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Homework 6

Part A

Estimation for data year 81

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

(Intercept):1 3.8077394 0.1909268 19.9435 < 2.2e-16 \*\*\*

(Intercept):2 0.3878269 0.1855553 2.0901 0.03662 \*

educ:1 -0.3570751 0.0149644 -23.8616 < 2.2e-16 \*\*\*

educ:2 -0.0754138 0.0138104 -5.4607 4.790e-08 \*\*\*

exper:1 1.0955657 0.0603814 18.1441 < 2.2e-16 \*\*\*

exper:2 2.0864348 0.0564818 36.9400 < 2.2e-16 \*\*\*

expersq:1 -0.1248613 0.0104908 -11.9020 < 2.2e-16 \*\*\*

expersq:2 -0.2044507 0.0094642 -21.6026 < 2.2e-16 \*\*\*

black:1 1.0067840 0.0627344 16.0484 < 2.2e-16 \*\*\*

black:2 0.4338390 0.0627611 6.9125 4.879e-12 \*\*\*

Estimation for data year 87

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

(Intercept):1 3.8077394 0.1909268 19.9435 < 2.2e-16 \*\*\*

(Intercept):2 0.3878269 0.1855553 2.0901 0.03662 \*

educ:1 -0.3570751 0.0149644 -23.8616 < 2.2e-16 \*\*\*

educ:2 -0.0754138 0.0138104 -5.4607 4.790e-08 \*\*\*

exper:1 1.0955657 0.0603814 18.1441 < 2.2e-16 \*\*\*

exper:2 2.0864348 0.0564818 36.9400 < 2.2e-16 \*\*\*

expersq:1 -0.1248613 0.0104908 -11.9020 < 2.2e-16 \*\*\*

expersq:2 -0.2044507 0.0094642 -21.6026 < 2.2e-16 \*\*\*

black:1 1.0067840 0.0627344 16.0484 < 2.2e-16 \*\*\*

black:2 0.4338390 0.0627611 6.9125 4.879e-12 \*\*\*

**According to the two results, the coefficients for year 81 and 87 are not meaningfully different.**

Part B&C

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

(Intercept):1 5.1515519 0.2282348 22.5713 < 2.2e-16 \*\*\*

(Intercept):2 1.8583230 0.2257486 8.2318 < 2.2e-16 \*\*\*

educ:1 -0.5473739 0.0189537 -28.8796 < 2.2e-16 \*\*\*

educ:2 -0.2555556 0.0182413 -14.0097 < 2.2e-16 \*\*\*

exper:1 0.7699565 0.0633138 12.1610 < 2.2e-16 \*\*\*

exper:2 1.8238206 0.0585207 31.1654 < 2.2e-16 \*\*\*

expersq:1 -0.1153747 0.0107128 -10.7698 < 2.2e-16 \*\*\*

expersq:2 -0.1956538 0.0095773 -20.4288 < 2.2e-16 \*\*\*

black:1 0.8773806 0.0656222 13.3702 < 2.2e-16 \*\*\*

black:2 0.3384600 0.0649310 5.2126 1.877e-07 \*\*\*

y82:1 0.9871298 0.0928663 10.6296 < 2.2e-16 \*\*\*

y82:2 0.5624964 0.0936880 6.0039 1.953e-09 \*\*\*

y83:1 1.3835914 0.1035336 13.3637 < 2.2e-16 \*\*\*

y83:2 1.2257324 0.0998515 12.2756 < 2.2e-16 \*\*\*

y84:1 1.5872132 0.1155479 13.7364 < 2.2e-16 \*\*\*

y84:2 1.4265200 0.1095937 13.0164 < 2.2e-16 \*\*\*

y85:1 2.0525935 0.1307155 15.7028 < 2.2e-16 \*\*\*

y85:2 1.6629944 0.1243068 13.3781 < 2.2e-16 \*\*\*

y86:1 2.6528468 0.1513582 17.5269 < 2.2e-16 \*\*\*

y86:2 2.0295849 0.1447250 14.0237 < 2.2e-16 \*\*\*

y87:1 2.7272648 0.1701078 16.0326 < 2.2e-16 \*\*\*

y87:2 1.9956392 0.1622285 12.3014 < 2.2e-16 \*\*\*

**Based on the above results, the time dummies should be kept in the model because all the variables are statistically significant. This will allow us toe control for change in time trend.**

Part D

**As indicated above the time dummies will allows us to control for time trend and autocorrelation. There certainly exist autocorrelation across different variables. For example, an individual experience would increase each year and its initial value will corelate with its future increased value and same goes for education.**

Part E

For year == 81

When educ == 12

0 1 2

1 0.03199082 0.04897495 0.9190342

When educ == 16

0 1 2

1 0.08689896 0.01489626 0.8982048

**So the change in the probability in 1981 of being employed (j = 2) for a black man with five years of experience when educ increases from 12 to 16 is -0.0208294**

For year == 87

When educ == 12

0 1 2

1 0.004241625 0.09929262 0.8964658

When educ == 16

0 1 2

1 0.01255278 0.03290325 0.954544

**So the change in the probability in 1981 of being employed (j = 2) for a black man with five years of experience when educ increases from 12 to 16 is 0.0580782**

Part F

Yes, they are different from one another. The probability of being employed decreased when edu increases for year 81 but the probability of being employed increased when educ increases for year 87.

To test whether they are equal to one another, we can

1. Derive the distribution of prediction
2. Derive the distribution of the difference
3. Check if the two predictions calculated are the same by testing the null hypothesis that suggest zero difference between the two predictions (two-way test)

Part G

**You can run a regression with isolated interaction terms using exper\*year and expersq\*year. The regression result is shown below:**

t test of coefficients:

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

(Intercept):1 5.093508 0.231121 22.0383 < 2.2e-16 \*\*\*

(Intercept):2 1.721362 0.229970 7.4852 7.389e-14 \*\*\*

educ:1 -0.560162 0.019276 -29.0607 < 2.2e-16 \*\*\*

educ:2 -0.266490 0.018505 -14.4008 < 2.2e-16 \*\*\*

exper:1 0.653184 0.079764 8.1889 2.765e-16 \*\*\*

exper:2 1.764385 0.073964 23.8548 < 2.2e-16 \*\*\*

expersq:1 -0.105660 0.016889 -6.2561 4.014e-10 \*\*\*

expersq:2 -0.196450 0.015468 -12.7000 < 2.2e-16 \*\*\*

black:1 0.902105 0.066476 13.5705 < 2.2e-16 \*\*\*

black:2 0.366270 0.065878 5.5599 2.728e-08 \*\*\*

y82:1 1.219250 0.099608 12.2405 < 2.2e-16 \*\*\*

y82:2 0.834386 0.105786 7.8875 3.213e-15 \*\*\*

y83:1 1.630235 0.110482 14.7557 < 2.2e-16 \*\*\*

y83:2 1.506665 0.111745 13.4830 < 2.2e-16 \*\*\*

y84:1 1.855849 0.123271 15.0550 < 2.2e-16 \*\*\*

y84:2 1.722675 0.121931 14.1282 < 2.2e-16 \*\*\*

y85:1 2.345073 0.139090 16.8601 < 2.2e-16 \*\*\*

y85:2 1.977394 0.136682 14.4671 < 2.2e-16 \*\*\*

y86:1 2.967836 0.160267 18.5181 < 2.2e-16 \*\*\*

y86:2 2.367644 0.156765 15.1031 < 2.2e-16 \*\*\*

y87:1 3.495651 0.228375 15.3066 < 2.2e-16 \*\*\*

y87:2 2.996462 0.214030 14.0002 < 2.2e-16 \*\*\*

I(exper \* y81):1 2.503562 0.460372 5.4381 5.436e-08 \*\*\*

I(exper \* y81):2 2.462329 0.445297 5.5296 3.242e-08 \*\*\*

I(expersq \* y81):1 -0.535728 0.271800 -1.9710 0.0487312 \*

I(expersq \* y81):2 -0.568146 0.265648 -2.1387 0.0324686 \*

I(exper \* y87):1 -0.692891 0.185125 -3.7428 0.0001824 \*\*\*

I(exper \* y87):2 -0.879534 0.169975 -5.1745 2.303e-07 \*\*\*

I(expersq \* y87):1 0.092150 0.030077 3.0638 0.0021875 \*\*

I(expersq \* y87):2 0.119240 0.027589 4.3221 1.552e-05 \*\*\*

**A failure to reject the null doesn’t imply that the marginal effect of experience has not changed over time as there is a clear correlation between the variables each year.**