Homework #6 Solutions

Problem #1

```
. gen educ_exper=educ*exper

. regress lwage educ educ_exper exper

      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  3,   931) =   48.41
       Model |  22.3529774     3  7.45099246           Prob > F      =  0.0000
    Residual |  143.303317   931  .153924078           R-squared     =  0.1349
-------------+------------------------------           Adj R-squared =  0.1321
       Total |  165.656294   934  .177362199           Root MSE      =  .39233

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0440498   .0173911     2.53   0.011     .0099195    .0781801
  educ_exper |    .003203   .0015292     2.09   0.036      .000202     .006204
       exper |  -.0214959   .0199783    -1.08   0.282    -.0607036    .0177118
       _cons |   5.949455   .2408264    24.70   0.000     5.476829     6.42208
------------------------------------------------------------------------------
```

a.) The return to education is written as the following:

$$\frac{\partial lwage}{\partial educ} = \beta_1 + \beta_2 \exp er$$

Thus, the returns to education depend on experience if the coefficient on the interaction term is significantly different from zero. Looking at the 95% confidence interval, it does not contain zero, which means that we can reject it using a standard t-test. Precisely, experience significantly increases the returns to education.

b.) First, write the returns to experience:

$$\frac{\partial lwage}{\partial \exp er} = -0.0215 + 0.0032 educ$$

The difference is that the gains to experience are negative for low levels of education, and positive to for high levels of education. At educ=6.71875, the returns to experience are zero.

You can stop here for this question, but in practice, check the range of education to see if the zero point is relevant.

```
. summarize educ

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        educ |       935    13.46845    2.196654          9         18
```

Clearly, education is never this low, so the returns to education are positive for all respondents.

Problem #2

a.)

```
. regress lwage educ married, level(99)

      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  2,   932) =   67.07
       Model |  20.8435558     2  10.4217779            Prob > F      =  0.0000
    Residual |  144.812739   932  .155378475            R-squared     =  0.1258
-------------+------------------------------           Adj R-squared =  0.1239
       Total |  165.656294   934  .177362199            Root MSE      =  .39418

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       lwage |      Coef.   Std. Err.      t    P>|t|     [99% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0617349   .0058817    10.50   0.000     .0465535    .0769164
     married |   .2299469   .0417834     5.50   0.000     .1220991    .3377948
       _cons |   5.742176    .090445    63.49   0.000     5.508727    5.975625
------------------------------------------------------------------------------
```

The 99% confidence interval of the coefficient on married is [0.122,0.338]. This implies that those who are married earn between 12% and 34% higher wages.

b.)

```
. gen educ_married=educ*married

. regress lwage educ married educ_married

      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  3,   931) =   44.77
       Model |  20.8866517     3  6.96221725            Prob > F      =  0.0000
    Residual |  144.769643   931  .155499079            R-squared     =  0.1261
-------------+------------------------------           Adj R-squared =  0.1233
       Total |  165.656294   934  .177362199            Root MSE      =  .39433

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       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0529178    .017752     2.98   0.003     .0180792    .0877563
     married |   .0933086   .2628925     0.35   0.723     -.422622    .6092392
educ_married |   .0099054   .0188156     0.53   0.599    -.0270205    .0468314
       _cons |   5.864206   .2488318    23.57   0.000      5.37587    6.352542
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```

According to the p-value, the probability that I falsely reject the null is 0.599. This is very high. Thus, I should not reject the null.

c. This is an open ended question. Clearly, married and the interaction are no longer significant. On a basic level, this suggests that being married has no effect on the returns to education. But why is the effect of being married seemingly insignificant? As stated above, education levels start at 9 years in our dataset. Thus, the coefficient on married is meaningless for our sample. Evaluating the returns to being married for the average person for the sample, we find that it is 0.226719, which his exactly the same as before. Thus, again, we must be careful when interpreting interactions (and squared terms), since the range of the data clearly matters.