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ACG5906

Econometrics

11/17/2024

Assignment 4

a. OLS coefficients are reported below

y	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
x1	-29867.17	35579.26	-0.84	0.401	-99602.93	39868.6
x2	1136.264	64.23775	17.69	0.000	1010.357	1262.171
x3	1066.092	63.04285	16.91	0.000	942.5272	1189.657
x4	314.7564	143.8341	2.19	0.029	32.83993	596.6728
x5	-5297.765	5767.21	-0.92	0.358	-16601.56	6006.032
x6	35.74171	288.07	0.12	0.901	-528.8787	600.3621
x7	324.5242	34.09117	9.52	0.000	257.7051	391.3432
x8	-143.6397	57.71279	-2.49	0.013	-256.7574	-30.52195
x9	12162.68	5776.333	2.11	0.035	841.0037	23484.36
x10	-6793.045	5770.938	-1.18	0.239	-18104.15	4518.059
_cons	44134.74	1156.14	38.17	0.000	41868.69	46400.79

b. Using robust standard errors (estimates below) does not change the coefficient estimates (as expected) but the standard errors are much larger when using robust. This is likely due to heteroskedasticity of the data.

y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
x1	-29867.17	35941.26	-0.83	0.406	-100312.4	40578.12
x2	1136.264	134.9289	8.42	0.000	871.8019	1400.726
x3	1066.092	133.054	8.01	0.000	805.3045	1326.879
x4	314.7564	171.1514	1.84	0.066	-20.70245	650.2152
x5	-5297.765	5741.956	-0.92	0.356	-16552.06	5956.534
x6	35.74171	348.6234	0.10	0.918	-647.5641	719.0475
x7	324.5242	40.33567	8.05	0.000	245.4658	403.5825
x8	-143.6397	63.56711	-2.26	0.024	-268.2319	-19.04742
x9	12162.68	5798.404	2.10	0.036	797.7441	23527.62
x10	-6793.045	5792.654	-1.17	0.241	-18146.71	4560.623
_cons	44134.74	1940.74	22.74	0.000	40330.87	47938.61

c. Coefficient of x1 with time and id fixed effects are reported below

y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
x1	-.0933842	2.931312	-0.03	0.975	-5.838804	5.652036
x2	1.998511	.0053486	373.65	0.000	1.988028	2.008995
x3	-3.995906	.0058014	-688.79	0.000	-4.007277	-3.984535
x4	-.0142484	.0115826	-1.23	0.219	-.0369505	.0084537
x5	.3065786	.4740587	0.65	0.518	-.6225844	1.235742
x6	2.001686	.0231406	86.50	0.000	1.95633	2.047042
x7	1.997075	.0027274	732.23	0.000	1.99173	2.002421
x8	-.0030103	.0047028	-0.64	0.522	-.0122279	.0062073
x9	-.5418248	.4752545	-1.14	0.254	-1.473332	.389682
x10	-.0729902	.4720059	-0.15	0.877	-.9981297	.8521493
_cons	71001.71	.100159	7.1e+05	0.000	71001.51	71001.9

d. The closest true betas are reported in the table below with associated controls, note the second table has the lowest combined error (distance1+distance2), and those are the controls used for parts e and f.

tuple	beta1	beta2
x6	-3.0069	2.762576
x2 x6	-3.0069	2.762576
x3 x5 x6 x7 x8	-1.3889	1.998527

Lowest combined error		
tuple	beta1	beta2
x3 x6 x7	-2.97379	1.998497

e. OLS coefficients including a linear time trend and id fixed effect are reported below. Including the time trend gives us a closer estimate for beta 1 and a lower standard error, but a slightly worse estimate for beta 2.

y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
x1	-2.98802	.1544881	-19.34	0.000	-3.290819	-2.68522
x2	1.895827	.0097765	193.92	0.000	1.876665	1.914989
x3	-3.796803	.0102169	-371.62	0.000	-3.816828	-3.776778
x6	2.009965	.0428104	46.95	0.000	1.926056	2.093874
x7	2.007511	.0051124	392.67	0.000	1.99749	2.017531
t	-17.11814	.0319184	-536.31	0.000	-17.1807	-17.05558
_cons	71094.82	.2489827	2.9e+05	0.000	71094.33	71095.31

f. OLS coefficients including a non-linear time trend and id fixed effect are reported below. This model gives us the absolute lowest standard errors.

y	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
x1	-2.972191	.0878595	-33.83	0.000	-3.144397	-2.799985
x2	1.979848	.005451	363.21	0.000	1.969164	1.990532
x3	-3.938134	.0057255	-687.83	0.000	-3.949356	-3.926912
x6	2.003558	.0243361	82.33	0.000	1.955859	2.051257
x7	1.999166	.002894	690.79	0.000	1.993493	2.004838
tsquared	-1.571195	.0014841	-1058.65	0.000	-1.574104	-1.568286
_cons	71061.79	.11212	6.3e+05	0.000	71061.57	71062.01

Part d. control variable table

tuple	beta1	beta2	beta1_diff	beta2_diff	combined difference
x8	3.011838	2.761267	6.011838	0.761267	6.773105
x7	3.041214	2.408979	6.041214	0.408979	6.450193
x6	-3.0069	2.762576	0.006901	0.762576	0.769477
x5	16.24085	2.761192	19.24085	0.761192	20.00204
x4	2.890648	2.76113	5.890647	0.76113	6.651777
x3	2.846467	2.350405	5.846467	0.350405	6.196872
x2	2.850658	2.761152	5.850658	0.761152	6.61181
x7 x8	3.374378	2.409198	6.374378	0.409198	6.783576
x6 x8	-2.87444	2.762668	0.125563	0.762668	0.888232
x6 x7	-2.70585	2.410463	0.294151	0.410463	0.704614
x5 x8	16.43969	2.761307	19.43969	0.761307	20.201
x5 x7	10.84246	2.409007	13.84246	0.409007	14.25147
x5 x6	9.813138	2.762613	12.81314	0.762613	13.57575
x4 x8	3.051865	2.761244	6.051865	0.761244	6.813109
x4 x7	3.038634	2.40898	6.038634	0.40898	6.447614
x4 x6	-2.96664	2.762553	0.033361	0.762553	0.795913
x4 x5	16.21158	2.761169	19.21158	0.761169	19.97275
x3 x8	2.735533	2.350315	5.735533	0.350315	6.085848
x3 x7	3.037266	1.99721	6.037266	0.00279	6.040056
x3 x6	-3.27488	2.351623	0.274875	0.351623	0.626498
x3 x5	10.58699	2.350434	13.58699	0.350434	13.93742
x3 x4	2.903107	2.350367	5.903107	0.350367	6.253474
x2 x8	3.011838	2.761267	6.011838	0.761267	6.773105
x2 x7	3.041214	2.408979	6.041214	0.408979	6.450193
x2 x6	-3.0069	2.762576	0.006901	0.762576	0.769477
x2 x5	16.24085	2.761192	19.24085	0.761192	20.00204
x2 x4	2.890648	2.76113	5.890647	0.76113	6.651777
x2 x3	2.846467	2.350405	5.846467	0.350405	6.196872
x6 x7 x8	-2.39888	2.410661	0.601117	0.410662	1.011779
x5 x7 x8	11.25096	2.409227	14.25096	0.409227	14.66019
x5 x6 x8	9.976583	2.762707	12.97658	0.762707	13.73929
x5 x6 x7	4.536868	2.410489	7.536868	0.410489	7.947357
x4 x7 x8	3.37181	2.409199	6.37181	0.409199	6.781009
x4 x6 x8	-2.83414	2.762645	0.165861	0.762645	0.928507
x4 x6 x7	-2.70806	2.410464	0.291942	0.410464	0.702405
x4 x5 x8	16.41044	2.761284	19.41044	0.761284	20.17172
x4 x5 x7	10.84462	2.409008	13.84462	0.409008	14.25363
x4 x5 x6	9.783476	2.76259	12.78348	0.76259	13.54607
x3 x7 x8	3.098168	1.997256	6.098168	0.002744	6.100912
x3 x6 x8	-3.41923	2.351507	0.419226	0.351507	0.770733
x3 x6 x7	-2.97379	1.998497	0.026207	0.001503	0.02771

x3 x5 x8	10.45188	2.350345	13.45188	0.350345	13.80222
x3 x5 x7	5.173693	1.99722	8.173693	0.00278	8.176473
x3 x5 x6	3.865504	2.35165	6.865504	0.35165	7.217154
x3 x4 x8	2.792207	2.350277	5.792207	0.350277	6.142484
x3 x4 x7	3.051303	1.997204	6.051302	0.002796	6.054098
x3 x4 x6	-3.21798	2.351584	0.217976	0.351585	0.56956
x3 x4 x5	10.54509	2.350396	13.54509	0.350396	13.89549
x2 x7 x8	3.374378	2.409198	6.374378	0.409198	6.783576
x2 x6 x8	-2.87444	2.762668	0.125563	0.762668	0.888232
x2 x6 x7	-2.70585	2.410463	0.294151	0.410463	0.704614
x2 x5 x8	16.43969	2.761307	19.43969	0.761307	20.201
x2 x5 x7	10.84246	2.409007	13.84246	0.409007	14.25147
x2 x5 x6	9.813138	2.762613	12.81314	0.762613	13.57575
x2 x4 x8	3.051865	2.761244	6.051865	0.761244	6.813109
x2 x4 x7	3.038634	2.40898	6.038634	0.40898	6.447614
x2 x4 x6	-2.96664	2.762553	0.033361	0.762553	0.795913
x2 x4 x5	16.21158	2.761169	19.21158	0.761169	19.97275
x2 x3 x8	2.735533	2.350315	5.735533	0.350315	6.085848
x2 x3 x7	3.037266	1.99721	6.037266	0.00279	6.040056
x2 x3 x6	-3.27488	2.351623	0.274875	0.351623	0.626498
x2 x3 x5	10.58699	2.350434	13.58699	0.350434	13.93742
x2 x3 x4	2.903107	2.350367	5.903107	0.350367	6.253474
x5 x6 x7 x8	4.912829	2.410688	7.912829	0.410688	8.323517
x4 x6 x7 x8	-2.40108	2.410662	0.598918	0.410662	1.009581
x4 x5 x7 x8	11.25311	2.409228	14.25311	0.409228	14.66234
x4 x5 x6 x8	9.946944	2.762684	12.94694	0.762684	13.70962
x4 x5 x6 x7	4.538746	2.41049	7.538746	0.41049	7.949236
x3 x6 x7 x8	-2.94379	1.99852	0.056214	0.00148	0.057694
x3 x5 x7 x8	5.248531	1.997266	8.24853	0.002734	8.251264
x3 x5 x6 x8	3.689584	2.351534	6.689583	0.351535	7.041118
x3 x5 x6 x7	-1.42578	1.998504	1.574216	0.001496	1.575712
x3 x4 x7 x8	3.112215	1.99725	6.112215	0.00275	6.114965
x3 x4 x6 x8	-3.36229	2.351469	0.362294	0.351469	0.713763
x3 x4 x6 x7	-2.9594	1.99849	0.040602	0.00151	0.042111
x3 x4 x5 x8	10.41002	2.350307	13.41002	0.350307	13.76033
x3 x4 x5 x7	5.16336	1.997213	8.16336	0.002787	8.166147
x3 x4 x5 x6	3.823141	2.351611	6.823141	0.351611	7.174752
x2 x6 x7 x8	-2.39888	2.410661	0.601117	0.410662	1.011779
x2 x5 x7 x8	11.25096	2.409227	14.25096	0.409227	14.66019
x2 x5 x6 x8	9.976583	2.762707	12.97658	0.762707	13.73929
x2 x5 x6 x7	4.536868	2.410489	7.536868	0.410489	7.947357
x2 x4 x7 x8	3.37181	2.409199	6.37181	0.409199	6.781009
x2 x4 x6 x8	-2.83414	2.762645	0.165861	0.762645	0.928507
x2 x4 x6 x7	-2.70806	2.410464	0.291942	0.410464	0.702405
x2 x4 x5 x8	16.41044	2.761284	19.41044	0.761284	20.17172

x2 x4 x5 x7	10.84462	2.409008	13.84462	0.409008	14.25363
x2 x4 x5 x6	9.783476	2.76259	12.78348	0.76259	13.54607
x2 x3 x7 x8	3.098168	1.997256	6.098168	0.002744	6.100912
x2 x3 x6 x8	-3.41923	2.351507	0.419226	0.351507	0.770733
x2 x3 x6 x7	-2.97379	1.998497	0.026207	0.001503	0.02771
x2 x3 x5 x8	10.45188	2.350345	13.45188	0.350345	13.80222
x2 x3 x5 x7	5.173693	1.99722	8.173693	0.00278	8.176473
x2 x3 x5 x6	3.865504	2.35165	6.865504	0.35165	7.217154
x2 x3 x4 x8	2.792207	2.350277	5.792207	0.350277	6.142484
x2 x3 x4 x7	3.051303	1.997204	6.051302	0.002796	6.054098
x2 x3 x4 x6	-3.21798	2.351584	0.217976	0.351585	0.56956
x2 x3 x4 x5	10.54509	2.350396	13.54509	0.350396	13.89549
x4 x5 x6 x7 x8	4.914699	2.410689	7.914699	0.410689	8.325388
x3 x5 x6 x7 x8	-1.3889	1.998527	1.611104	0.001473	1.612577
x3 x4 x6 x7 x8	-2.92938	1.998513	0.070618	0.001487	0.072105
x3 x4 x5 x7 x8	5.238204	1.99726	8.238203	0.00274	8.240943
x3 x4 x5 x6 x8	3.647259	2.351496	6.64726	0.351496	6.998756
x3 x4 x5 x6 x7	-1.43647	1.998497	1.563533	0.001503	1.565036
x2 x5 x6 x7 x8	4.912829	2.410688	7.912829	0.410688	8.323517
x2 x4 x6 x7 x8	-2.40108	2.410662	0.598918	0.410662	1.009581
x2 x4 x5 x7 x8	11.25311	2.409228	14.25311	0.409228	14.66234
x2 x4 x5 x6 x8	9.946944	2.762684	12.94694	0.762684	13.70962
x2 x4 x5 x6 x7	4.538746	2.41049	7.538746	0.41049	7.949236
x2 x3 x6 x7 x8	-2.94379	1.99852	0.056214	0.00148	0.057694
x2 x3 x5 x7 x8	5.248531	1.997266	8.24853	0.002734	8.251264
x2 x3 x5 x6 x8	3.689584	2.351534	6.689583	0.351535	7.041118
x2 x3 x5 x6 x7	-1.42578	1.998504	1.574216	0.001496	1.575712
x2 x3 x4 x7 x8	3.112215	1.99725	6.112215	0.00275	6.114965
x2 x3 x4 x6 x8	-3.36229	2.351469	0.362294	0.351469	0.713763
x2 x3 x4 x6 x7	-2.9594	1.99849	0.040602	0.00151	0.042111
x2 x3 x4 x5 x8	10.41002	2.350307	13.41002	0.350307	13.76033
x2 x3 x4 x5 x7	5.16336	1.997213	8.16336	0.002787	8.166147
x2 x3 x4 x5 x6	3.823141	2.351611	6.823141	0.351611	7.174752
x3 x4 x5 x6 x7 x8	-1.39957	1.99852	1.600428	0.00148	1.601908
x2 x4 x5 x6 x7 x8	4.914699	2.410689	7.914699	0.410689	8.325388
x2 x3 x5 x6 x7 x8	-1.3889	1.998527	1.611104	0.001473	1.612577
x2 x3 x4 x6 x7 x8	-2.92938	1.998513	0.070618	0.001487	0.072105
x2 x3 x4 x5 x7 x8	5.238204	1.99726	8.238203	0.00274	8.240943
x2 x3 x4 x5 x6 x8	3.647259	2.351496	6.64726	0.351496	6.998756
x2 x3 x4 x5 x6 x7	-1.43647	1.998497	1.563533	0.001503	1.565036
x2 x3 x4 x5 x6 x7 x8	-1.39957	1.99852	1.600428	0.00148	1.601908
MINIMUM			0.006901	0.001473	0.02771