

## [Example13-3] DiD estimator

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### Difference in Difference estimator

```
load("~/計量経済学演習/R data sets for 5e/kielmc.RData")
kielmc<-data
```

### Separate regs for 1978 and 1981 conditioning each year

```
coef( lm(rprice~nearinc, data=kielmc, subset=(year==1978)) ) #treatment
の前でconditioning
```

```
## (Intercept)      nearinc
##      82517.23    -18824.37
```

```
coef( lm(rprice~nearinc, data=kielmc, subset=(year==1981)) ) #treatment
の後にconditioning
```

```
## (Intercept)      nearinc
##      101307.51    -30688.27
```

この差  $-30688.27 - (-18824.37) = -11863.9$  が DiD estimator

### Joint reg including an interaction term

```
library(lmtest)
```

```
## Loading required package: zoo
```

```
##
```

```
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
##      as.Date, as.Date.numeric
```

```
DiD<-lm(rprice~nearinc*y81, data=kielmc)
```

```
coeftest(DiD)
```

```
##
```

```
## t test of coefficients:
```

```
##
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```
##              Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept)  82517.2      2726.9 30.2603 < 2.2e-16 ***
```

```
## nearinc      -18824.4      4875.3 -3.8612 0.0001368 ***
## y81          18790.3      4050.1  4.6395 5.117e-06 ***
## nearinc:y81 -11863.9      7456.6 -1.5911 0.1125948
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

DiD estimator(estimate) は interaction の coef の estimate と一致する。

だが実際まで garbage incinarator construction の影響を過小評価。推定結果は 10%ですら significant ではない。おそらく理由 g は construction に伴う incidental changes を 1 つも model に含んでいないこと。要するに omitted variable bias 。これを改善しにいく。

```
DiD2<-lm(log(rprice)~nearinc*y81+age+I(age^2)+log(intst)+
          log(land)+log(area)+rooms+baths, data=kielmc)
```

```
library(stargazer)
```

```
##
```

```
## Please cite as:
```

```
## Hlavac, Marek (2018). stargazer: Well-Formatted Regression and Summary Statistics Tables.
```

```
## R package version 5.2.2. https://CRAN.R-project.org/package=stargazer
```

```
stargazer(DiD,DiD2,type="text")
```

```
##
```

```
## =====
```

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```
Dependent variable:
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```

	rprice (1)	log(rprice) (2)
nearinc	-18,824.370*** (4,875.322)	0.032 (0.047)
y81	18,790.290*** (4,050.065)	0.162*** (0.028)
age		-0.008*** (0.001)
I(age2)		0.00004*** (0.00001)
log(intst)		-0.061*

```

##                                     (0.032)
##
## log(land)                          0.100***
##                                     (0.024)
##
## log(area)                          0.351***
##                                     (0.051)
##
## rooms                             0.047***
##                                     (0.017)
##
## baths                             0.094***
##                                     (0.028)
##
## nearinc:y81                       -11,863.900
##                                     (7,456.646)
##                                     -0.132**
##                                     (0.052)
##
## Constant                          82,517.230***
##                                     (2,726.910)
##                                     7.652***
##                                     (0.416)
## -----
## Observations                      321
## R2                                0.174
## Adjusted R2                       0.166
## Residual Std. Error 30,242.900 (df = 317)
## F Statistic          22.251*** (df = 3; 317)
## =====
## Note:                             *p<0.1; **p<0.05; ***p<0.01

```

nearinc:y81 の coef を見れば、incidental changes を regressors として含んだことにより改善したことがわかる。5%significant に変わった。もうちょいで 1%も。