Economics 113 Professor Spearot
Fall 2014 – Midterm 2

Introduction to Econometrics

Name ______________________________ ID ________________________________

Midterm 2 –70 Points

The exam is closed book and closed notes. You may use calculators. No cell phones. Do not use your own paper.

<u>You must show your work to receive full credit</u>

I have neither given nor received unauthorized aid on this examination, nor have I concealed any similar misconduct by others.

*Signature*____

Problem 1

Many models of labor economics predict hours worked, and many policies depend on the number of hours worked (eg. Affordable Care Act). Suppose we wish to predict hours worked per week, *hours*, using the following regression:

$$\log(hours) = \beta_0 + \beta_1 educ + \beta_2 age + \beta_3 exper + u$$

Education, experience and age are all measured in years. The results from this regression are below.

```
      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  3,   931) =    3.77
       Model |  .261139734     3  .087046578           Prob > F      =  0.0104
    Residual |  21.4864901   931  .023078937           R-squared     =  0.0120
-------------+------------------------------           Adj R-squared =  0.0088
       Total |  21.7476298   934    .0232844           Root MSE      =  .15192
------------------------------------------------------------------------------
   log_hours |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0052999   .0026448    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
         age |   .0025309   .0019156    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
       exper |  -.0018032   .0015286    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
       _cons |    3.63621   .0616024    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
------------------------------------------------------------------------------
```

a. Please construct a 99% confidence interval for the effect of education on hours worked. Please interpret this confidence interval. **(10 Points)**

b. Using the 97% confidence level, please test whether the coefficient on *age* is significantly different from zero. State your null and alternative hypotheses, and briefly interpret your result. Show your work! **(10 Points)**

c. Suppose that we instead estimate the following:

$$\log(hours) = \beta_0 + \beta_1 educ + u$$

Source	SS	df	MS			
Model	.214070425	1	.214070425	Number of obs	=	935
Residual	21.5335594	933	.023079914	F(1, 933)	=	9.28
Total	21.7476298	934	.0232844	Prob > F	=	0.0024
				R-squared	=	0.0098
				Adj R-squared	=	0.0088
				Root MSE	=	.15192

log_hours	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
educ	.006892	.002263	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		
_cons	3.677639	.0308812	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		

Is this model preferred to the model in 'a'? If a hypothesis test is warranted, please test this at the 95% level, stating your null and alternative. If not, please provide other evidence for your answer. Show your work! **(10 Points)**

d. Suppose that we instead estimate the following:

$$\log(hours) = \beta_0 + \beta_1 educ + \beta_2 iq + u$$

```
      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  2,   932) =    5.40
       Model |  .249339979     2  .124669989           Prob > F      =  0.0046
    Residual |  21.4982898   932  .023066835           R-squared     =  0.0115
-------------+------------------------------           Adj R-squared =  0.0093
       Total |  21.7476298   934    .0232844           Root MSE      =  .15188

------------------------------------------------------------------------------
   log_hours |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0052082   .0026405    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
          iq |   .0004765   .0003853    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
       _cons |   3.652058   .0371631    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
------------------------------------------------------------------------------
```

Is this model preferred to the model in 'a'? If a hypothesis test is warranted, please test this at the 95% level, stating your null and alternative. If not, please provide other evidence for your answer. Show your work! **(10 Points)**

e. Using the model in 'd', suppose I claim that IQ has a significant effect on hours worked. What is the probability that I'm wrong? **(10 Points)**

Problem 2 (20 points)

Using the same data, but instead using hours worked per week rather than log hours, we estimate the following equation.

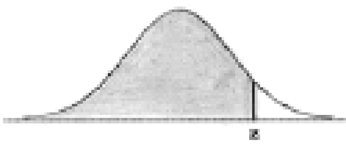
$$hours = \beta_0 + \beta_1(educ - 16) + \beta_2(iq - 140) + u$$

```
      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  2,   932) =    4.36
       Model |   451.81313     2  225.906565           Prob > F      =  0.0130
    Residual |   48293.528   932  51.8170902           R-squared     =  0.0093
-------------+------------------------------           Adj R-squared =  0.0071
       Total |  48745.3412   934  52.1898728           Root MSE      =  7.1984
------------------------------------------------------------------------------
       hours |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     educ-16 |   .2371403   .1251517    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
      iq-140 |   .0175916   .0182636    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
       _cons |   45.21085     .65173    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
------------------------------------------------------------------------------
```

a. Please construct and interpret a 90% confidence interval for the constant in this regression. Show your work!! **(10 Points)**

b. Do the variables of the model tell us anything about hours worked? Test this at the 95% level, stating your null and alternative. Show your work! **(10 Points)**

Have a great weekend!



Normal Distribution from -oo to Z

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990

TABLE G.3b

5% Critical Values of the *F* Distribution

	Numerator Degrees of Freedom									
	1	2	3	4	5	6	7	8	9	10
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83

Example: The 5% critical value for numerator $df = 4$ and large denominator df (∞) is 2.37.

Source: This table was generated using the Stata® function invFtail.