Time-lapse regressions


> mtruesigtheta = signif(mtrue$X15 - mtrue$X11)/(sqrt(4))
> mtruesig

X11 X13 X15 W theta
1 37.56 49.29 61.02 15.970 5.855
2 45.65 51.58 57.51 31.530 2.995
3 40.94 52.88 64.82 11.480 2.970
4 47.36 55.45 68.15 16.890 0.945
5 52.71 62.70 72.70 19.180 0.999
6 30.45 46.34 62.23 11.820 7.944
7 43.65 58.37 73.09 15.330 7.362
8 41.16 49.26 57.37 13.210 4.054
9 44.15 52.00 59.84 13.900 3.923
10 38.16 46.57 55.03 10.320 4.217
11 37.68 39.87 42.06 10.260 1.096
12 45.30 54.38 63.47 15.640 5.541
13 39.37 48.56 53.94 13.900 4.392
14 36.66 43.75 50.08 13.530 3.544
15 53.40 62.32 71.23 14.450 4.459
16 59.35 62.80 66.25 20.160 1.724
17 51.14 64.35 75.56 16.110 5.605
18 44.90 58.82 72.75 15.060 6.962
19 41.79 59.44 77.09 13.830 8.827
20 38.25 48.98 59.71 13.770 5.367
21 47.24 60.79 74.36 12.880 7.766
22 51.57 67.71 81.84 23.210 7.068
23 35.54 43.51 51.48 10.150 3.984
24 37.54 50.25 62.95 9.462 3.653
25 37.07 49.71 62.35 15.810 6.321
26 32.40 44.69 56.98 11.600 6.145
27 45.22 62.08 78.94 14.080 8.430
28 35.67 47.42 59.17 12.190 5.875
29 38.30 51.13 63.97 14.070 6.416
30 52.61 55.52 58.42 16.680 1.452
31 38.36 48.49 58.62 15.070 5.064
32 45.14 51.44 57.73 13.940 3.148
33 53.82 64.27 74.73 20.400 5.228
34 49.46 61.42 73.39 16.000 5.984
35 56.29 59.04 61.80 14.700 1.378
36 49.59 57.58 65.57 17.300 3.995
37 41.45 59.43 77.41 15.860 8.891
38 47.42 57.42 67.43 18.950 5.002
39 59.00 65.73 74.47 18.900 4.367
40 41.06 43.54 46.03 13.790 1.241
41 pairs( ~ X11 + X13 + X15 + W) look real screw
> cor(mtruesig)

X11 X13 X15 W
X11 1.0000000 0.8422138 0.76617578 0.280851506
X13 0.8422138 1.0000000 0.76518895 0.280906648
X15 0.76617578 0.76518895 1.0000000 0.598501304
W 0.280851506 0.280906648 0.598501304 1.0000000

theta -0.2808515 0.2809066 0.5985013 -0.001592367

> truerегID = lm(I(X15 - X11) ~ W + X11)
> summary(truerегID)

Call:
lm(formula = I(X15 - X11) ~ W + X11)

Residuals:
Min 1Q Median 3Q Max
-7.26371 -2.36648 -0.07474 2.20751 8.12447

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 31.2139 7.5445 4.137 0.000194 ***
W 1.5002 0.6680 2.246 0.030788 *
X11 0.0968 0.02588 2.940 0.005624 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 7.514 on 37 degrees of freedom
Multiple R-squared: 0.1894, Adjusted R-squared: 0.1543
F-statistic: 4.323 on 2 and 37 DF, p-value: 0.02055

> truerегD2 = lm(I(X15 - X13) ~ W + X13)
> summary(truerегD2)

Call:
lm(formula = I(X15 - X13) ~ W + X13)

Residuals:
Min 1Q Median 3Q Max
-9.20751 -2.36648 -0.07474 2.20751 8.12447

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 31.2139 7.5445 4.137 0.000194 ***
W 0.7570 0.3329 -2.274 0.02886 **
X13 0.3821 0.1290 2.963 0.00529 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 7.514 on 37 degrees of freedom
Multiple R-squared: 0.1918, Adjusted R-squared: 0.1481
F-statistic: 4.391 on 2 and 37 DF, p-value: 0.01945

> detach(mtruesig)
Demonstration: time 1, time 2 Regressions $y_2, y_1, w$, exog.

On $y_1, w$ same as $y_2$ on $y_1, w$

coefficients for $w$ in population or sample, perfect or fallible measurement

$$\beta_{w \cdot y_1} = \beta_{0(w \cdot y_1)} = \frac{\text{Cov}(y_2 - y_1, w - \beta_{w \cdot y_1} y_1)}{\text{Var}(w \cdot y_1)}$$

(Note: $\beta_{w \cdot y_1} \text{Var}(y_1) = \text{Cov}(y_1, w))$

$$= \frac{\text{Cov}(y_2, w) - \beta_{w \cdot y_1} \text{Cov}(y_1, y_2) - \text{Cov}(y_1, w) + \beta_{w \cdot y_1} \text{Var}(y_1)}{\text{Var}(w \cdot y_1)}$$

$$= \frac{\text{Cov}(y_2, w) - \beta_{w \cdot y_1} \text{Cov}(y_1, y_2)}{\text{Var}(w \cdot y_1)}$$

$$= \frac{\text{Cov}(y_2, w \cdot y_1)}{\text{Var}(w \cdot y_1)} = \beta_{y_2(w \cdot y_1)} = \beta_{y_2 \cdot w \cdot y_1}$$

brute force,
quicker ways to find

see STAT 209 week 1 adjusted variables