Brief instructions for md_ar1

Måns Söderbom, University of Gothenburg
September 2009

Blundell and Bond (2000) consider a panel data model of the following type:

y(it) = b*x(it) + e(it)

where

e(it) = rho*e(i,t-1) + v(it)

This can be re-written as

y(it) = b*x(it) - rho*b*x(i,t-1) + rho*y(i,t-1) + v(it)

or

(*) y(it) = a1*x(it) +a2*x(i,t-1) + a3*y(i,t-1) + v(it)

The model generalizes in a straightforward way to a more general case with K x-variables.

Suppose you estimate equation (*) using some suitable linear estimator, e.g. OLS, 2SLS, Within or GMM. My STATA program md_ar1, can then be used to impose, and test the validity of, the common factor restrictions ex post, based on a minimum distance procedure.

Please note that the program is not as neat and tidy as it should: in particular, the user **MUST** make sure inputs in the freely estimated model are entered in the right order - namely x1(t) x1(t-1) x2(t) x2(t-1) ... y(t-1) controls. If you don't do it like this you will get **garbage**. Note also that the program will only work for an AR1 series.

Here is an illustration of how the program works:

First I load the file used by Blundell-Bond, 2002.

. use usbal89.dta, clear

I then estimate the production function freely using OLS (the md_ar1 routine will work for any underlying estimator):

```
. xi: reg y n l.n k l.k l.y i.year, robust cluster(id)
i.year            _Iyear_1982-1989    (naturally coded; _Iyear_1982 omitted)
Linear regression                                      Number of obs =    3563
                                                       F( 11,   508) =75113.93
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9949
                                                       Root MSE      =   .1426
                                    (Std. Err. adjusted for 509 clusters in id)
------------------------------------------------------------------------------
             |               Robust
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           n |
         --. |   .4789653   .0288963    16.58   0.000     .4221944    .5357362
         L1. |  -.4233997   .0305806   -13.85   0.000    -.4834797   -.3633198
```

```
           k |
         --. |   .2348098   .0352859     6.65   0.000     .1654854    .3041341
         L1. |  -.2120621   .0347141    -6.11   0.000    -.280263   -.1438613
           y |
         L1. |   .9216418   .0105283    87.54   0.000     .9009575    .9423261
 _Iyear_1983 |  -.0356445   .0097659    -3.65   0.000    -.0548311   -.0164579
 _Iyear_1984 |   .0304689   .0078524     3.88   0.000     .0150416    .0458962
 _Iyear_1985 |  -.0229294   .0076409    -3.00   0.003    -.0379412   -.0079177
 _Iyear_1986 |  -.0008055   .0091111    -0.09   0.930    -.0187056    .0170947
 _Iyear_1987 |   .0411118   .0082566     4.98   0.000     .0248906    .0573331
 _Iyear_1988 |   .0422808   .0077698     5.44   0.000     .0270159    .0575457
 _Iyear_1989 |  (dropped)
       _cons |   .2822485   .0342594     8.24   0.000     .2149409    .3495561
------------------------------------------------------------------------------
```

Note the <u>order</u> of inputs and the lagged dependent variable.

Now I can obtain the minimum distance estimates:

. md_ar1, nx(2) beta(e(b)) cov(e(V))

The syntax of md_ar1 is very simple: nx(.) indicates the number of inputs (2 in this case, capital & labour) beta(.) indicates the name of the parameter vector and cov(.) the name of the covariance matrix.

Results:

```
all[3,4]
           Coef         Std     t-value        Prob
  n  .53815661  .02505872   21.475826           0
  k  .26639143  .03181457   8.3732532           0
L.y   .9636204  .00638379   150.94804           0
```

Prob[COMFAC]: 0.00000

This replicates the results in the IFS working paper version of "GMM estimation with persistent panel data...", Blundell-Bond, 2002.

I suggest you try to replicate the other results in the Blundell-Bond paper, before using the program in your own analysis.