+1})] = 0, \qquad \text{for } t = 1988,\ldots,1990,$$

$$\mathrm{E}[y_{is}\, \hbar U_{it}^{-}(\gamma, \Delta TD_t, \Delta TD_{t+1})] = 0, \quad \text{for } s = 1986,\ldots,t-2;\ t = 1988,\ldots,1990.$$

Used moment conditions based on h-form

$$\mathrm{E}[\hbar \Upsilon_{it}^{-}(\gamma, \Delta TD_t, \Delta TD_{t+1})] = 0, \qquad \text{for } t = 1988,\ldots,1990,$$

$$\mathrm{E}[y_{is}\, \hbar \Upsilon_{it}^{-}(\gamma, \Delta TD_t, \Delta TD_{t+1})] = 0, \quad \text{for } s = 1986,\ldots,t-2;\ t = 1988,\ldots,1990.$$

Parameters to be estimated

$\gamma = \gamma_{fls(-1)}$: g_fls_lag1

ΔTD_{1988}: dtd1988

ΔTD_{1989}: dtd1989

ΔTD_{1990}: dtd1990

ΔTD_{1991}: dtd1991