

freedom of the within effect model and LSDV. For example, the standard error of the logged output is computed as $.0299 = .0288 * \sqrt{87/81}$.

4.5.2 Using SAS: PROC TSCSREG and PROC PANEL

PROC TSCSREG and PROC PANEL of SAS/ETS allows users to fit the within effect model conveniently. They, in fact, report LSDV1, but you do not need to create dummy variables and compute deviations from group means.

```
PROC SORT DATA=masil.airline;
  BY airline year;
```

A data set needs to be sorted in advance by the variables, which will appear in the ID statement of PROC TSCSREG and PROC PANEL. These time-series and cross-sectional variables may be numeric or string in SAS. /FIXONE of the MODEL statement fits a one-way fixed effect model.

```
PROC TSCSREG DATA=masil.airline;
  ID airline year;
  MODEL cost = output fuel load /FIXONE;
RUN;
```

The TSCSREG Procedure
Fixed One Way Estimates

Dependent Variable: cost

Model Description

Estimation Method	FixOne
Number of Cross Sections	6
Time Series Length	15

Fit Statistics

SSE	0.2926	DFE	81
MSE	0.0036	Root MSE	0.0601
R-Square	0.9974		

F Test for No Fixed Effects

Num DF	Den DF	F Value	Pr > F
5	81	57.73	<.0001

Parameter Estimates

Variable	DF	Estimate	Standard Error	t Value	Pr > t	Label
CS1	1	-0.08706	0.0842	-1.03	0.3042	Cross Sectional

						Effect
CS2	1	-0.1283	0.0757	-1.69	0.0941	1
						Cross Sectional
						Effect
CS3	1	-0.29598	0.0500	-5.92	<.0001	2
						Cross Sectional
						Effect
CS4	1	0.097494	0.0330	2.95	0.0041	3
						Cross Sectional
						Effect
CS5	1	-0.06301	0.0239	-2.64	0.0100	4
						Cross Sectional
						Effect
Intercept	1	9.793004	0.2637	37.14	<.0001	5
						Intercept
output	1	0.919285	0.0299	30.76	<.0001	
fuel	1	0.417492	0.0152	27.47	<.0001	
load	1	-1.0704	0.2017	-5.31	<.0001	

The following PANEL procedure returns the same output.

```
PROC PANEL DATA=masil.airline;
  ID airline year;
  MODEL cost = output fuel load /FIXONE;
RUN;
```

Both PROC TSCSREG and PROC PANEL report correct (adjusted) MSE, SEE, R^2 , and standard errors, and conduct the F test for fixed group effect as well. They have strong advantages over other software packages in this respect.

4.5.3 Using Stata

The Stata `.xtreg` command fits the within group effect model without creating dummy variables. `.xtreg` should follow the `.tsset` command that specifies cross-sectional and time-series variables. Both variables should be numeric in Stata; string variables are not allowed in `.tsset`.

```
. quietly tsset airline year
```

The `fe` option of `.xtreg` indicates the within effect model and `i(airline)` specifies `airline` as the independent unit. Once `.tsset` is executed, `i(airline)` is redundant. This command report incorrect F 3,604 and R^2 of .9926.

```
. xtreg cost output fuel load, fe i(airline)
```

```
Fixed-effects (within) regression           Number of obs   =       90
Group variable: airline                    Number of groups =        6

R-sq:  within = 0.9926                     Obs per group:  min =       15
        between = 0.9856                   avg   =       15.0
        overall = 0.9873                   max   =       15

corr(u_i, Xb) = -0.3475                    F(3,81)         =    3604.80
                                                Prob > F        =     0.0000
```

```
-----+-----
      cost |          Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
      output |   .9192846   .0298901    30.76  0.000   .8598126   .9787565
        fuel |   .4174918   .0151991    27.47  0.000   .3872503   .4477333
        load |  -1.070396   .20169     -5.31  0.000  -1.471696  -.6690963
        _cons |   9.713528   .229641    42.30  0.000   9.256614  10.17044
```