

Econometrics Assignment 6a

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II.

a)

The mean of the outcome variable in week 34 is 7.89

Command & output:

```
. sum residual_weight if calendar_week==34
```

Variable	Obs	Mean	Std. Dev.	Min	Max
residual_w~t	55	7.887636	1.082052	5.66	10.26

b) The minimum value of the time in between treatments is equal to 7 weeks.

The maximum value of the time in between treatments is equal to 35 weeks.

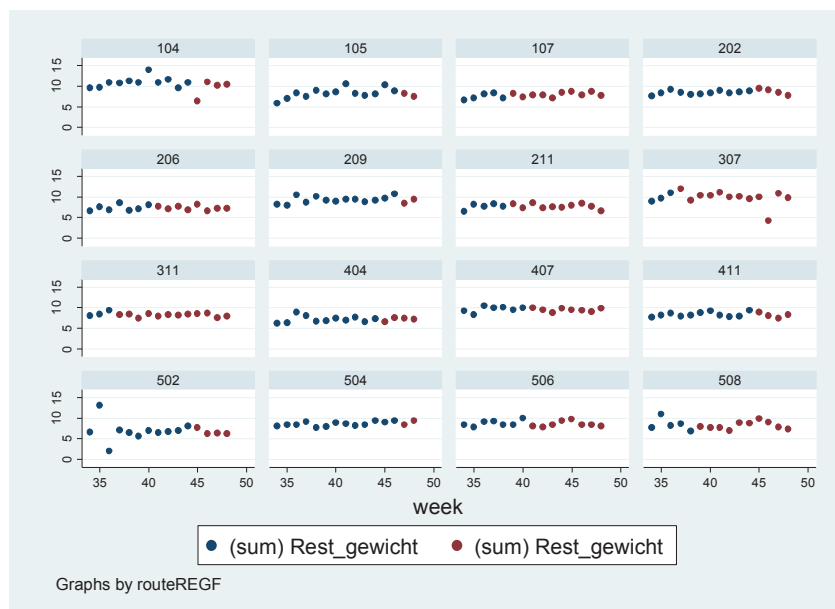
Command & output:

```
. sum TimeElapsed
```

Variable	Obs	Mean	Std. Dev.	Min	Max
TimeElapsed	825	22.41818	6.361932	7	35

c) **Command:** graph twoway (scatter residual_weight calendar_week if RepTreatmentOngoing==0&RepTreatmentCompleted==0) (scatter residual_weight calendar_week if RepTreatmentOngoing==1|RepTreatmentCompleted==1) if TimeElapsed>25, by(route)

Output:



The scatter graph shows no clear sign of anything going on at all as of the date of the repeated treatment.

III.

a) Command & output:

```
. xtreg residual_weight RepTreatment i.calendar_week, fe i(route) cluster(route)
```

Fixed-effects (within) regression
Group variable: route

Number of obs = 825
Number of groups = 55

R-sq:

within = 0.1331
between = 0.0016
overall = 0.0575

Obs per group:

min = 15
avg = 15.0
max = 15

corr(u_i, Xb) = -0.0110

F(15,54) = 16.36
Prob > F = 0.0000

(Std. Err. adjusted for 55 clusters in route)

residual_weight	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
RepTreatment	-.2196485	.1040657	-2.11	0.039	-.4282877	-.0110094
calendar_week						
35	.4847273	.2045601	2.37	0.021	.074609	.8948455
36	1.181091	.2356929	5.01	0.000	.708555	1.653627
37	1.087209	.1322987	8.22	0.000	.8219659	1.352452
38	.8072088	.1334875	6.05	0.000	.5395825	1.074835
39	.8173267	.1309538	6.24	0.000	.5547802	1.079873
40	1.326781	.1443665	9.19	0.000	1.037344	1.616219
41	1.142717	.1457799	7.84	0.000	.8504462	1.434989
42	.6834447	.1229308	5.56	0.000	.4369832	.9299062
43	.9346535	.1266024	7.38	0.000	.680831	1.188476
44	1.233563	.1347114	9.16	0.000	.9634825	1.503643
45	1.625499	.1962734	8.28	0.000	1.231994	2.019003
46	1.184771	.2038179	5.81	0.000	.7761412	1.593402
47	.9429213	.1568108	6.01	0.000	.6285346	1.257308
48	.7720122	.1370651	5.63	0.000	.4972131	1.046811
_cons	7.887636	.0698455	112.93	0.000	7.747605	8.027668
sigma_u	1.0697362					
sigma_e	.93856932					
rho	.56503482	(fraction of variance due to u_i)				

As can be concluded from the table the ATE is estimated to be – 0.22 .

If the same regression is ran without clustering the standard errors, the standard error of the treatment variable rises from 0.1041 to 0.1188.

Command & output:

```
. margins, eydx(RepTreatment)
```

```
Average marginal effects      Number of obs      =      825
Model VCE      : Robust
```

```
Expression      : Linear prediction, predict()
ey/dx w.r.t.    : RepTreatment
```

	Delta-method				
	ey/dx	Std. Err.	z	P> z	[95% Conf. Interval]
RepTreatment	-.0252123	.0119466	-2.11	0.035	-.0486271 -.0017974

From these results we can conclude that being subjected to treatment leads to a 2.5% decrease in the residual weight.

b) Commands and output of large tables can be found in the log-file below.

We assumed that dydx was a typo and we used eydx instead, this indeed leads to approximately the same results as found under a) (a 2.6% decrease).

Commands & output:

```
. margins, eydx(RepTreatment)
```

```
Average marginal effects      Number of obs      =      825
Model VCE      : Robust
```

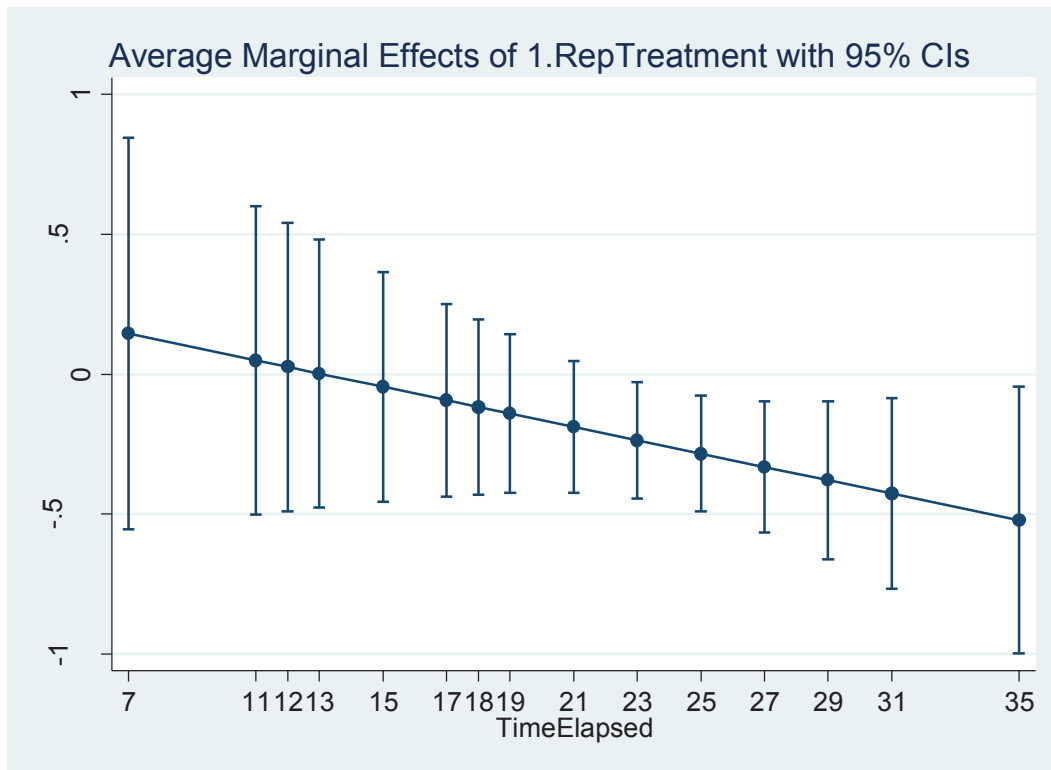
```
Expression      : Linear prediction, predict()
ey/dx w.r.t.    : 1.RepTreatment
```

	Delta-method				
	ey/dx	Std. Err.	t	P> t	[95% Conf. Interval]
1.RepTreatment	-.0262506	.0123644	-2.12	0.038	-.0510398 -.0014614

Note: ey/dx for factor levels is the discrete change from the base level.

The interaction term may predict but cannot be concluded to cause the treatment effect.

c)



The marginal effects plot suggests that the greater the time elapsed since the last treatment has ended, the greater the negative marginal treatment effect of the repeated treatment i.e. the more the residual_weight decreases when subjected to the repeated treatment. This can be seen from the negative slope of the marginal effects plot.

The marginal effects line up nicely because of the linear relationship between the value of the time elapsed and the marginal effect of the repeated treatment. This can be seen when taking the first order derivative of the estimation equation with respect to the repeated treatment variable.

d) Regression command and output:

```
. xtreg residual_weight RepTreatment_quick RepTreatment_medium1 RepTreatment_medium2 Re
> pTreatment_slow i.calendar_week, fe i(route) cluster(route)
```

```
Fixed-effects (within) regression                Number of obs   =           825
Group variable: route                          Number of groups  =           55
```

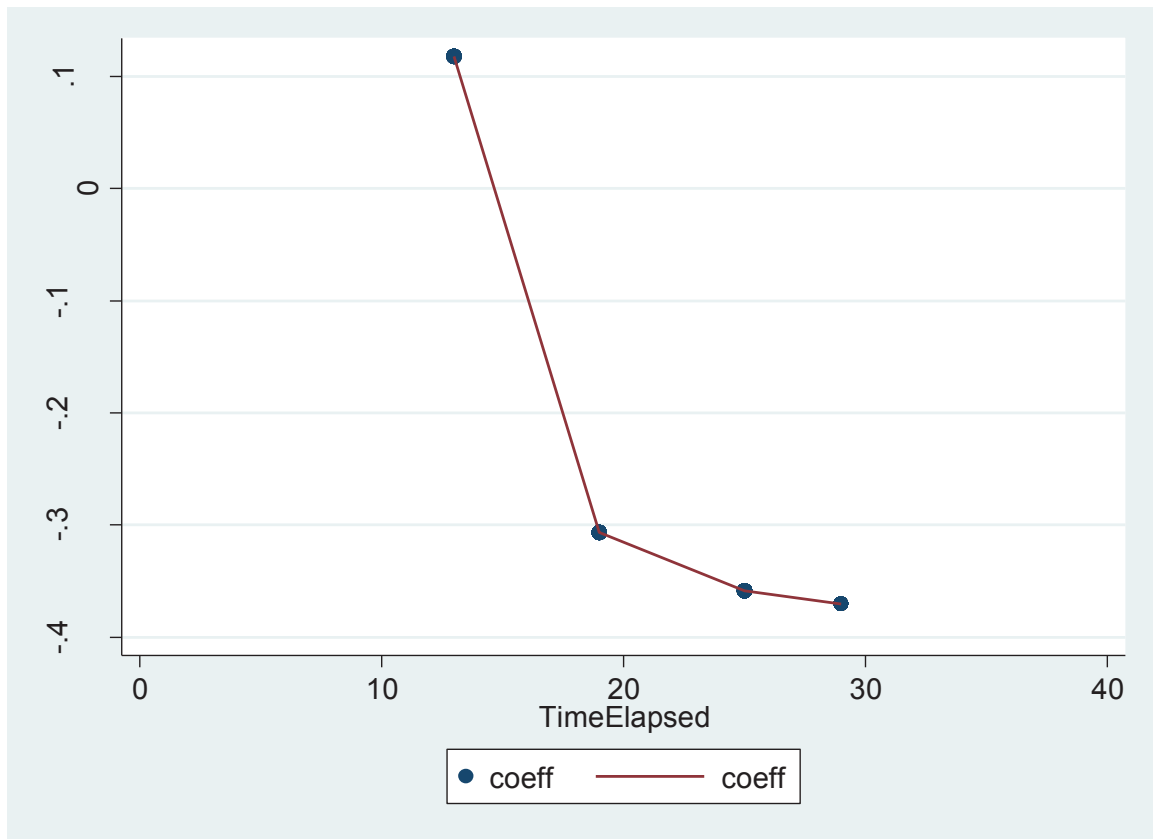
```
R-sq:                                           Obs per group:
    within = 0.1419                               min =           15
    between = 0.0047                               avg  =          15.0
    overall = 0.0510                               max  =           15
```

```
corr(u_i, Xb)  = -0.0547                        F(18,54)         =          16.03
                                           Prob > F          =          0.0000
```

(Std. Err. adjusted for 55 clusters in route)

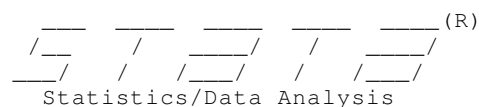
residual_weight	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
RepTreatment_quick	.1177308	.2964861	0.40	0.693	-.4766881	.7121496
RepTreatment_medium1	-.3068546	.1442285	-2.13	0.038	-.5960153	-.0176939
RepTreatment_medium2	-.358484	.1443722	-2.48	0.016	-.6479327	-.0690352
RepTreatment_slow	-.3706549	.1514551	-2.45	0.018	-.6743041	-.0670057
calendar_week						
35	.4847273	.2049404	2.37	0.022	.0738465	.8956081
36	1.181091	.2361312	5.00	0.000	.7076764	1.654505
37	1.074063	.1365077	7.87	0.000	.8003815	1.347744
38	.794063	.1345275	5.90	0.000	.5243515	1.063774
39	.8195517	.1329858	6.16	0.000	.5529312	1.086172
40	1.329006	.142134	9.35	0.000	1.044045	1.613968
41	1.141119	.1498751	7.61	0.000	.8406374	1.4416
42	.6818461	.1224603	5.57	0.000	.4363279	.9273642
43	.9112506	.1277635	7.13	0.000	.6551001	1.167401
44	1.21016	.136903	8.84	0.000	.9356856	1.484634
45	1.62353	.1966725	8.25	0.000	1.229225	2.017835
46	1.182803	.2024983	5.84	0.000	.7768182	1.588788
47	.9455796	.1563869	6.05	0.000	.6320428	1.259116
48	.7746705	.1374764	5.63	0.000	.4990469	1.050294
_cons	7.887636	.0722353	109.19	0.000	7.742813	8.032459
sigma_u	1.0814731					
sigma_e	.93564324					
rho	.57192032	(fraction of variance due to u_i)				

e)



This marginal effect plot looks different from the one generated under c) because before making this graph, four bins have been created: quick, medium1, medium2 and slow. Using these bins, the values on the y-axis give the average marginal effect per bin.

The marginal effect plot can help policymakers make the decision of how much time to leave between the first treatment and the repeated treatment. We can see from the plot that the more time has elapsed, the greater the marginal average treatment effect. We would go for the time elapsed in the slowest bin as this indicates the largest marginal treatment effect i.e. it can target its treatment.



```
1 . log using "M:\Master\Methods Econometrics I\Log-file CA6a.smcl"
```

```
    name: <unnamed>
    log: M:\Master\Methods Econometrics I\Log-file CA6a.smcl
    log type: smcl
    opened on: 6 Oct 2017, 16:22:34
```

```
2 . do "C:\Users\u1266283\AppData\Local\Temp\STD000000000.tmp"
```

```
3 . * Computer Assignment 6a
```

```
4 .
```

```
5 . * (I)
```

```
6 . * (a)
```

```
7 . use "C:\Users\u1266283\Downloads\heterogeneity.dta", clear
```

```
8 . xtset route calendar_week
```

```
    panel variable: route (strongly balanced)
```

```
    time variable: calendar_week, 34 to 48
```

```
    delta: 1 unit
```

```
9 .
```

```
10 . * (II)
```

```
11 . * (a)
```

```
12 . sum residual_weight if calendar_week==34
```

Variable	Obs	Mean	Std. Dev.	Min	Max
residual_w~t	55	7.887636	1.082052	5.66	10.26

```
13 . * (b)
```

```
14 . sum TimeElapsed
```

Variable	Obs	Mean	Std. Dev.	Min	Max
TimeElapsed	825	22.41818	6.361932	7	35

```
15 . * (c)
```

```
16 . graph twoway (scatter residual_weight calendar_week if RepTreatmentOngoing==0&RepTreatmentCom
> atmentCompleted==1) if TimeElapsed>25, by(route)
```

```
17 .
```

```
18 . * (III)
```

```
19 . * (a)
```

```
20 . xtreg residual_weight RepTreatment i.calendar_week, fe i(route) cluster(route)
```

Fixed-effects (within) regression

Number of obs = 825

Group variable: route

Number of groups = 55

R-sq:

Obs per group:

within = 0.1331

min = 15

between = 0.0016

avg = 15.0

overall = 0.0575

max = 15

corr(u_i, Xb) = -0.0110

F(15, 54) = 16.36

Prob > F = 0.0000

(Std. Err. adjusted for 55 clusters in route)

residual_we~t	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
RepTreatment	-.2196485	.1040657	-2.11	0.039	-.4282877	-.0110094
calendar_week						
35	.4847273	.2045601	2.37	0.021	.074609	.8948455
36	1.181091	.2356929	5.01	0.000	.708555	1.653627
37	1.087209	.1322987	8.22	0.000	.8219659	1.352452
38	.8072088	.1334875	6.05	0.000	.5395825	1.074835
39	.8173267	.1309538	6.24	0.000	.5547802	1.079873
40	1.326781	.1443665	9.19	0.000	1.037344	1.616219
41	1.142717	.1457799	7.84	0.000	.8504462	1.434989

23 . * (b)

24 . reg residual_weight i.RepTreatment#c.TimeElapsed i.calendar_week i.route, cluster(route)
 note: 512.route omitted because of collinearity

Linear regression

Number of obs = 825
 F(15, 54) = .
 Prob > F = .
 R-squared = 0.6085
 Root MSE = .93654

(Std. Err. adjusted for 55 clusters in route)

residual_weight	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
1.RepTreatment	.3118539	.4822727	0.65	0.521	-.6550446	1.278752
TimeElapsed	.1124518	.009412	11.95	0.000	.0935819	.1313217
RepTreatment#c.TimeElapsed						
1	-.0238263	.0196146	-1.21	0.230	-.0631513	.0154987
calendar_week						
35	.4847273	.2118895	2.29	0.026	.0599144	.9095402
36	1.181091	.2441379	4.84	0.000	.691624	1.670558
37	1.074614	.1400283	7.67	0.000	.793874	1.355354
38	.7946139	.1394755	5.70	0.000	.5149824	1.074245
39	.8124976	.1387798	5.85	0.000	.5342608	1.090734
40	1.321952	.1485578	8.90	0.000	1.024112	1.619793
41	1.139156	.1532918	7.43	0.000	.8318243	1.446487
42	.6798831	.1266379	5.37	0.000	.4259895	.9337767
43	.9132986	.1337287	6.83	0.000	.6451886	1.181409
44	1.212208	.1416117	8.56	0.000	.9282933	1.496122
45	1.620574	.202232	8.01	0.000	1.215123	2.026024
46	1.179846	.2102106	5.61	0.000	.7583994	1.601293
47	.9455613	.1619552	5.84	0.000	.6208607	1.270262
48	.7746522	.1422769	5.44	0.000	.4894043	1.0599
route						
103	-3.042262	.047876	-63.54	0.000	-3.138248	-2.946277
104	.1272273	.078517	1.62	0.111	-.0301899	.2846444
105	-1.522732	.0750226	-20.30	0.000	-1.673143	-1.372321
106	1.233734	.031387	39.31	0.000	1.170807	1.296661
107	-1.755207	.0363132	-48.34	0.000	-1.828011	-1.682404
108	1.876374	.0818692	22.92	0.000	1.712236	2.040512
109	-2.477648	.0103986	-238.27	0.000	-2.498496	-2.4568
110	.3837704	.027726	13.84	0.000	.3281831	.4393578
111	.9060447	.0209246	43.30	0.000	.8640933	.9479961
113	-.0102703	.0181566	-0.57	0.574	-.046672	.0261315
202	-1.437714	.0649819	-22.12	0.000	-1.567995	-1.307433
203	1.523689	.0104623	145.64	0.000	1.502713	1.544665
204	-.2822623	.047876	-5.90	0.000	-.3782479	-.1862766
205	1.568603	.1094333	14.33	0.000	1.349203	1.788004
206	-2.505244	.0418493	-59.86	0.000	-2.589147	-2.421341
207	2.291775	.0408523	56.10	0.000	2.209871	2.373679
208	-1.202581	.0277274	-43.37	0.000	-1.258171	-1.146991
209	-.558732	.0750226	-7.45	0.000	-.7091432	-.4083208
210	1.395685	.0103986	134.22	0.000	1.374837	1.416533
211	-1.877874	.0363132	-51.71	0.000	-1.950677	-1.80507
213	-.2592846	.0376529	-6.89	0.000	-.334774	-.1837952
302	1.031378	.0209246	49.29	0.000	.9894266	1.073329
303	1.107067	.031387	35.27	0.000	1.04414	1.169994
304	1.110895	.0490772	22.64	0.000	1.012501	1.209289
305	.6552339	.0733683	8.93	0.000	.5081393	.8023284
306	1.583463	.0479986	32.99	0.000	1.487232	1.679695
307	.4047888	.0313834	12.90	0.000	.3418688	.4677087
308	1.196711	.0209246	57.19	0.000	1.15476	1.238663
310	.671063	.0181566	36.96	0.000	.6346613	.7074648
311	-1.116545	.0313834	-35.58	0.000	-1.179465	-1.053625
312	-.2782703	.0181566	-15.33	0.000	-.314672	-.2418685
313	-1.250266	.031387	-39.83	0.000	-1.313193	-1.187339
402	-.7733333	1.46e-13	-5.3e+12	0.000	-.7733333	-.7733333
403	-.1389817	.0103986	-13.37	0.000	-.1598295	-.1181338


```
27 . * (c)
28 . marginsplot
```

Variables that uniquely identify margins: TimeElapsed

```
29 . * (d)
30 . gen quick=(TimeElapsed<=17)

31 . gen medium1=(TimeElapsed>17&TimeElapsed<=23)
32 . gen medium2=(TimeElapsed>23&TimeElapsed<=27)
33 . gen slow=(TimeElapsed>27)

34 . gen RepTreatment_quick=RepTreatment*quick
35 . gen RepTreatment_medium1=RepTreatment*medium1
36 . gen RepTreatment_medium2=RepTreatment*medium2
37 . gen RepTreatment_slow=RepTreatment*slow

38 . xtreg residual_weight RepTreatment_quick RepTreatment_medium1 RepTreatment_medium2 RepTreatment_slow
```

```
Fixed-effects (within) regression      Number of obs      =      825
Group variable: route                  Number of groups    =      55
```

```
R-sq:                                Obs per group:
    within = 0.1419                    min =      15
    between = 0.0047                   avg  =     15.0
    overall = 0.0510                   max  =      15
```

```
corr(u_i, Xb) = -0.0547                F(18, 54)          =     16.03
                                          Prob > F           =     0.0000
```

(Std. Err. adjusted for 55 clusters in route)

residual_weight	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
RepTreatment_quick	.1177308	.2964861	0.40	0.693	-.4766881	.7121496
RepTreatment_medium1	-.3068546	.1442285	-2.13	0.038	-.5960153	-.0176939
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RepTreatment_slow	-.3706549	.1514551	-2.45	0.018	-.6743041	-.0670057
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39	.8195517	.1329858	6.16	0.000	.5529312	1.086172
40	1.329006	.142134	9.35	0.000	1.044045	1.613968
41	1.141119	.1498751	7.61	0.000	.8406374	1.4416
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44	1.21016	.136903	8.84	0.000	.9356856	1.484634
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46	1.182803	.2024983	5.84	0.000	.7768182	1.588788
47	.9455796	.1563869	6.05	0.000	.6320428	1.259116
48	.7746705	.1374764	5.63	0.000	.4990469	1.050294
_cons	7.887636	.0722353	109.19	0.000	7.742813	8.032459
sigma_u	1.0814731					
sigma_e	.93564324					
rho	.57192032	(fraction of variance due to u_i)				

```
39 . * (e)
40 . gen coeff=.
    (825 missing values generated)

41 . replace coeff=_b[RepTreatment_quick] if TimeElapsed==13
    (45 real changes made)

42 . replace coeff=_b[RepTreatment_medium1] if TimeElapsed==19
    (45 real changes made)

43 . replace coeff=_b[RepTreatment_medium2] if TimeElapsed==25
    (90 real changes made)

44 . replace coeff=_b[RepTreatment_slow] if TimeElapsed==29
    (90 real changes made)

45 . sort coeff

46 . graph twoway (scatter coeff TimeElapsed) (line coeff TimeElapsed)

47 .
    end of do-file

48 .
```