WWS 509 Generalized Linear Models: Precept 5
A Review of Interactions

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1 Logit Regression Interaction

1.1 HIV and Age

Here we have the data on the chance of giving birth in the follow-up period. Included in this model is age groups (with age 15-19 as the reference group), a dummy for HIV status, and interaction terms for HIV status and age.

```
. logit chi_dum hiv5 age_group* hiv_*

Iteration 0:   log likelihood = -2112.9466
Iteration 1:   log likelihood =  -1934.095
Iteration 2:   log likelihood = -1929.9259
Iteration 3:   log likelihood = -1929.8897
Iteration 4:   log likelihood = -1929.8896

Logistic regression                                     Number of obs   =       3307
                                                        LR chi2(11)     =     366.11
                                                        Prob > chi2     =     0.0000
Log likelihood = -1929.8896                             Pseudo R2       =     0.0866

------------------------------------------------------------------------------
     chi_dum |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        hiv5 |   .3448405   .8072783     0.43   0.669    -1.237396    1.927077
  age_group2 |   1.234313   .1278387     9.66   0.000      .983754    1.484873
  age_group3 |   1.730612   .1291826    13.40   0.000     1.477418    1.983805
  age_group4 |   1.638989   .1343145    12.20   0.000     1.375737     1.90224
  age_group5 |   1.182523   .1444718     8.19   0.000     .8993634    1.465682
  age_group6 |  -.1099815   .1652238    -0.67   0.506    -.4338142    .2138511
   hiv_20_24 |  -1.630209     .94745    -1.72   0.085    -3.487177    .2267589
```

```
   hiv_25_29 |  -1.418832    .863965    -1.64   0.101    -3.112172    .2745082
   hiv_30_34 |  -1.290682   .8622822    -1.50   0.134    -2.980724    .3993601
   hiv_35_39 |  -.9483295   .8766014    -1.08   0.279    -2.666437    .7697778
   hiv_40_44 |  -1.345281   1.097031    -1.23   0.220    -3.495424    .8048608
       _cons |  -1.597603   .0940268   -16.99   0.000    -1.781893   -1.413314
------------------------------------------------------------------------------
```

2 Linear Regression Interactions

2.1 Education and Smoking

Here we are looking at birth weight (in grams). Our predictors include education (in years) and smoking during pregnancy (dummy variable where yes=1). I have also included an interaction between education and smoking.

```
. reg grams educ smoke e_s

      Source |       SS       df       MS              Number of obs =    1115
-------------+------------------------------           F(  3,  1111) =   22.53
       Model |  25638449.3     3  8546149.76           Prob > F      =  0.0000
    Residual |   421459702  1111  379351.667           R-squared     =  0.0573
-------------+------------------------------           Adj R-squared =  0.0548
       Total |   447098151  1114   401344.84           Root MSE      =  615.92

------------------------------------------------------------------------------
       grams |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   17.76375   10.12754     1.75   0.080    -2.107507    37.63501
       smoke |  -521.3268   264.8108    -1.97   0.049    -1040.912   -1.741078
         e_s |   17.79089   22.40432     0.79   0.427    -26.16865    61.75044
       _cons |   3078.364   128.6837    23.92   0.000     2825.874    3330.854
------------------------------------------------------------------------------
```

2.2 Education and Race

This regression comes from the same data set as above. This time, we will be looking at a dummy variable for race (coded 1 if the mother is African-American). Again, I have included an interaction.

```
. reg grams educ black e_b

      Source |       SS       df       MS              Number of obs =    1115
-------------+------------------------------           F(  3,  1111) =   29.96
       Model |    33466512     3    11155504           Prob > F      =  0.0000
    Residual |   413631639  1111  372305.706           R-squared     =  0.0749
-------------+------------------------------           Adj R-squared =  0.0724
```

```
       Total |   447098151  1114   401344.84           Root MSE      =  610.17

------------------------------------------------------------------------------
       grams |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   11.41936   12.03392     0.95   0.343    -12.19241    35.03114
       black |  -678.0532   220.6327    -3.07   0.002    -1110.957   -245.1493
         e_b |   29.50743   17.67211     1.67   0.095    -5.167042    64.1819
       _cons |   3271.569   154.7367    21.14   0.000      2967.96    3575.178
------------------------------------------------------------------------------
```

2.3 The Gender Gap

Here is the regression from the problem set. I want us to take a section look at the dummy variable female and interaction with gender and work experience.

```
. gen workeXfemale = workexp * female

. regress logWages educ workexp union south ‘occupation’ female workeXfemale

      Source |       SS       df       MS              Number of obs =     534
-------------+------------------------------           F( 11,   522) =   26.11
       Model |  52.6813635    11  4.78921486           Prob > F      =  0.0000
    Residual |  95.7654588   522  .183458733           R-squared     =  0.3549
-------------+------------------------------           Adj R-squared =  0.3413
       Total |  148.446822   533  .278511862           Root MSE      =  .42832

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    logWages |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   education |   .0714044   .0099382     7.18   0.000     .0518806    .0909282
     workexp |   .0140507   .0022475     6.25   0.000     .0096353     .018466
 unionmember |   .1964052   .0509929     3.85   0.000     .0962287    .2965817
       south |   -.110057    .041532    -2.65   0.008    -.1916474   -.0284666
    occSales |   -.344788   .0914325    -3.77   0.000    -.5244089   -.1651672
 occClerical |  -.2024009   .0762767    -2.65   0.008     -.352248   -.0525538
  occService |  -.3819969   .0811085    -4.71   0.000    -.5413362   -.2226577
     occProf |  -.0367114   .0727433    -0.50   0.614    -.1796169    .1061942
    occOther |  -.1890991     .07595    -2.49   0.013    -.3383042    -.039894
      female |  -.0858201   .0678538    -1.26   0.207      -.21912    .0474799
workeXfemale |  -.0069357   .0030461    -2.28   0.023    -.0129198   -.0009516
       _cons |   1.158463   .1757792     6.59   0.000     .8131414    1.503784
------------------------------------------------------------------------------
```