BS2280 – Econometrics I
Homework 8: Dummy Variables

1

Does the sex of an individual affect educational attainment? We regress *S (educational attainment in years)* on *ASVABC (Ability score)*, *SM (educational attainment of mother in years)*, *SF (educational attainment of father in years)*, and $MALE$, a dummy variable that is 1 for male respondents and 0 for female ones. Interpret the coefficients and perform t-tests. The critical t value at the 5% significance level is 1.96. Is there any evidence that the educational attainment of males is different from that of females?

```
Call:
lm(formula = S ~ ASVABC + SM + SF + MALE, data = EAWE22)

Residuals:
    Min      1Q  Median      3Q     Max
-6.6240 -1.5514  0.0377  1.4935  6.3454

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 10.90114    0.59470
ASVABC       1.20327    0.11344
SM           0.17453    0.04755
SF           0.11214    0.04125
MALE        -0.86372    0.20170
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.228 on 495 degrees of freedom
Multiple R-squared:  0.3573,    Adjusted R-squared:  0.3521
F-statistic: 68.81 on 4 and 495 DF,  p-value: < 2.2e-16
```

2

Does ethnicity affect educational attainment? We add the following ethnic dummy variables to the regression model above:

$ETHHISP$	1 if hispanic, 0 otherwise
$ETHBLACK$	1 if black, 0 otherwise
$ETHWHITE$	1 if not hispanic or black, 0 otherwise

We regress S on $ASVABC$, $MALE$, SM, SF, $ETHBLACK$, and $ETHHISP$. In this specification $ETHWHITE$ has been chosen as the reference category, and so it is omitted. Interpret the regression results and perform t tests on the coefficients. The critical t value at the 5% significance level is 1.96.

```
Call:
lm(formula = S ~ ASVABC + SM + SF + MALE + ETHBLACK + ETHHISP,
    data = EAWE22)

Residuals:
    Min      1Q  Median      3Q     Max
-6.5677 -1.5150  0.0058  1.4156  6.4117

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 10.78365    0.63926
ASVABC       1.26416    0.12042
SM           0.17396    0.04802
SF           0.11385    0.04196
MALE        -0.83509    0.20254
ETHBLACK     0.51097    0.34022
ETHHISP      0.18325    0.33330
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.227 on 493 degrees of freedom
Multiple R-squared:  0.3604,    Adjusted R-squared:  0.3526
F-statistic: 46.29 on 6 and 493 DF,  p-value: < 2.2e-16
```

3

Using the ANOVA tables below, Evaluate whether the ethnicity dummies as a group have significant explanatory power for educational attainment by comparing the residual sums of squares in the regressions in Question 1 and 2. The critical F value at the 5% significance level is 3.01. Analysis of Variance Table

Model 1:

```
Response: S
           Df  Sum Sq Mean Sq  F value    Pr(>F)
ASVABC      1 1089.37 1089.37 219.4517 < 2.2e-16 ***
SM          1  161.56  161.56  32.5468 2.005e-08 ***
SF          1   24.26   24.26   4.8869   0.02752 *
MALE        1   91.03   91.03  18.3382 2.222e-05 ***
Residuals 495 2457.21    4.96
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Model 2:

```
Response: S
           Df  Sum Sq Mean Sq  F value    Pr(>F)
ASVABC      1 1089.37 1089.37 219.6059 < 2.2e-16 ***
SM          1  161.56  161.56  32.5697 1.987e-08 ***
SF          1   24.26   24.26   4.8904   0.02746 *
MALE        1   91.03   91.03  18.3511 2.209e-05 ***
ETHBLACK    1   10.15   10.15   2.0454   0.15330
ETHHISP     1    1.50    1.50   0.3023   0.58271
Residuals 493 2445.56    4.96
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

4

Is the effect of the $ASVABC$ score on educational attainment different for males and females? We define a slope dummy variable $MALEASVC$ as the product of $MALE$ and $ASVABC$:

$$MALEASVC = MALE \times ASVABC$$

Regress S on $ASVABC$, SM, SF, $ETHBLACK$, $ETHHISP$, $MALE$, and $MALEASVC$, interpret the equation.

```
Call:
lm(formula = S ~ SM + SF + ETHBLACK + ETHHISP + ASVABC + MALE +
    MALEASVC, data = EAWE22)

Residuals:
    Min      1Q  Median      3Q     Max
-6.6488 -1.5246 -0.0176  1.3740  6.4195

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 10.77864    0.63893  16.870  < 2e-16 ***
SM           0.16983    0.04811   3.530 0.000454 ***
SF           0.11518    0.04195   2.746 0.006258 **
ETHBLACK     0.52734    0.34029   1.550 0.121870
ETHHISP      0.19088    0.33318   0.573 0.566973
ASVABC       1.42912    0.17996   7.941 1.37e-14 ***
MALE        -0.78987    0.20573  -3.839 0.000140 ***
MALEASVC    -0.26292    0.21326  -1.233 0.218213
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.226 on 492 degrees of freedom
Multiple R-squared:  0.3623,    Adjusted R-squared:  0.3533
F-statistic: 39.94 on 7 and 492 DF,  p-value: < 2.2e-16
```