Econometrics II
Summer 2022
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Exercise Session 4

Problem 1: From Final of 2019

Consider a model with individual effects:

$$y_{it} = \alpha y_{it-1} + \beta_0 x_{it} + \beta_1 x_{it-1} + \eta_i + \nu_{it}$$

Discuss the identification and estimation of the parameters of a model of this type when T is small and N is large, under the assumptions listed below. Set out carefully any additional assumptions that you make in each case.

(a) x_{it} is a strictly exogenous variable uncorrelated with η_i, and ν_{it} is a potentially serially correlated error.

(b) The variable x_{it} is strictly exogenous but correlated with the individual effect η_i.

(c) x_{it} is a predetermined variable correlated with η_i; ν_{it} is a white noise error.

Problem 2

In this exercise we will partially replicate the empirical work reported in Arellano and Bond (1991) and Blundell and Bond (1998). Arellano-Bond gathered a dataset of 1031 observations from an unbalanced panel of 140 U.K. companies for 1976-1984.

1. Replicate first 3 columns of Table 4 from Arellano and Bond (1991). Note that time dummies are included in all equations and the reported GMM estimates are all two step except column (a1). What is the assumption on the regressors?

TABLE 4

Employment equations

GMM estimates (all variables in first differences)

Dependent variable: ln (Employment)$_{it}$ Sample Period: 1979–1984 (140 companies)

Independent variables	(a1)	(a2)	(b)	Instrumenting wages and capital* (c)	(d)
$n_{i(t-1)}$	0·686 (0·145)	0·629 (0·090)	0·474 (0·085)	0·800 (0.048)	0·825 (0.056)
$n_{i(t-2)}$	−0·085 (0·056)	−0·065 (0·027)	−0·053 (0·027)	−0·116 (0·021)	−0·074 (0·020)
w_{it}	−0·608 (0·178)	−0·526 (0·054)	−0·513 (0·049)	−0·640 (0·054)	—
$w_{i(t-1)}$	0·393 (0·168)	0·311 (0·094)	0·225 (0·080)	0·564 (0·066)	0·431 (0·076)
k_{it}	0·357 (0·059)	0·278 (0·045)	0·293 (0·039)	0·220 (0·051)	—
$k_{i(t-1)}$	−0·058 (0·073)	0·014 (0·053)	—	—	−0·077 (0·045)
$k_{i(t-2)}$	−0·020 (0·033)	−0·040 (0·026)	—	—	—
ys_{it}	0·608 (0.172)	0·592 (0·116)	0·610 (0·109)	0·890 (0·098)	—
$ys_{i(t-1)}$	−0·711 (0·232)	−0·566 (0·140)	−0·446 (0·125)	−0·875 (0·105)	−0·115(0·100)
$ys_{i(t-2)}$	0·106 (0·141)	0·101 (0·113)	—	—	0·096 (0·092)
m_2	−0·516	−0·434	−0·327	−0·610	−1·259
Sargan test	65·8 (25)	31·4 (25)	30·1 (25)	63·0 (50)	68·3 (51)
Difference-Sargan	41·9 (6)	15·4 (6)	10·0 (6)	28·6 (20)	31·6 (20)
Hausman	5·8 (1)	14·4 (1)	13·4 (1)	2·0 (1)	2·9 (1)
Wald test	408·3 (10)	667·0 (10)	372·0 (7)	779·3 (7)	623·9 (6)
No. of observations	611	611	611	611	611

Blundell and Bond (1998) estimated a dynamic panel regression of log employment n on log real wages w and log capital k. One of their specifications used the Arellano-Bond one-step estimator, treating $w_{i,t-1}$ and $k_{i,t-1}$ as predetermined:

$$\hat{n}_{it} = 0.7075n_{it-1} - 0.7088w_{it} + 0.5000w_{it-1} + 0.4660k_{it} - 0.2151k_{it-1} \quad (*)$$

2. Produce the GMM estimator of the coefficient on n_{it-1} using only n_{it-2} as an instrument for Δn_{it-1}. State carefully any assumptions you might have to make and also the minimum number of observations required for estimation.

3. Estimate the equation treating $w_{i,t-1}$ and $k_{i,t-1}$ as predetermined to verify the results in $(*)$. What is the difference between the estimates treating the regressors as strictly exogenous versus predetermined?

4. Estimate the equation using the Blundell-Bond one-step systems GMM estimator.