

Assignment 7 Panel Data

The study on capital structure of Thai companies listed in the stock exchange market of Thailand (SET) employs the following regression models:

1. Panel Data Model

$$y_{it} = \alpha + \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_3 x_{3it} + \beta_4 x_{4it} + \beta_5 x_{5it} + \beta_6 x_{6it} + \beta_7 x_{7it} + u_{it} \quad (1)$$

where:

y_{it} = leverage of firm i in year t

x_{1it} = size of firm determined by log of total revenue

x_{2it} = tangibles asset of the firm determined by log of tangible assets plus inventories divided by total book assets

x_{3it} = profitability index determined by return on assets

x_{4it} = non-debt tax shields determined by depreciation divided by total assets

x_{5it} = growth rate of the firm determined by book value of asset plus market value of equity minus book value of equity then divided by book value of asset

x_{6it} = risk of the firm determined by square of deviation from mean of return on asset at period t

x_{7it} = dividend payment equals to 1 if firm paid dividend at period t or equals to 0 if no dividend paid

2. Fixed Effects Model

$$y_{it} = \alpha_i + \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_3 x_{3it} + \beta_4 x_{4it} + \beta_5 x_{5it} + \beta_6 x_{6it} + \beta_7 x_{7it} + u_{it} \quad (2)$$

where:

α_i = Cross-sectional fixed effects

3. Random Effects Model

$$y_{it} = \alpha + \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_3 x_{3it} + \beta_4 x_{4it} + \beta_5 x_{5it} + \beta_6 x_{6it} + \beta_7 x_{7it} + u_{it} \quad (3)$$

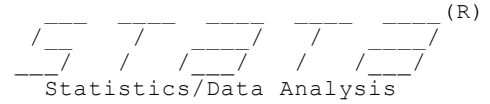
and $u_{it} = v_i + \varepsilon_{it}$

where: v_i = Cross-section random effects

ε_{it} = residual terms

From the given data set (`assign7.dta`):

- Estimate model (1) using Panel Least Squares estimation method and PGLS assuming Heteroskedasticity, and test whether there exists Heteroskedasticity problem.
- Estimate the **above three models including Panel Least Squares model, Fixed effects model, and Random-effects model**. Perform fixed effects tests and random effects test, also state null hypothesis of the tests. Then, determine the most appropriated model. Also, give explanation of the choosing criterion (perform the tests), and make interpretation of the estimated models.



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 log: C:\Users\Pongpanot\Downloads\ASS7.smcl
 log type: smcl
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```
1 . xtset crossid time
    panel variable: crossid (strongly balanced)
    time variable: time, 40 to 44
    delta: 1 year
```

```
2 . reg y x1 x2 x3 x4 x5 x6 x7
```

Source	SS	df	MS	Number of obs =	1,275
Model	37.9375371	7	5.41964815	F(7, 1267)	= 127.76
Residual	53.7478325	1,267	.042421336	Prob > F	= 0.0000
				R-squared	= 0.4138
				Adj R-squared	= 0.4105
Total	91.6853695	1,274	.071966538	Root MSE	= .20596

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
x1	.0794732	.0094177	8.44	0.000	.0609972	.0979492
x2	.0183375	.0051583	3.55	0.000	.0082177	.0284572
x3	.0977707	.0527988	1.85	0.064	-.005812	.2013535
x4	.0873838	.2192954	0.40	0.690	-.3428383	.517606
x5	-.1076457	.0069432	-15.50	0.000	-.1212671	-.0940243
x6	-.1432493	.01874	-7.64	0.000	-.1800142	-.1064845
x7	-.2712849	.0120328	-22.55	0.000	-.2948913	-.2476786
_cons	-.0107965	.0863053	-0.13	0.900	-.1801134	.1585205

```
3 . xtreg y x1 x2 x3 x4 x5 x6 x7, fe
```

Fixed-effects (within) regression
 Group variable: crossid
 Number of obs = 1,275
 Number of groups = 255

R-sq: within = 0.3772
 between = 0.1103
 overall = 0.1644
 Obs per group: min = 5
 avg = 5.0
 max = 5

corr(u_i, Xb) = -0.2003
 F(7, 1013) = 87.64
 Prob > F = 0.0000

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
x1	-.1256447	.0180942	-6.94	0.000	-.161151	-.0901384
x2	.0123739	.008023	1.54	0.123	-.0033697	.0281176
x3	.0747825	.039773	1.88	0.060	-.0032643	.1528293
x4	.6493144	.2855092	2.27	0.023	.0890573	1.209572
x5	-.1104883	.0061097	-18.08	0.000	-.1224773	-.0984992
x6	-.1461423	.0141035	-10.36	0.000	-.1738178	-.1184669
x7	-.0951497	.0121853	-7.81	0.000	-.1190611	-.0712383
_cons	1.756067	.1658407	10.59	0.000	1.430636	2.081497

sigma_u	.22676694					
sigma_e	.11725953					
rho	.78902632	(fraction of variance due to u_i)				

F test that all u_i=0: F(254, 1013) = 11.40 Prob > F = 0.0000

```

4 . estimates store fixed
5 . predict y_fe, xbu
6 . predict ai, u
7 . table crossid , c(mean ai)

```

CROSSID	mean(ai)
1	.1179877
2	-.0688583
3	-.3076372
4	-.3847394
5	.1860881
6	-.0691241
7	.2993367
8	-.1167426
9	-.3042506
10	.2812602
11	.0625951
12	.3002143
13	.0591167
14	.0947033
15	.3564131
16	-.2273619
17	-.2720726
18	.1593111
19	.2946341
20	-.3028748
21	-.5444298
22	-.075842
23	-.0552248
24	.3965797
25	.0508951
26	-.3491979
27	-.1875699
28	.2317366
29	-.3023256
30	-.1073962
31	.283464
32	.0178973
33	.0863213
34	-.2098946
35	.1166871
36	-.0564318
37	.2353057
38	-.33442
39	.1985804
40	-.1262242
41	.1992234
42	-.1025281
43	-.0903486
44	-.0511456
45	-.1374054
46	.2790801
47	-.0331355
48	.1874332
49	.2953667
50	.2069916
51	.0622689
52	-.1173871
53	.0328878
54	-.3170947
55	.2136027
56	-.2469867

57	-.0802104
58	-.273037
59	.0832633
60	-.2707515
61	-.1536239
62	.1868865
63	-.168611
64	.2368186
65	-.1493501
66	-.1689323
67	.2323093
68	.1366055
69	-.205924
70	.11148
71	-.213541
72	-.2123275
73	.2610708
74	.1955792
75	.0374835
76	.2456527
77	-.4317304
78	-.0296581
79	-.0558108
80	-.131119
81	.0754021
82	.1839097
83	-.294273
84	.1697147
85	-.0818064
86	.3012981
87	-.2370235
88	-.2421173
89	.1993015
90	.079109
91	.274037
92	.2844306
93	.3790213
94	.1146499
95	.2125908
96	.0073188
97	.1857645
98	.0545105
99	.312327
100	-.2591561
101	.1572106
102	-.1645625
103	.0935633
104	-.1274652
105	-.0243396
106	-.2275865
107	-.0841879
108	.1616827
109	-.0303212
110	.1971905
111	-.0024535
112	-.308773
113	-.0417285
114	.2486805
115	-.1324236
116	-.3823357
117	-.1857197
118	-.4836546
119	-.0487107
120	.0721546
121	-.1197235
122	.0883395
123	.2009159

124	-.0237417
125	.2038743
126	-.034487
127	.0909755
128	-.0223108
129	.1242109
130	.3631682
131	.4055254
132	.1665071
133	-.0159082
134	-.0216812
135	-.046606
136	.4397194
137	.2802401
138	.2728052
139	.0933884
140	-.334188
141	-.1277287
142	.0729046
143	.0990436
144	.2362383
145	-.4735954
146	.0178514
147	-.0200448
148	.0625943
149	.1971359
150	.0645117
151	.0182246
152	.1665388
153	.254573
154	.3451733
155	.2273609
156	-.0581791
157	-.079919
158	-.119292
159	.064468
160	.1471561
161	.0785254
162	-.0450562
163	-.3095208
164	.0483383
165	.0960483
166	.492102
167	.0187869
168	-.2272806
169	-.2576004
170	.1824461
171	.3723981
172	.1678091
173	-.1965343
174	.0848485
175	.0646448
176	-.064675
177	.1916314
178	-.0401438
179	.2753257
180	.2018917
181	.1524691
182	.2037826
183	-.0652892
184	.2111544
185	.2679104
186	.1341272
187	-.1363719
188	-.3761334
189	.0196812
190	.0639722

191	-.2928044
192	-.3454445
193	-.278348
194	.0767552
195	.0375085
196	-.0312761
197	.07977
198	-.1913502
199	-.2867734
200	.1707745
201	-.3870632
202	-.2563513
203	-.0922752
204	-.1404833
205	-.3388946
206	.2703579
207	-.2208357
208	-.0263273
209	.0639384
210	-.3288249
211	-.3156894
212	-.4391288
213	-.0343149
214	-.5958523
215	-.2798052
216	-.1075037
217	-.1778713
218	-.4965972
219	-.0763658
220	-.0142669
221	-.2349915
222	-.2612036
223	.1426281
224	-.3496795
225	.0822377
226	.4187857
227	.1919504
228	-.5135269
229	.1946076
230	-.0813862
231	-.5152081
232	.7889794
233	-.3993402
234	.1302106
235	-.2250371
236	.2266397
237	.378013
238	.0690148
239	-.0715341
240	-.1565461
241	.191928
242	-.0200206
243	.0779399
244	-.1765512
245	-.0967001
246	-.1063667
247	-.0097393
248	.1739514
249	.3129217
250	.0874324
251	-.0805677
252	.0997599
253	-.0563064
254	.3276982
255	.3049391

8 . xtreg y x1 x2 x3 x4 x5 x6 x7, re

```

Random-effects GLS regression           Number of obs   =    1,275
Group variable: crossid                Number of groups =     255

R-sq:                                    Obs per group:
    within = 0.3492                       min =           5
    between = 0.3404                       avg =          5.0
    overall = 0.3377                       max =           5

corr(u_i, X) = 0 (assumed)                Wald chi2(7)     =    663.43
                                                Prob > chi2      =     0.0000
    
```

y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
x1	-.0145018	.0133366	-1.09	0.277	-.040641 .0116375	
x2	.0146948	.0064463	2.28	0.023	.0020604 .0273292	
x3	.0985565	.0399464	2.47	0.014	.020263 .1768501	
x4	.4693539	.2493856	1.88	0.060	-.0194329 .9581407	
x5	-.1117985	.005959	-18.76	0.000	-.1234779 -.100119	
x6	-.1541318	.014125	-10.91	0.000	-.1818163 -.1264472	
x7	-.1494529	.0115006	-13.00	0.000	-.1719937 -.1269122	
_cons	.7714573	.1226841	6.29	0.000	.5310009 1.011914	
sigma_u	.15944933					
sigma_e	.11725953					
rho	.64900604	(fraction of variance due to u_i)				

9 . estimates store random

10 . predict y_re, xbu

11 . predict ri, u

12 . table crossid , c(mean ri)

CROSSID	mean(ri)
1	.0887309
2	-.0772131
3	-.2941025
4	-.303993
5	.0610583
6	-.0480735
7	.2847414
8	-.1467772
9	-.260304
10	.201722
11	.0745034
12	.2322129
13	.0547399
14	.0730161
15	.252516
16	-.257033
17	-.1992955
18	.1135974
19	.2556412
20	-.2162569
21	-.2778253
22	-.0108889
23	-.0615342
24	.3087698
25	.0889791
26	-.2690791

27	-.1575273
28	.2083569
29	-.2559611
30	-.0877486
31	.3198622
32	-.0570609
33	.0730698
34	-.2145337
35	.0939902
36	-.1165269
37	.1571742
38	-.2387038
39	.1382089
40	-.1337869
41	.1664483
42	-.0111363
43	-.0141485
44	-.0459966
45	-.1249762
46	.2338298
47	-.090727
48	.1380407
49	.2966444
50	.2396441
51	.0526386
52	-.0607271
53	.0199196
54	-.2447201
55	.1139673
56	-.2098732
57	-.0690802
58	-.2788376
59	.0695586
60	-.2229899
61	-.1054854
62	.1915002
63	-.0901907
64	.2032366
65	-.1564789
66	-.1570447
67	.1733939
68	.1737497
69	-.1739035
70	.087604
71	-.1790737
72	-.1524394
73	.2465263
74	.1560543
75	-.008872
76	.2641704
77	-.3190178
78	.01083
79	-.0367801
80	-.1300188
81	.064486
82	.111428
83	-.2496971
84	.1209326
85	-.0871061
86	.2722191
87	-.1932432
88	-.2245077
89	.1724562
90	.0451844
91	.2262525
92	.1218001
93	.2781525

94	.1512118
95	.234661
96	.0258916
97	.046972
98	-.0115294
99	.1273077
100	-.2486487
101	.0704314
102	-.1069269
103	.0613136
104	-.0672899
105	-.1041363
106	-.1469192
107	-.0109335
108	.1395624
109	-.0113743
110	.137117
111	.0099068
112	-.2021984
113	.0039555
114	.1883977
115	-.0660144
116	-.2832918
117	-.0990658
118	-.3787253
119	-.0584207
120	.0718256
121	-.0921068
122	.0855275
123	.0911205
124	-.1083447
125	.1828887
126	-.041798
127	.0115437
128	.0032933
129	.1001256
130	.1884265
131	.3509527
132	.1213398
133	-.0267641
134	-.0187087
135	-.054906
136	.3379354
137	.1794541
138	.2017993
139	.0752595
140	-.2359992
141	-.1066319
142	.0789554
143	.0294092
144	.2110179
145	-.3121997
146	-.0773436
147	-.0128643
148	.0647492
149	.1715278
150	.0713629
151	.0262807
152	.1045906
153	.171277
154	.3557077
155	.1521361
156	-.0366046
157	-.0340266
158	-.0461098
159	.0354666
160	.1034293

161	.0037919
162	-.0035091
163	-.2110045
164	.0941578
165	.0552175
166	.2534954
167	.048703
168	-.2103911
169	-.2087771
170	.1503265
171	.1031911
172	.043863
173	-.2131911
174	.1286456
175	.002796
176	-.1227492
177	.0373377
178	-.0730118
179	.2775249
180	.1301143
181	.0770061
182	.06309
183	.0266525
184	.1051872
185	.2179077
186	.1328993
187	-.106024
188	-.3074846
189	.0261331
190	.0611958
191	-.183354
192	-.214559
193	-.1583034
194	.1654267
195	.057943
196	-.0241249
197	.0377754
198	-.1176052
199	-.2192102
200	.1644883
201	-.2546277
202	-.19455
203	-.0874069
204	-.0766507
205	-.2753781
206	.3576378
207	-.1686609
208	-.0172088
209	.041629
210	-.2293983
211	-.1570497
212	-.3441758
213	.0033839
214	-.4100606
215	-.2284046
216	-.0372125
217	-.1090696
218	-.3476793
219	-.0446954
220	.0474905
221	-.1589897
222	-.1895518
223	.1637635
224	-.2935108
225	.1355649
226	.3506207
227	.188049

```

228 | -.2811113
229 | .1710765
230 | -.0902586
231 | -.3310963
232 | .5411432
233 | -.2459162
234 | .1235347
235 | -.0996545
236 | .0914115
237 | .2921195
238 | -.0506965
239 | -.0214294
240 | -.0964207
241 | .1652538
242 | -.0308394
243 | .003913
244 | -.1854613
245 | -.141938
246 | -.0311122
247 | -.061996
248 | .1524523
249 | .2552815
250 | .0917869
251 | -.0467202
252 | .0263516
253 | -.1062188
254 | .1740169
255 | .1925889

```

13 . hausman random fixed

	Coefficients			sqrt(diag(V_b-V_B)) S.E.
	(b) random	(B) fixed	(b-B) Difference	
x1	-.0145018	-.1256447	.1111429	.
x2	.0146948	.0123739	.0023208	.
x3	.0985565	.0747825	.0237741	.0037189
x4	.4693539	.6493144	-.1799605	.
x5	-.1117985	-.1104883	-.0013102	.
x6	-.1541318	-.1461423	-.0079894	.0007791
x7	-.1494529	-.0951497	-.0543033	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= -190.39 chi2<0 ==> model fitted on these
data fails to meet the asymptotic
assumptions of the Hausman test;
see suest for a generalized test

14 . log close
name: <unnamed>
log: C:\Users\Pongpanot\Downloads\ASS7.smcl
log type: smcl
closed on: 18 Mar 2021, 04:12:27