HW 3

1) $\widehat{ACT} = 7.724 + 5.650\ GPA$
$(6.378)\quad (1.973)$

$SST = 56.875$

$SSR = 32.841$

$SSE = 24.034$

2) $t = 2.86 > t_{6,0.025} = 2.45$ $\quad H_0: \beta_2 = 0\ ;\ H_A: \beta_2 \neq 0$

Will reject at $\alpha = 0.05$.

P-value is 0.029

3) $R^2 = 0.5774$

$$1 - \frac{SSE}{SST} = 1 - \frac{24.034}{56.875} = 0.5774$$

4) - For $X_{02} = 3.0$, $\hat{y}^f = 24.6744$

Individual forecast error $se(\hat{y}^f) = \sqrt{\left[1 + \frac{1}{8} + \frac{(\bar{X}_2 - X_{20})^2}{\Sigma(X_{i2} - \bar{X}_2)^2}\right]\hat{\sigma}^2} = 2.1638$

PI is $[19.3796, 29.9691]$

- For $X_{02} = \bar{X}_2 = 3.3125$

Individual forecast err. $se(\hat{y}^f) = \sqrt{(1 + \frac{1}{8})\hat{\sigma}^2} = 2.1228$

PI is $[20.6806, 31.0674]$

Mean forecast err. $se(\hat{y}^f) = \sqrt{\frac{1}{8}\hat{\sigma}^2} = 0.7076$

CI is $[24.1435, 27.6065]$

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      name:  <unnamed>
       log:  C:\Users\wsr\Dropbox\2018S\571\Econ571_Lab\logs/HW3.log
  log type:  text
 opened on:  14 Feb 2018, 13:36:55

.
. ************
. *Input data*
. ************
.
. input gpa act


         gpa       act
  1.         2.8 21
  2.         3.4 24
  3.         3.0 26
  4.         3.5 27
  5.         3.6 29
  6.         3.0 25
  7.         2.7 25
  8.         3.7 30
  9. end

. gen student = _n


.
.
. ************
. *Regression*
. ************
```

```
.
. regress act gpa

      Source |       SS       df       MS              Number of obs =       8
-------------+------------------------------           F(  1,     6) =    8.20
       Model |  32.8409772     1  32.8409772           Prob > F      =  0.0287
    Residual |  24.0340228     6  4.00567047           R-squared     =  0.5774
-------------+------------------------------           Adj R-squared =  0.5070
       Total |     56.875     7      8.125           Root MSE      =  2.0014

------------------------------------------------------------------------------
         act |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         gpa |   5.650061   1.973253     2.86   0.029     .8216855    10.47844
       _cons |    7.72418   6.378446     1.21   0.271    -7.883314    23.33167
------------------------------------------------------------------------------

.
.
. ***********
. *Prediction*
. ***********
.
. set obs 11
obs was 8, now 11

. quietly summarize gpa

. replace gpa = 3 in 9
(1 real change made)
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```
. replace gpa = r(mean) in 10/11
(2 real changes made)

.
. predict act_hat in 9/11
(option xb assumed; fitted values)
(8 missing values generated)

. predict se_ind in 9/10, stdf /*individual prediction*/
(9 missing values generated)

. predict se_mean in 11, stdp /*mean prediction*/
(10 missing values generated)

.
. gen t = invttail(6, 0.025) in 9/11 /*crital value*/
(8 missing values generated)

. gen lb_ind = act_hat - t*se_ind in 9/10 /*lower bound for indiv. prediction*/
(9 missing values generated)

. gen ub_ind = act_hat + t*se_ind in 9/10 /*upper bound for indiv. prediction*/
(9 missing values generated)

. gen lb_mean = act_hat - t*se_mean in 11 /*lower bound for mean prediction*/
(10 missing values generated)

. gen ub_mean = act_hat + t*se_mean in 11 /*upper bound for mean prediction*/
(10 missing values generated)

.
```

```
. list act_hat *_ind *_mean in 9/11

     +-------------------------------------------------------------------------------+
     | act_hat    se_ind    lb_ind    ub_ind   se_mean   lb_mean   ub_mean |
     |-------------------------------------------------------------------------------|
  9. | 24.67436   2.163841   19.37963   29.96909         .         .         . |
 10. |   25.875   2.122823   20.68064   31.06936         .         .         . |
 11. |   25.875         .         .         .   .7076078   24.14355   27.60645 |
     +-------------------------------------------------------------------------------+

.
. log close
      name:  <unnamed>
       log:  C:\Users\wsr\Dropbox\2018S\571\Econ571_Lab\logs/HW3.log
  log type:  text
 closed on:  14 Feb 2018, 13:36:55
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