The University of Kansas

Department of Economics

Quiz 6 **Nov/14/2018**
Econ 526 - Introduction to Econometrics **Instructor: Caio Vigo Pereira**

Name:

Regression I (same from Quiz 4)

Consider a random sample with the Grade Point Average (GPA) and standardized test scores (ACT), along with the performance in an introductory economics course, for students at a large public university. The variable to be explained is *score*, which is the final score in the course measured as a percentage.
The econometric model is:

$$log(score) = \beta_0 + \beta_1 hsgpa + \beta_2 log(actmth) + \beta_3 colgpa + u$$

where *hsgpa* is the high school GPA, *log(actmth)* is the natural logarithm of the ACT in math and *colgpa* is the college GPA of the student prior to take the economics course.
The *R* output is:

```
===============================================
                       Dependent variable:
                   ---------------------------
                           log(score)
-----------------------------------------------
hsgpa                        0.0274
                            (0.0204)

log(actmth)                 0.3082***
                            (0.0388)

colgpa                      0.1784***
                            (0.0125)

Constant                    2.7073***
                            (0.1119)

-----------------------------------------------
Observations                  814
R2                           0.3704
Adjusted R2                  0.3681
Residual Std. Error     0.1662 (df = 810)
F Statistic         158.8443*** (df = 3; 810)
===============================================
Note:               *p<0.1; **p<0.05; ***p<0.01
```

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.70730    0.11192    ?     < 2e-16
hsgpa        0.02741    0.02037    ?        ?
log(actmth)  0.30816    0.03881    ?     6.7e-15
colgpa       0.17840    0.01250    ?     < 2e-16
---
```

SECTION A - MULTIPLE CHOICE

12% 1. Consider the **Regression I**. Suppose you want to test whether $\beta_1 > 0$. What is $t_{\hat{\beta}_1}$ equal to?
A. 0.7445
B. 24.1939
C. 1.3431
D. 0.0413

12% 2. Consider the **Regression I** again. Suppose you want to test whether $\beta_1 = 0$. Evaluate the statements below and determine which one is correct.
A. We can reject H_0 at 5% significance level, but not at 1% significance level.
B. We can reject H_0 at 10% significance level, but not at 5% significance level.
C. We can reject H_0 at 1% significance level, but not at 0.1% significance level.
D. We cannot reject H_0 at any significance level less than or equal to 10%.

12% 3. Consider the **Regression I** again. Suppose you want to test whether $\beta_3 = 0$. Evaluate the statements below and determine which one is correct.
A. $\hat{\beta}_3$ is statistically significant at 1% significance level.
B. $\hat{\beta}_3$ is NOT statistically significant at 1% significance level.
C. $\hat{\beta}_3$ is NOT statistically significant at 5% significance level.
D. $\hat{\beta}_3$ is NOT statistically significant at 10% significance level.

12% 4. Consider the **Regression I** again. Suppose you want to test whether $\beta_2 = 0$. Evaluate the statements below and determine which one is correct.
A. $\hat{\beta}_2$ is statistically significant at 0.1% significance level.
B. $\hat{\beta}_2$ is statistically significant at 1% significance level.
C. $\hat{\beta}_2$ is statistically significant at 5% significance level.
D. All the above.

12% 5. Consider the **Regression I** again. Suppose you want to test whether the elasticity of *score* with respect *actmth* is unitary, i.e., equal to 1. Evaluate the statements below and determine which one is correct.
A. We can NOT reject the null hypothesis at 2% significance level.
B. the t statistic provides **no (or little)** evidence against the null hypothesis at small significance levels ($< 1\%$).
C. the t statistic provides evidence against the null hypothesis at small significance levels ($< 1\%$).
D. $\hat{\beta}_2$ is NOT statistically different from 1 at 5% significance level.

12% 6. Assume that the **Classical Linear Model (CLM)** assumptions hold. Knowing that $E(u^2) = 0.1$, what is the distribution of u? (Tip: recall the formula for Variance)
A. $N(0, 0.1^2)$
B. $N(0, 0.1)$
C. t_{df}, where $df = (0.1) \cdot (100)$
D. t_{df}, where $df = n - k - 1$

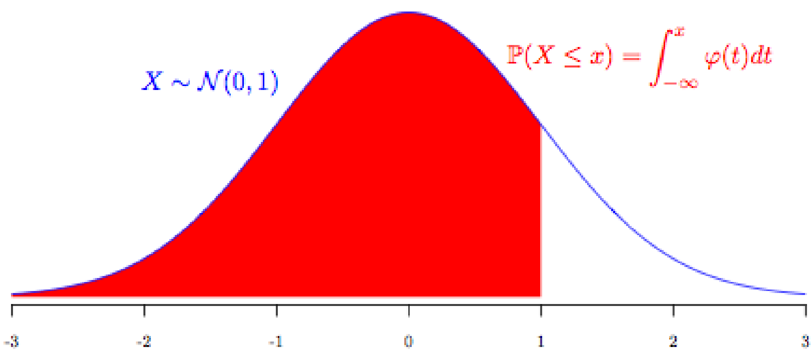
SECTION B - TRUE OR FALSE

10% 1. Whenever we **fail** to reject (“accept”) the null hypothesis when it is in fact **false**, we are committing **Error type I**.
◯ True ◯ False

9% 2. Consider any multiple linear regression. Knowing that you can reject H_0 for a specific parameter at 1% significance level, then you should be able to reject the H_0 at 2% significance level.
◯ True ◯ False

9% 3. Consider any multiple linear regression. Knowing that you can reject H_0 for a specific parameter at 1% significance level, then you should be able to reject the H_0 at 0.1% significance level.
◯ True ◯ False

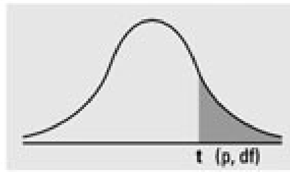
Figure 1: Standard Normal Distribution



	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

Figure 2: t-distribution

Numbers in each row of the table are values on a *t*-distribution with (*df*) degrees of freedom for selected right-tail (greater-than) probabilities (*p*).



df/p	0.40	0.25	0.10	0.05	0.025	0.01	0.005	0.0005
1	0.324920	1.000000	3.077684	6.313752	12.70620	31.82052	63.65674	636.6192
2	0.288675	0.816497	1.885618	2.919986	4.30265	6.96456	9.92484	31.5991
3	0.276671	0.764892	1.637744	2.353363	3.18245	4.54070	5.84091	12.9240
4	0.270722	0.740697	1.533206	2.131847	2.77645	3.74695	4.60409	8.6103
5	0.267181	0.726687	1.475884	2.015048	2.57058	3.36493	4.03214	6.8688
6	0.264835	0.717558	1.439756	1.943180	2.44691	3.14267	3.70743	5.9588
7	0.263167	0.711142	1.414924	1.894579	2.36462	2.99795	3.49948	5.4079
8	0.261921	0.706387	1.396815	1.859548	2.30600	2.89646	3.35539	5.0413
9	0.260955	0.702722	1.383029	1.833113	2.26216	2.82144	3.24984	4.7809
10	0.260185	0.699812	1.372184	1.812461	2.22814	2.76377	3.16927	4.5869
11	0.259556	0.697445	1.363430	1.795885	2.20099	2.71808	3.10581	4.4370
12	0.259033	0.695483	1.356217	1.782288	2.17881	2.68100	3.05454	43178
13	0.258591	0.693829	1.350171	1.770933	2.16037	2.65031	3.01228	4.2208
14	0.258213	0.692417	1.345030	1.761310	2.14479	2.62449	2.97684	4.1405
15	0.257885	0.691197	1.340606	1.753050	2.13145	2.60248	2.94671	4.0728
16	0.257599	0.690132	1.336757	1.745884	2.11991	2.58349	2.92078	4.0150
17	0.257347	0.689195	1.333379	1.739607	2.10982	2.56693	2.89823	3.9651
18	0.257123	0.688364	1.330391	1.734064	2.10092	2.55238	2.87844	3.9216
19	0.256923	0.687621	1.327728	1.729133	2.09302	2.53948	2.86093	3.8834
20	0.256743	0.686954	1.325341	1.724718	2.08596	2.52798	2.84534	3.8495
21	0.256580	0.686352	1.323188	1.720743	2.07961	2.51765	2.83136	3.8193
22	0.256432	0.685805	1.321237	1.717144	2.07387	2.50832	2.81876	3.7921
23	0.256297	0.685306	1.319460	1.713872	2.06866	2.49987	2.80734	3.7676
24	0.256173	0.684850	1.317836	1.710882	2.06390	2.49216	2.79694	3.7454
25	0.256060	0.684430	1.316345	1.708141	2.05954	2.48511	2.78744	3.7251
26	0.255955	0.684043	1.314972	1.705618	2.05553	2.47863	2.77871	3.7066
27	0.255858	0.683685	1.313703	1.703288	2.05183	2.47266	2.77068	3.6896
28	0.255768	0.683353	1.312527	1.701131	2.04841	2.46714	2.76326	3.6739
29	0.255684	0.683044	1.311434	1.699127	2.04523	2.46202	2.75639	3.6594
30	0.255605	0.682756	1.310415	1.697261	2.04227	2.45726	2.75000	3.6460
z	0.253347	0.674490	1.281552	1.644854	1.95996	2.32635	2.57583	3.2905
CI	———	———	80%	90%	95%	98%	99%	99.9%