**Trabajo Práctico N° 3:**

**Modelos de Paneles Dinámicos.**

**Ejercicio 1.**

*Considerar la base de datos “mod\_abdata.dta” que fue utilizada por Arellano y Bond en su famoso paper de 1991. Se trata de un panel de 140 empresas británicas encuestadas, anualmente, entre 1976 y 1984. El panel original no es balanceado, pero la versión para este ejercicio se trata de un panel balanceado de empresas con observaciones para, exactamente, 6 años entre 1977 y 1982. La variable que identifica la empresa es id y la variable que identifica el tiempo es year. La variable n es el empleo de la empresa. Luego, considerar un modelo muy simplificado del siguiente tipo:*

*ln = ln + ,*

*= + ,*

*E ()= E ()= E ()= 0,*

*donde es el empleo de la empresa i en el año t.*

**(a)** *Estimar el modelo por OLS. ¿Qué sesgo se esperaría encontrar y por qué?*

POLS:

Source | SS df MS Number of obs = 770

-------------+---------------------------------- F(1, 768) = 76542.09

Model | 1396.09073 1 1396.09073 Prob > F = 0.0000

Residual | 14.0079495 768 .018239518 R-squared = 0.9901

-------------+---------------------------------- Adj R-squared = 0.9901

Total | 1410.09868 769 1.83367839 Root MSE = .13505

------------------------------------------------------------------------------

n | Coefficient Std. err. t P>|t| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | .9967362 .0036027 276.66 0.000 .9896639 1.003809

\_cons | -.0379493 .0063799 -5.95 0.000 -.0504734 -.0254252

------------------------------------------------------------------------------

El sesgo que se esperaría encontrar es el sesgo de paneles dinámicos, el cual se desprende que ln está correlacionado con los efectos fijos, , que se encuentran en el término de error. En general, bajo muchos supuestos, OLS sobrestima el valor real del parámetro .

**(b)** *Estimar el modelo usando efectos fijos (FE). ¿Permite la transformación within eliminar el sesgo de paneles dinámicos?*

FE:

Fixed-effects (within) regression Number of obs = 770

Group variable: id Number of groups = 138

R-squared: Obs per group:

Within = 0.4926 min = 5

Between = 0.9979 avg = 5.6

Overall = 0.9901 max = 6

F(1,631) = 612.49

corr(u\_i, Xb) = 0.9382 Prob > F = 0.0000

------------------------------------------------------------------------------

n | Coefficient Std. err. t P>|t| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | .869605 .0351375 24.75 0.000 .8006043 .9386056

\_cons | .1076112 .0405095 2.66 0.008 .0280614 .1871609

-------------+----------------------------------------------------------------

sigma\_u | .18358137

sigma\_e | .1315487

rho | .66073284 (fraction of variance due to u\_i)

------------------------------------------------------------------------------

F test that all u\_i=0: F(137, 631) = 1.30 Prob > F = 0.0194

La transformación *within* no permite eliminar el sesgo de paneles dinámicos, ya que, ahora, el problema se encuentra en que = ln - está correlacionado con = - , aun cuando no tiene correlación serial. En particular, el término ln correlaciona negativamente con que se encuentra dentro de , mientras que, simétricamente, ln y también se encuentran correlacionados negativamente. Adicionalmente, hay otros pares de términos que correlacionan, pero su impacto es de segundo orden. Por último, cabe mencionar que Nickell mostró que, si 0, este sesgo es siempre negativo.

**(c)** *Considerar una transformación de diferencias finitas de primer orden del modelo. ¿Continúa siendo la variable dependiente rezagada potencialmente endógena?*

Considerando una transformación de diferencias finitas de primer orden del modelo, la variable dependiente rezagada continúa siendo potencialmente endógena, ya que el término ln = ln - ln está correlacionado con en = - .

**(d)** *Implementar el estimador de Anderson-Hsiao a partir del comando ivregress en Stata.*

IV (Anderson-Hsiao):

Instrumental variables 2SLS regression Number of obs = 632

Wald chi2(1) = .

Prob > chi2 = .

R-squared = .

Root MSE = .25024

------------------------------------------------------------------------------

D.n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 |

D1. | 2.015601 .4911953 4.10 0.000 1.052876 2.978327

------------------------------------------------------------------------------

Instrumented: D.nL1

Instruments: nL2

**(e)** *Ahora, obtener la estimación GMM de utilizando todos los instrumentos posibles en niveles para el modelo en primeras diferencias. Para ello, utilizar el comando xtabond2.*

GMM One-Step (Arellano-Bond):

Dynamic panel-data estimation, one-step difference GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 632

Time variable : year Number of groups = 138

Number of instruments = 10 Obs per group: min = 4

Wald chi2(0) = . avg = 4.58

Prob > chi2 = . max = 5

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | 1.146045 .0865907 13.24 0.000 .9763309 1.31576

------------------------------------------------------------------------------

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -4.21 Pr > z = 0.000

Arellano-Bond test for AR(2) in first differences: z = -2.35 Pr > z = 0.019

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(9) = 122.88 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

GMM Two-Step (Arellano-Bond):

Dynamic panel-data estimation, two-step difference GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 632

Time variable : year Number of groups = 138

Number of instruments = 10 Obs per group: min = 4

Wald chi2(0) = . avg = 4.58

Prob > chi2 = . max = 5

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | 1.176208 .0771686 15.24 0.000 1.024961 1.327456

------------------------------------------------------------------------------

Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -2.97 Pr > z = 0.003

Arellano-Bond test for AR(2) in first differences: z = -1.71 Pr > z = 0.087

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(9) = 122.88 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(9) = 48.86 Prob > chi2 = 0.000

(Robust, but weakened by many instruments.)

**(f)** *Obtener la estimación de GMM de utilizando todos los instrumentos posibles en niveles para el modelo en primeras diferencias e como instrumento para el modelo en niveles.*

SGMM One-Step (Blundell-Bond):

Dynamic panel-data estimation, one-step system GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 770

Time variable : year Number of groups = 138

Number of instruments = 15 Obs per group: min = 5

Wald chi2(1) = 75831.06 avg = 5.58

Prob > chi2 = 0.000 max = 6

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | 1.107192 .0200965 55.09 0.000 1.067803 1.14658

\_cons | -.1644167 .0233703 -7.04 0.000 -.2102216 -.1186118

------------------------------------------------------------------------------

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

Instruments for levels equation

Standard

\_cons

GMM-type (missing=0, separate instruments for each period unless collapsed)

D.L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -5.47 Pr > z = 0.000

Arellano-Bond test for AR(2) in first differences: z = -2.27 Pr > z = 0.023

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(13) = 168.40 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:

GMM instruments for levels

Sargan test excluding group: chi2(9) = 127.56 Prob > chi2 = 0.000

Difference (null H = exogenous): chi2(4) = 40.84 Prob > chi2 = 0.000

SGMM Two-Step (Blundell-Bond):

Dynamic panel-data estimation, two-step system GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 770

Time variable : year Number of groups = 138

Number of instruments = 15 Obs per group: min = 5

Wald chi2(1) = 23169.14 avg = 5.58

Prob > chi2 = 0.000 max = 6

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | 1.149856 .0316392 36.34 0.000 1.087845 1.211868

\_cons | -.1738829 .0370401 -4.69 0.000 -.2464801 -.1012857

------------------------------------------------------------------------------

Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

Instruments for levels equation

Standard

\_cons

GMM-type (missing=0, separate instruments for each period unless collapsed)

D.L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -3.18 Pr > z = 0.001

Arellano-Bond test for AR(2) in first differences: z = -1.71 Pr > z = 0.087

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(13) = 168.40 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(13) = 56.19 Prob > chi2 = 0.000

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

GMM instruments for levels

Hansen test excluding group: chi2(9) = 49.15 Prob > chi2 = 0.000

Difference (null H = exogenous): chi2(4) = 7.04 Prob > chi2 = 0.134

**(g)** *Repetir las estimaciones de los incisos (e) y (f) incluyendo efectos fijos de tiempo.*

GMM One-Step (Arellano-Bond):

Dynamic panel-data estimation, one-step difference GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 632

Time variable : year Number of groups = 138

Number of instruments = 15 Obs per group: min = 4

Wald chi2(0) = . avg = 4.58

Prob > chi2 = . max = 5

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | .2667934 .1114731 2.39 0.017 .0483102 .4852767

yr1977 | .0072053 .0133804 0.54 0.590 -.0190198 .0334304

yr1978 | -.000092 .0101049 -0.01 0.993 -.0198972 .0197132

yr1980 | -.0390927 .010015 -3.90 0.000 -.0587218 -.0194636

yr1981 | -.1440582 .0107307 -13.42 0.000 -.1650901 -.1230264

yr1982 | -.214458 .0194763 -11.01 0.000 -.2526308 -.1762851

------------------------------------------------------------------------------

Instruments for first differences equation

Standard

D.(yr1977 yr1978 yr1979 yr1980 yr1981 yr1982)

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = 0.30 Pr > z = 0.764

Arellano-Bond test for AR(2) in first differences: z = -0.93 Pr > z = 0.351

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(9) = 36.01 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

GMM Two-Step (Arellano-Bond):

Dynamic panel-data estimation, two-step difference GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 632

Time variable : year Number of groups = 138

Number of instruments = 15 Obs per group: min = 4

Wald chi2(0) = . avg = 4.58

Prob > chi2 = . max = 5

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | .4092502 .0923988 4.43 0.000 .2281518 .5903486

yr1977 | .0090912 .0095385 0.95 0.341 -.009604 .0277864

yr1978 | .0020047 .0051366 0.39 0.696 -.0080629 .0120723

yr1980 | -.0313017 .0073163 -4.28 0.000 -.0456414 -.0169621

yr1981 | -.1342723 .0163176 -8.23 0.000 -.1662543 -.1022903

yr1982 | -.2001323 .0235447 -8.50 0.000 -.2462791 -.1539855

------------------------------------------------------------------------------

Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation

Standard

D.(yr1977 yr1978 yr1979 yr1980 yr1981 yr1982)

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -0.90 Pr > z = 0.370

Arellano-Bond test for AR(2) in first differences: z = -1.22 Pr > z = 0.222

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(9) = 36.01 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(9) = 11.00 Prob > chi2 = 0.276

(Robust, but weakened by many instruments.)

SGMM One-Step (Blundell-Bond):

Dynamic panel-data estimation, one-step system GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 770

Time variable : year Number of groups = 138

Number of instruments = 20 Obs per group: min = 5

Wald chi2(6) = 84467.08 avg = 5.58

Prob > chi2 = 0.000 max = 6

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | 1.070702 .0198077 54.05 0.000 1.031879 1.109524

yr1977 | .0438478 .0151864 2.89 0.004 .0140831 .0736126

yr1978 | .0518471 .0129701 4.00 0.000 .0264261 .0772681

yr1979 | .0418566 .0129664 3.23 0.001 .0164428 .0672704

yr1981 | -.0742759 .0129883 -5.72 0.000 -.0997325 -.0488193

yr1982 | -.0521052 .0133172 -3.91 0.000 -.0782065 -.026004

\_cons | -.1213363 .0250374 -4.85 0.000 -.1704086 -.072264

------------------------------------------------------------------------------

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

Instruments for levels equation

Standard

yr1977 yr1978 yr1979 yr1980 yr1981 yr1982

\_cons

GMM-type (missing=0, separate instruments for each period unless collapsed)

D.L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -6.30 Pr > z = 0.000

Arellano-Bond test for AR(2) in first differences: z = -2.36 Pr > z = 0.018

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(13) = 79.17 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:

GMM instruments for levels

Sargan test excluding group: chi2(9) = 21.45 Prob > chi2 = 0.011

Difference (null H = exogenous): chi2(4) = 57.72 Prob > chi2 = 0.000

iv(yr1977 yr1978 yr1979 yr1980 yr1981 yr1982, eq(level))

Sargan test excluding group: chi2(8) = 56.13 Prob > chi2 = 0.000

Difference (null H = exogenous): chi2(5) = 23.05 Prob > chi2 = 0.000

SGMM Two-Step (Blundell-Bond):

Dynamic panel-data estimation, two-step system GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 770

Time variable : year Number of groups = 138

Number of instruments = 20 Obs per group: min = 5

Wald chi2(6) = 19554.89 avg = 5.58

Prob > chi2 = 0.000 max = 6

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | 1.115279 .0252032 44.25 0.000 1.065881 1.164676

yr1977 | .042046 .0187107 2.25 0.025 .0053737 .0787184

yr1978 | .0475315 .0087333 5.44 0.000 .0304146 .0646484

yr1979 | .0347642 .0075048 4.63 0.000 .0200551 .0494734

yr1981 | -.0766901 .0109072 -7.03 0.000 -.0980679 -.0553123

yr1982 | -.0535137 .0128686 -4.16 0.000 -.0787358 -.0282917

\_cons | -.1778026 .0308186 -5.77 0.000 -.238206 -.1173993

------------------------------------------------------------------------------

Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

Instruments for levels equation

Standard

yr1977 yr1978 yr1979 yr1980 yr1981 yr1982

\_cons

GMM-type (missing=0, separate instruments for each period unless collapsed)

D.L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -3.22 Pr > z = 0.001

Arellano-Bond test for AR(2) in first differences: z = -1.56 Pr > z = 0.118

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(13) = 79.17 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(13) = 28.91 Prob > chi2 = 0.007

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

GMM instruments for levels

Hansen test excluding group: chi2(9) = 6.67 Prob > chi2 = 0.671

Difference (null H = exogenous): chi2(4) = 22.23 Prob > chi2 = 0.000

iv(yr1977 yr1978 yr1979 yr1980 yr1981 yr1982, eq(level))

Hansen test excluding group: chi2(8) = 22.21 Prob > chi2 = 0.005

Difference (null H = exogenous): chi2(5) = 6.69 Prob > chi2 = 0.244

**Ejercicio 2.**

*En este ejercicio, se ilustrará el hecho de que los estimadores de Arellano-Bond y de Blundell-Bond pueden extenderse, en forma directa, a modelos que incluyan regresores estrictamente exógenos y regresores secuencialmente exógenos.*

*En su paper original, Arellano y Bond modelaron el empleo de las empresas (n) utilizando un modelo de ajuste parcial para reflejar los costos de contratación y despido, incluyendo dos rezagos de la variable empleo. Otras variables incluidas fueron el nivel salarial actual y el rezagado (w), el stock de capital actual, rezagado una y dos veces (k), y la producción agregada actual, rezagada una y dos veces en el sector de la empresa (ys). Todas las variables se expresan en logaritmos. También se incluye un conjunto de variables dummy de tiempo.*

**(a)** *Estimar el modelo por OLS. Computar los errores estándar robustos a heterocedasticidad y correlación serial.*

POLS:

Linear regression Number of obs = 632

F(14, 137) = 15042.46

Prob > F = 0.0000

R-squared = 0.9948

Root MSE = .09885

(Std. err. adjusted for 138 clusters in id)

------------------------------------------------------------------------------

| Robust

n | Coefficient std. err. t P>|t| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | 1.083681 .0479746 22.59 0.000 .9888145 1.178548

nL2 | -.1204015 .0432502 -2.78 0.006 -.2059257 -.0348772

w | -.4314672 .1861579 -2.32 0.022 -.7995817 -.0633527

wL1 | .3933175 .1806983 2.18 0.031 .035999 .7506359

k | .3214569 .0546692 5.88 0.000 .2133524 .4295614

kL1 | -.2087172 .0674584 -3.09 0.002 -.3421117 -.0753228

kL2 | -.0811552 .030786 -2.64 0.009 -.1420324 -.020278

ys | .5156912 .1862924 2.77 0.006 .1473108 .8840716

ysL1 | -.7065917 .2745098 -2.57 0.011 -1.249416 -.1637674

ysL2 | .2489473 .1450994 1.72 0.088 -.0379767 .5358714

yr1977 | 0 (omitted)

yr1978 | 0 (omitted)

yr1979 | .0161153 .0087992 1.83 0.069 -.0012845 .0335151

yr1980 | .0267825 .0153105 1.75 0.082 -.003493 .057058

yr1981 | -.0111743 .0255106 -0.44 0.662 -.0616197 .0392712

yr1982 | -.0017447 .0217911 -0.08 0.936 -.044835 .0413456

\_cons | -.1238146 .2952534 -0.42 0.676 -.7076579 .4600287

------------------------------------------------------------------------------

**(b)** *Estimar el modelo por FE. Computar los errores estándar robustos a heterocedasticidad y correlación serial.*

FE:

Fixed-effects (within) regression Number of obs = 632

Group variable: id Number of groups = 138

R-squared: Obs per group:

Within = 0.7708 min = 4

Between = 0.9706 avg = 4.6

Overall = 0.9674 max = 5

F(14,137) = 128.03

corr(u\_i, Xb) = 0.6273 Prob > F = 0.0000

(Std. err. adjusted for 138 clusters in id)

------------------------------------------------------------------------------

| Robust

n | Coefficient std. err. t P>|t| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 | .712259 .0546499 13.03 0.000 .6041925 .8203255

nL2 | -.2216269 .0557228 -3.98 0.000 -.3318149 -.1114389

w | -.504334 .1902322 -2.65 0.009 -.8805051 -.1281629

wL1 | .1750077 .1374862 1.27 0.205 -.0968619 .4468772

k | .3667223 .0660277 5.55 0.000 .2361571 .4972875

kL1 | -.0648159 .052492 -1.23 0.219 -.1686152 .0389834

kL2 | .0287852 .0412597 0.70 0.487 -.0528031 .1103735

ys | .5252203 .1803162 2.91 0.004 .1686574 .8817831

ysL1 | -.5622163 .2111979 -2.66 0.009 -.9798456 -.1445871

ysL2 | .1339081 .1695363 0.79 0.431 -.2013383 .4691544

yr1977 | 0 (omitted)

yr1978 | .0218097 .0273806 0.80 0.427 -.0323336 .0759531

yr1979 | .0241949 .0257897 0.94 0.350 -.0268024 .0751922

yr1980 | .0319888 .0201233 1.59 0.114 -.0078037 .0717813

yr1981 | -.0005961 .0168409 -0.04 0.972 -.0338978 .0327056

yr1982 | 0 (omitted)

\_cons | 1.248446 .8176095 1.53 0.129 -.3683202 2.865213

-------------+----------------------------------------------------------------

sigma\_u | .29806935

sigma\_e | .09040774

rho | .91575291 (fraction of variance due to u\_i)

------------------------------------------------------------------------------

**(c)** *Implementar el estimador de Anderson-Hsiao usando como instrumento.*

IV (Anderson-Hsiao):

Instrumental variables 2SLS regression Number of obs = 494

Wald chi2(13) = 14.10

Prob > chi2 = 0.3669

R-squared = .

Root MSE = .53695

------------------------------------------------------------------------------

D.n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

nL1 |

D1. | 5.823993 14.07042 0.41 0.679 -21.75353 33.40152

|

nL2 |

D1. | -.9846567 2.216574 -0.44 0.657 -5.329062 3.359749

|

w |

D1. | -.3323156 .4888956 -0.68 0.497 -1.290533 .6259022

|

wL1 |

D1. | 1.433551 3.563217 0.40 0.687 -5.550226 8.417328

|

k |

D1. | .0698672 .7653782 0.09 0.927 -1.430246 1.569981

|

kL1 |

D1. | -1.708326 4.482217 -0.38 0.703 -10.49331 7.076659

|

kL2 |

D1. | -.5052786 1.434586 -0.35 0.725 -3.317016 2.306459

|

ys |

D1. | 1.344045 1.935232 0.69 0.487 -2.448939 5.13703

|

ysL1 |

D1. | -2.722142 6.196766 -0.44 0.660 -14.86758 9.423296

|

ysL2 |

D1. | -.1505585 .837905 -0.18 0.857 -1.792822 1.491705

|

yr1977 |

D1. | 0 (omitted)

|

yr1978 |

D1. | .0677291 .381059 0.18 0.859 -.6791328 .814591

|

yr1979 |

D1. | .1150868 .3885855 0.30 0.767 -.6465268 .8767003

|

yr1980 |

D1. | .1093503 .2766837 0.40 0.693 -.4329398 .6516404

|

yr1981 |

D1. | 0 (omitted)

|

yr1982 |

D1. | 0 (omitted)

|

\_cons | .1190119 .350733 0.34 0.734 -.5684122 .806436

------------------------------------------------------------------------------

Instrumented: D.nL1

Instruments: D.nL2 D.w D.wL1 D.k D.kL1 D.kL2 D.ys D.ysL1 D.ysL2 D.yr1978

D.yr1979 D.yr1980 nL2

**(d)** *Estimar la ecuación de empleo usando el estimador de Arellano-Bond. Asumir que la única endogeneidad presente es en el rezago de la variable dependiente.*

GMM One-Step (Arellano-Bond):

Dynamic panel-data estimation, one-step difference GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 414

Time variable : year Number of groups = 138

Number of instruments = 20 Obs per group: min = 3

Wald chi2(0) = . avg = 3.00

Prob > chi2 = . max = 3

------------------------------------------------------------------------------

| Robust

n | Coefficient std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

n |

L1. | .5325962 .4060438 1.31 0.190 -.2632351 1.328428

L2. | -.1678165 .108895 -1.54 0.123 -.3812468 .0456137

|

w |

--. | -.5435347 .1878885 -2.89 0.004 -.9117894 -.1752799

L1. | .0465042 .2149028 0.22 0.829 -.3746976 .467706

|

k |

--. | .3597198 .0798932 4.50 0.000 .203132 .5163076

L1. | -.0203542 .1486021 -0.14 0.891 -.311609 .2709006

L2. | .0531949 .0564035 0.94 0.346 -.0573539 .1637438

|

ys |

--. | .6720783 .1618321 4.15 0.000 .3548932 .9892634

L1. | -.3962257 .2155005 -1.84 0.066 -.818599 .0261475

L2. | -.061621 .1883471 -0.33 0.744 -.4307746 .3075325

|

yr1979 | -.0019098 .0289454 -0.07 0.947 -.0586417 .0548221

yr1980 | .0153498 .0194 0.79 0.429 -.0226734 .0533731

yr1982 | -.0047222 .0199879 -0.24 0.813 -.0438977 .0344534

------------------------------------------------------------------------------

Instruments for first differences equation

Standard

D.(w L.w k L.k L2.k ys L.ys L2.ys yr1977 yr1978 yr1979 yr1980 yr1981

yr1982)

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -0.93 Pr > z = 0.351

Arellano-Bond test for AR(2) in first differences: z = -1.57 Pr > z = 0.117

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(7) = 18.99 Prob > chi2 = 0.008

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(7) = 12.33 Prob > chi2 = 0.090

(Robust, but weakened by many instruments.)

GMM Two-Step (Arellano-Bond):

Dynamic panel-data estimation, two-step difference GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 414

Time variable : year Number of groups = 138

Number of instruments = 20 Obs per group: min = 3

Wald chi2(0) = . avg = 3.00

Prob > chi2 = . max = 3

------------------------------------------------------------------------------

| Corrected

n | Coefficient std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

n |

L1. | .6080291 .6739661 0.90 0.367 -.7129203 1.928978

L2. | -.137942 .1688863 -0.82 0.414 -.468953 .1930691

|

w |

--. | -.4912924 .2335444 -2.10 0.035 -.949031 -.0335539

L1. | .1263267 .2293468 0.55 0.582 -.3231847 .5758381

|

k |

--. | .2912765 .0889614 3.27 0.001 .1169154 .4656376

L1. | -.0170639 .219071 -0.08 0.938 -.4464351 .4123073

L2. | .0263268 .0736175 0.36 0.721 -.1179608 .1706145

|

ys |

--. | .5452599 .1895989 2.88 0.004 .1736528 .916867

L1. | -.307353 .2411337 -1.27 0.202 -.7799662 .1652603

L2. | -.1253987 .2036039 -0.62 0.538 -.524455 .2736577

|

yr1979 | .008789 .0360821 0.24 0.808 -.0619306 .0795087

yr1980 | .0244669 .0224526 1.09 0.276 -.0195394 .0684731

yr1982 | -.0189478 .0283143 -0.67 0.503 -.0744428 .0365472

------------------------------------------------------------------------------

Instruments for first differences equation

Standard

D.(w L.w k L.k L2.k ys L.ys L2.ys yr1977 yr1978 yr1979 yr1980 yr1981

yr1982)

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).L.n

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -0.64 Pr > z = 0.523

Arellano-Bond test for AR(2) in first differences: z = -1.41 Pr > z = 0.159

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(7) = 18.99 Prob > chi2 = 0.008

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(7) = 12.33 Prob > chi2 = 0.090

(Robust, but weakened by many instruments.)

**(e)** *Ahora, considerar, como hicieron Blundell y Bond (1998), que los salarios y el stock de capital no deben tomarse como estrictamente exógenos en este contexto (como se hizo en los modelos anteriores). Reestimar el modelo usando el estimador de A-B y considerando a los salarios y al stock de capital como regresores secuencialmente exógenos.*

GMM One-Step (Arellano-Bond):

Dynamic panel-data estimation, one-step difference GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 414

Time variable : year Number of groups = 138

Number of instruments = 33 Obs per group: min = 3

Wald chi2(0) = . avg = 3.00

Prob > chi2 = . max = 3

------------------------------------------------------------------------------

| Robust

n | Coefficient std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

n |

L1. | .8328315 .1219725 6.83 0.000 .5937698 1.071893

L2. | -.1640736 .0770492 -2.13 0.033 -.3150873 -.0130599

|

w |

--. | -.5056556 .3148758 -1.61 0.108 -1.122801 .1114896

L1. | .2750362 .3347117 0.82 0.411 -.3809867 .931059

|

k |

--. | .3384097 .1810356 1.87 0.062 -.0164135 .6932329

L1. | -.2157422 .1197218 -1.80 0.072 -.4503925 .0189082

L2. | -.0006972 .0481602 -0.01 0.988 -.0950895 .0936951

|

ys |

--. | .7245478 .2528721 2.87 0.004 .2289276 1.220168

L1. | -.5540143 .4752081 -1.17 0.244 -1.485405 .3773765

L2. | .0545983 .2887007 0.19 0.850 -.5112447 .6204413

|

yr1979 | -.0061002 .0303218 -0.20 0.841 -.0655299 .0533295

yr1980 | .0188299 .0214161 0.88 0.379 -.0231449 .0608046

yr1982 | -.0067336 .0217373 -0.31 0.757 -.049338 .0358708

------------------------------------------------------------------------------

Instruments for first differences equation

Standard

D.(ys L.ys L2.ys yr1977 yr1978 yr1979 yr1980 yr1981 yr1982)

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).(L.n L.w L.k)

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -3.83 Pr > z = 0.000

Arellano-Bond test for AR(2) in first differences: z = -2.12 Pr > z = 0.034

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(20) = 38.36 Prob > chi2 = 0.008

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(20) = 22.98 Prob > chi2 = 0.290

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

iv(ys L.ys L2.ys yr1977 yr1978 yr1979 yr1980 yr1981 yr1982)

Hansen test excluding group: chi2(14) = 14.84 Prob > chi2 = 0.389

Difference (null H = exogenous): chi2(6) = 8.14 Prob > chi2 = 0.228

GMM Two-Step (Arellano-Bond):

Dynamic panel-data estimation, two-step difference GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 414

Time variable : year Number of groups = 138

Number of instruments = 33 Obs per group: min = 3

Wald chi2(0) = . avg = 3.00

Prob > chi2 = . max = 3

------------------------------------------------------------------------------

| Corrected

n | Coefficient std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

n |

L1. | .9403457 .1894156 4.96 0.000 .5690979 1.311593

L2. | -.1526986 .0928117 -1.65 0.100 -.3346062 .029209

|

w |

--. | -.4490707 .3993756 -1.12 0.261 -1.231833 .3336911

L1. | .3385343 .3136958 1.08 0.281 -.2762982 .9533668

|

k |

--. | .1701686 .2126183 0.80 0.424 -.2465556 .5868928

L1. | -.2258957 .1315513 -1.72 0.086 -.4837316 .0319401

L2. | -.0419358 .0564683 -0.74 0.458 -.1526117 .0687401

|

ys |

--. | .689388 .2434718 2.83 0.005 .2121921 1.166584

L1. | -.5276126 .4812107 -1.10 0.273 -1.470768 .4155429

L2. | .1320996 .2419835 0.55 0.585 -.3421794 .6063786

|

yr1979 | .0193174 .0342941 0.56 0.573 -.0478977 .0865326

yr1980 | .0379698 .0228282 1.66 0.096 -.0067727 .0827124

yr1982 | -.0206929 .0242533 -0.85 0.394 -.0682285 .0268427

------------------------------------------------------------------------------

Instruments for first differences equation

Standard

D.(ys L.ys L2.ys yr1977 yr1978 yr1979 yr1980 yr1981 yr1982)

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).(L.n L.w L.k)

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -2.47 Pr > z = 0.014

Arellano-Bond test for AR(2) in first differences: z = -1.74 Pr > z = 0.081

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(20) = 38.36 Prob > chi2 = 0.008

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(20) = 22.98 Prob > chi2 = 0.290

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

iv(ys L.ys L2.ys yr1977 yr1978 yr1979 yr1980 yr1981 yr1982)

Hansen test excluding group: chi2(14) = 14.84 Prob > chi2 = 0.389

Difference (null H = exogenous): chi2(6) = 8.14 Prob > chi2 = 0.228

**(f)** *Adicionalmente, Blundell y Bond (1998) eliminan de su modelo los rezagos más largos (de dos períodos) del empleo y el capital y prescinden del nivel de producto agregado sectorial. Considerando esta cuestión, computar el estimador de Blundell-Bond.*

SGMM One-Step (Blundell-Bond):

Dynamic panel-data estimation, one-step system GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 690

Time variable : year Number of groups = 138

Number of instruments = 47 Obs per group: min = 5

Wald chi2(9) = 37427.45 avg = 5.00

Prob > chi2 = 0.000 max = 5

------------------------------------------------------------------------------

| Robust

n | Coefficient std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

n |

L1. | .9025721 .0412484 21.88 0.000 .8217267 .9834175

|

w |

--. | -.5397871 .1984403 -2.72 0.007 -.928723 -.1508513

L1. | .3047706 .1800251 1.69 0.090 -.0480722 .6576134

|

k |

--. | .4734141 .0900715 5.26 0.000 .2968772 .6499511

L1. | -.3942878 .086912 -4.54 0.000 -.5646322 -.2239433

|

yr1978 | .0347845 .0217776 1.60 0.110 -.0078988 .0774678

yr1979 | .044848 .0173516 2.58 0.010 .0108395 .0788565

yr1980 | .0291248 .0171671 1.70 0.090 -.004522 .0627716

yr1982 | .0333513 .0144621 2.31 0.021 .0050062 .0616964

\_cons | .8194633 .3304982 2.48 0.013 .1716988 1.467228

------------------------------------------------------------------------------

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).(L.n L.w L.k)

Instruments for levels equation

Standard

yr1977 yr1978 yr1979 yr1980 yr1981 yr1982

\_cons

GMM-type (missing=0, separate instruments for each period unless collapsed)

D.(L.n L.w L.k)

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -4.61 Pr > z = 0.000

Arellano-Bond test for AR(2) in first differences: z = -1.18 Pr > z = 0.238

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(37) = 86.05 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(37) = 52.82 Prob > chi2 = 0.044

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

GMM instruments for levels

Hansen test excluding group: chi2(25) = 35.67 Prob > chi2 = 0.077

Difference (null H = exogenous): chi2(12) = 17.15 Prob > chi2 = 0.144

iv(yr1977 yr1978 yr1979 yr1980 yr1981 yr1982, eq(level))

Hansen test excluding group: chi2(33) = 44.68 Prob > chi2 = 0.084

Difference (null H = exogenous): chi2(4) = 8.14 Prob > chi2 = 0.087

SGMM Two-Step (Blundell-Bond):

Dynamic panel-data estimation, two-step system GMM

------------------------------------------------------------------------------

Group variable: id Number of obs = 690

Time variable : year Number of groups = 138

Number of instruments = 47 Obs per group: min = 5

Wald chi2(9) = 30749.14 avg = 5.00

Prob > chi2 = 0.000 max = 5

------------------------------------------------------------------------------

| Corrected

n | Coefficient std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

n |

L1. | .892057 .0524149 17.02 0.000 .7893258 .9947883

|

w |

--. | -.4138471 .2405795 -1.72 0.085 -.8853744 .0576801

L1. | .23221 .1663529 1.40 0.163 -.0938358 .5582558

|

k |

--. | .4563271 .1222931 3.73 0.000 .2166371 .6960171

L1. | -.3582417 .1210988 -2.96 0.003 -.595591 -.1208924

|

yr1978 | .0405244 .0265643 1.53 0.127 -.0115406 .0925895

yr1979 | .0513874 .0198615 2.59 0.010 .0124596 .0903151

yr1980 | .0296077 .0200915 1.47 0.141 -.0097708 .0689863

yr1982 | .0290802 .014089 2.06 0.039 .0014662 .0566942

\_cons | .6712912 .3744471 1.79 0.073 -.0626117 1.405194

------------------------------------------------------------------------------

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/5).(L.n L.w L.k)

Instruments for levels equation

Standard

yr1977 yr1978 yr1979 yr1980 yr1981 yr1982

\_cons

GMM-type (missing=0, separate instruments for each period unless collapsed)

D.(L.n L.w L.k)

------------------------------------------------------------------------------

Arellano-Bond test for AR(1) in first differences: z = -4.46 Pr > z = 0.000

Arellano-Bond test for AR(2) in first differences: z = -1.27 Pr > z = 0.203

------------------------------------------------------------------------------

Sargan test of overid. restrictions: chi2(37) = 86.05 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(37) = 52.82 Prob > chi2 = 0.044

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

GMM instruments for levels

Hansen test excluding group: chi2(25) = 35.67 Prob > chi2 = 0.077

Difference (null H = exogenous): chi2(12) = 17.15 Prob > chi2 = 0.144

iv(yr1977 yr1978 yr1979 yr1980 yr1981 yr1982, eq(level))

Hansen test excluding group: chi2(33) = 44.68 Prob > chi2 = 0.084

Difference (null H = exogenous): chi2(4) = 8.14 Prob > chi2 = 0.087

**Ejercicio 3.**

*Cuando hay muchos instrumentos, surgen dos problemas principales:*

* *Sobreestimación (overfitting) de la variable endógena.*
* *Mala estimación de la matriz de pesos W.*

*En estos casos, se proponen las siguientes soluciones:*

* *Probar diferentes especificaciones de IV recortando el número de rezagos en la matriz de instrumentos Z.*
* *Colapsar/combinar instrumentos. Se modifica la matriz de instrumentos para el individuo i:*

*= .*

*Si el modelo funciona, debería dar resultados similares con distintos instrumentos. Retomar el Ejercicio 2.e para ver una aplicación de esta cuestión. Estimar el modelo de empleo restringiendo el máximo rezago a 3 y 4 períodos. Por último, estimar el modelo colapsando instrumentos. Analizar si los resultados obtenidos son robustos.*

Tabla comparativa:

--------------------------------------------------------------------------------------------------------------------------------------------

(1) (2) (3) (4) (5) (6) (7) (8)

GMM (OS) 2 GMM (TS) 2 GMM (OS) 3 GMM (TS) 3 GMM (OS) 4 GMM (TS) 4 GMM (OS) 5 GMM (TS) 5

--------------------------------------------------------------------------------------------------------------------------------------------

nL1 0.833\*\*\* 0.940\*\*\* 0.949\*\*\* 0.900\*\*\* 0.847\*\*\* 0.930\*\*\* 1.108\*\*\* 0.877\*

(0.122) (0.189) (0.182) (0.226) (0.121) (0.174) (0.387) (0.455)

--------------------------------------------------------------------------------------------------------------------------------------------

N 414 414 414 414 414 414 414 414

--------------------------------------------------------------------------------------------------------------------------------------------

Standard errors in parentheses

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

**Ejercicio 4.**

*Considerar, nuevamente, el modelo del primer ejercicio. Obtener el estimador LSDVC propuesto por Kiviet (1995) a partir del comando xtlsdvc. Luego, estimar la matriz de varianzas y covarianzas de los coeficientes de Kiviet siguiendo el procedimiento explicado en clase.*

LSDVC (Kiviet):

LSDVC dynamic regression

(SE not computed)

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

n |

L1. | .9890308 . . . . .

------------------------------------------------------------------------------

LSDVC (Kiviet):

LSDVC dynamic regression

(SE not computed)

------------------------------------------------------------------------------

n | Coefficient Std. err. z P>|z| [95% conf. interval]

-------------+----------------------------------------------------------------

n |

L1. | .7863675 . . . . .

|

yr1978 | .1430045 . . . . .

yr1979 | .1365801 . . . . .

yr1980 | .0957011 . . . . .

yr1981 | .0105706 . . . . .

------------------------------------------------------------------------------