Advanced Econometrics 1 – PS3

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1 Fixed Effects (FE) vs. Random Effects (RE)

2 Pooled OLS (POLS) and RE (Vella and Verbeek 1998)

see https://rdrr.io/cran/wooldridge/man/wagepan.html for variable description.

2.1 Difference between Pooled OLS and Random Effects

Explain the difference between POLS and RE with respect to the underlying assumptions.

2.2 Estimate Pooled OLS and Random Effects Model on Wagepan Data

Using log(wage) as dependent variable estimate a model that contains an intercept, the regressor union, the year dummies d81 through d87, educ, black, hisp. Consider the POLS and RE estimation. How do coefficients and standard errors compare?

```
library(plm)
library(lmtest)
library(sandwich)
library(stargazer)
```

```
wagepan <- read.csv("data/PS3_wagepan.csv")
```

```
model_ols <- lm(lwage ~ union + d81 + d82 + d83 + d84 + d85 + d86 + d87 + educ + black + hisp,
                data = wagepan)
model_pols <- plm(lwage ~ union + d81 + d82 + d83 + d84 + d85 + d86 + d87 + educ + black + hisp,
                  model = "pooling",
                  index = c("nr", "year"),
                  data = wagepan)
model_re <- plm(lwage ~ union + d81 + d82 + d83 + d84 + d85 + d86 + d87 + educ + black + hisp,
                  model = "random",
                  index = c("nr", "year"),
                  data = wagepan)
```

Coefficients and standard errors are rather similar and there is no obvious pattern in their small differences

2.3 Obtain the robust standard errors for POLS in your estimation. Why do we need them in the POLS estimation?

Followed this method:

https://stats.stackexchange.com/questions/145650/estimating-robust-standard-errors-in-panel-data-regressions

```
pols_robust_se <- coeftest(model_pols, vcov = vcovHC(model_pols, type = "HC0")) # , cluster = "group" ?
```

2.4 What happens if you estimate the equation by FE? Compare the estimates.

```r
model_fe <- plm(lwage ~ union + d81 + d82 + d83 + d84 + d85 + d86 + d87 + educ + black + hisp,
                model = "within",
                index = c("nr", "year"),
                data = wagepan)
```

```r
stargazer(model_ols, model_pols, pols_robust_se, model_re, model_fe,
          title = "Model Comparison",
          omit.stat = c("f"),
          column.labels = c("OLS", "Pooled OLS", "POLS (robust SE)", "Random Effects", "Fixed Effects")
          model.names = FALSE, header = FALSE, font.size = "small")
```

Table 1: Model Comparison

	Dependent variable:				
	lwage			lwage	
	OLS	Pooled OLS	POLS (robust SE)	Random Effects	Fixed Effects
	(1)	(2)	(3)	(4)	(5)
union	0.198***	0.198***	0.198***	0.114***	0.085***
	(0.017)	(0.017)	(0.028)	(0.018)	(0.019)
d81	0.120***	0.120***	0.120***	0.120***	0.120***
	(0.029)	(0.029)	(0.024)	(0.021)	(0.021)
d82	0.177***	0.177***	0.177***	0.178***	0.178***
	(0.029)	(0.029)	(0.024)	(0.021)	(0.021)
d83	0.227***	0.227***	0.227***	0.226***	0.226***
	(0.029)	(0.029)	(0.024)	(0.021)	(0.021)
d84	0.297***	0.297***	0.297***	0.297***	0.297***
	(0.029)	(0.029)	(0.027)	(0.021)	(0.021)
d85	0.351***	0.351***	0.351***	0.349***	0.348***
	(0.029)	(0.029)	(0.026)	(0.021)	(0.021)
d86	0.414***	0.414***	0.414***	0.411***	0.410***
	(0.029)	(0.029)	(0.027)	(0.021)	(0.021)
d87	0.471***	0.471***	0.471***	0.472***	0.472***
	(0.029)	(0.029)	(0.026)	(0.021)	(0.021)
educ	0.077***	0.077***	0.077***	0.077***	
	(0.004)	(0.004)	(0.009)	(0.009)	
black	−0.153***	−0.153***	−0.153***	−0.140***	
	(0.024)	(0.024)	(0.051)	(0.048)	
hisp	0.013	0.013	0.013	0.018	
	(0.021)	(0.021)	(0.040)	(0.043)	
Constant	0.457***	0.457***	0.457***	0.474***	
	(0.056)	(0.056)	(0.111)	(0.109)	
Observations	4,360	4,360		4,360	4,360
R^2	0.170	0.170		0.166	0.167
Adjusted R^2	0.168	0.168		0.164	0.046
Residual Std. Error	0.486 (df = 4348)				
Note:					*p<0.1; **p<0.05; ***p<0.01