

```

* Panel Data Models in SAS;
* Copyright 2013 by Ani Katchova;

proc import out= work.data
datafile= "C:\Econometrics\Data\panel_wage.csv"
dbms=csv replace; getnames=yes;
run;

proc means data=data;
var id t lwage exp exp2 wks ed;
run;

proc sort data=data;
by id t;
run;

*Pooled OLS estimator;
proc reg data=data;
model lwage = exp exp2 wks ed;
run;

*Pooled OLS estimator;
proc panel data=data;
id id t;
model lwage = exp exp2 wks ed /POOLED;
run;

*Between group estimator;
proc panel data=data;
id id t;
model lwage = exp exp2 wks ed /BTWNG;
run;

*Fixed effects or within estimator;
proc panel data=data;
id id t;
model lwage = exp exp2 wks ed /FIXONE;
run;

*Fixed effects or within estimator;
proc tscsreg data=data;
id id t;
model lwage = exp exp2 wks ed /FIXONE;
run;

*Random effects estimator;
proc tscsreg data=data;
id id t;
model lwage = exp exp2 wks ed /RANONE;
run;

*Random effects estimator;
proc panel data=data;
id id t;
model lwage = exp exp2 wks ed /RANONE;

```

```
run;

*Random effects estimator with Breusch-Pagan LM test;
proc panel data=data;
id id t;
model lwage = exp exp2 wks ed /RANONE BP;
run;
```

The SAS System

The MEANS Procedure

Variable	N	Mean	Std Dev	Minimum	Maximum
id	4165	298.0000000	171.7820858	1.0000000	595.0000000
t	4165	4.0000000	2.0002401	1.0000000	7.0000000
lwage	4165	6.6763464	0.4615122	4.6051700	8.5370000
exp	4165	19.8537815	10.9663702	1.0000000	51.0000000
exp2	4165	514.4050420	496.9962208	1.0000000	2601.00
wks	4165	46.8115246	5.1290982	5.0000000	52.0000000
ed	4165	12.8453782	2.7879950	4.0000000	17.0000000

The SAS System

The REG Procedure

Model: MODEL1

Dependent Variable: lwage

Number of Observations Read 4165

Number of Observations Used 4165

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	251.49147	62.87287	411.62	<.0001
Error	4160	635.41347	0.15274		
Corrected Total	4164	886.90494			

Root MSE 0.39082 R-Square 0.2836

Dependent Mean 6.67635 Adj R-Sq 0.2829

Coeff Var 5.85386

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	4.90796	0.06733	72.89	<.0001
exp	1	0.04468	0.00239	18.67	<.0001
exp2	1	-0.00071563	0.00005279	-13.56	<.0001
wks	1	0.00583	0.00118	4.93	<.0001
ed	1	0.07604	0.00223	34.15	<.0001

The SAS System

The PANEL Procedure
Pooled (OLS) Estimates

Dependent Variable: lwage

Model Description	
Estimation Method	Pooled
Number of Cross Sections	595
Time Series Length	7

Fit Statistics			
SSE	635.4135	DFE	4160
MSE	0.1527	Root MSE	0.3908
R-Square	0.2836		

Parameter Estimates						
Variable	DF	Estimate	Standard Error	t Value	Pr > t	Label
Intercept	1	4.907961	0.0673	72.89	<.0001	Intercept
exp	1	0.044675	0.00239	18.67	<.0001	
exp2	1	-0.00072	0.000053	-13.56	<.0001	
wks	1	0.005827	0.00118	4.93	<.0001	
ed	1	0.076041	0.00223	34.15	<.0001	

The SAS System

The PANEL Procedure
Between Groups Estimates

Dependent Variable: lwage

Model Description	
Estimation Method	BtwGrps
Number of Cross Sections	595
Time Series Length	7

Fit Statistics			
SSE	62.1869	DFE	590
MSE	0.1054	Root MSE	0.3247
R-Square	0.3264		

Parameter Estimates						
Variable	DF	Estimate	Standard Error	t Value	Pr > t	Label
Intercept	1	4.683039	0.2101	22.29	<.0001	Intercept
exp	1	0.038153	0.00570	6.70	<.0001	
exp2	1	-0.00063	0.000126	-5.02	<.0001	
wks	1	0.01309	0.00407	3.22	0.0014	
ed	1	0.073784	0.00490	15.06	<.0001	

The SAS System

The PANEL Procedure
Fixed One Way Estimates

Dependent Variable: lwage

Model Description

Estimation Method	FixOne
Number of Cross Sections	595
Time Series Length	7

Fit Statistics

SSE	82.6324	DFE	3567
MSE	0.0232	Root MSE	0.1522
R-Square	0.9068		

F Test for No Fixed Effects

Num DF	Den DF	F Value	Pr > F
594	3567	40.17	<.0001

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Pr > t	Label
Intercept	1	5.574241	0.0653	85.36	<.0001	Intercept
exp	1	0.113788	0.00247	46.09	<.0001	
exp2	1	-0.00042	0.000055	-7.77	<.0001	
wks	1	0.000836	0.000600	1.39	0.1634	
ed	0	0	.	.	.	

The SAS System

The TSCSREG Procedure
Fixed One Way Estimates

Dependent Variable: lwage

Model Description

Estimation Method	FixOne
Number of Cross Sections	595
Time Series Length	7

Fit Statistics

SSE	82.6324	DFE	3567
MSE	0.0232	Root MSE	0.1522
R-Square	0.9068		

F Test for No Fixed Effects

Num DF	Den DF	F Value	Pr > F
594	3567	40.17	<.0001

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Pr > t	Label
Intercept	1	5.574241	0.0653	85.36	<.0001	Intercept
exp	1	0.113788	0.00247	46.09	<.0001	
exp2	1	-0.00042	0.000055	-7.77	<.0001	
wks	1	0.000836	0.000600	1.39	0.1634	
ed	0	0	.	.	.	

The SAS System

The TSCSREG Procedure
Fuller and Battese Variance Components (RanOne)

Dependent Variable: lwage

Model Description	
Estimation Method	RanOne
Number of Cross Sections	595
Time Series Length	7

Fit Statistics			
SSE	112.9661	DFE	4160
MSE	0.0272	Root MSE	0.1648
R-Square	0.5429		

Variance Component Estimates	
Variance Component for Cross Sections	0.326289
Variance Component for Error	0.023166

Hausman Test for Random Effects		
DF	m Value	Pr > m
0	.	.

Parameter Estimates					
Variable	DF	Estimate	Standard Error	t Value	Pr > t
Intercept	1	3.239534	0.1293	25.05	<.0001
exp	1	0.10259	0.00259	39.67	<.0001
exp2	1	-0.0006	0.000057	-10.54	<.0001
wks	1	0.00085	0.000647	1.31	0.1891
ed	1	0.130033	0.00919	14.14	<.0001

The SAS System

The PANEL Procedure
Fuller and Battese Variance Components (RanOne)

Dependent Variable: lwage

Model Description	
Estimation Method	RanOne
Number of Cross Sections	595
Time Series Length	7

Fit Statistics			
SSE	112.9661	DFE	4160
MSE	0.0272	Root MSE	0.1648
R-Square	0.5429		

Variance Component Estimates	
Variance Component for Cross Sections	0.326289
Variance Component for Error	0.023166

Hausman Test for Random Effects		
DF	m Value	Pr > m
0	.	.

Parameter Estimates					
Variable	DF	Estimate	Standard Error	t Value	Pr > t
Intercept	1	3.239534	0.1293	25.05	<.0001
exp	1	0.10259	0.00259	39.67	<.0001
exp2	1	-0.0006	0.000057	-10.54	<.0001
wks	1	0.00085	0.000647	1.31	0.1891
ed	1	0.130033	0.00919	14.14	<.0001

The SAS System

The PANEL Procedure
Fuller and Battese Variance Components (RanOne)

Dependent Variable: lwage

Model Description	
Estimation Method	RanOne
Number of Cross Sections	595
Time Series Length	7

Fit Statistics			
SSE	112.9661	DFE	4160
MSE	0.0272	Root MSE	0.1648
R-Square	0.5429		

Variance Component Estimates	
Variance Component for Cross Sections	0.326289
Variance Component for Error	0.023166

Hausman Test for Random Effects		
DF	m Value	Pr > m
0	.	.

Breusch Pagan Test for Random Effects (One Way)		
DF	m Value	Pr > m
1	5192.13	<.0001

Parameter Estimates					
Variable	DF	Estimate	Standard Error	t Value	Pr > t
Intercept	1	3.239534	0.1293	25.05	<.0001
exp	1	0.10259	0.00259	39.67	<.0001
exp2	1	-0.0006	0.000057	-10.54	<.0001
wks	1	0.00085	0.000647	1.31	0.1891
ed	1	0.130033	0.00919	14.14	<.0001