

Econ 741 (Spring 2003):
Suggested Answer for Computer Homework 2

@ A. COMPUTER PROGRAM @

```
new;
cls;
outfile = "e741sp03.out reset";
seedno = 03050426;
format /rdn 8,0;
"Seed number used = "; seedno;
format /rdn 12,4;
n = 26; @ sample size @
rep = 500; @ # of replication of MCS @
dfe = 4; @ degree of freedom of e @
@ critical values with 5 % significance level @
nc = 1.96; @ standard normal distribution @
tc = 2.06; @ t distribution with df = 25 @

@ creating vector for storing t value in MCS @
t1h0 = zeros(rep,1); @ t1 under H0: beta = 0 @
t1h1 = zeros(rep,1); @ t1 under H1: beta = 1.5 @
t2h0 = zeros(rep,1); @ t2 under H0: beta = 0 @
t2h1 = zeros(rep,1); @ t2 under H1: beta = 1.5 @
i = 1;
do while i <= rep;

@ generating series @
series = rndn(n,dfe+2);
x = series[:,1]; @ regressor @
z = series[:,2]; @ numerator for generating e @
q = sumc((series[:,3:dfe+2])'); @ denominator for generating e @
e = z./sqrt(q/dfe); @ generate e following t- distribution @

@ construct y @
yh0 = e; @ under H0: beta = 0 @
yh1 = x*0.15 + e; @ under H1: beta = 0.15 @

@ construct t-values @
k = cols(x);
dft1 = n-k; @ for t1 @
dft2 = n; @ for t2 @
bh0 = invpd(x'x)*x'yh0; @ b under H0: beta = 0 @
bh1 = invpd(x'x)*x'yh1; @ b under H1: beta = 0.15 @
eh0 = yh0 - x*bh0; @ residuals under H0: beta=0 @
eh1 = yh1 - x*bh1; @ residuals under H1: beta=0.15 @
```

```

t1vh0 = eh0'eh0 / dft1; @ variance of e under H0: beta=0 for t1 @
t1vh1 = eh1'eh1 / dft1; @ variance of e under H1: beta=0.15 for t1 @
t2vh0 = eh0'eh0 / dft2; @ variance of e under H0: beta=0 for t2 @
t2vh1 = eh1'eh1 / dft2; @ variance of e under H1: beta=0.15 for t2 @
t1sbh0 = sqrt(t1vh0*invpd(x'x)); @ standard error of b under H0: beta=0 for t1 @
t1sbh1 = sqrt(t1vh1*invpd(x'x)); @ standard error of b under H0: beta=0.15 for t1 @
t2sbh0 = sqrt(t2vh0*invpd(x'x)); @ standard error of b under H0: beta=0 for t2 @
t2sbh1 = sqrt(t2vh1*invpd(x'x)); @ standard error of b under H0: beta=0.15 for t2 @
t1h0[i] = bh0./ t1sbh0; @ t values under H0: beta=0 for t1 @
t1h1[i] = bh1./ t1sbh1; @ t values under H1: beta=0.15 for t1 @
t2h0[i] = bh0./ t2sbh0; @ t values under H0: beta=0 for t2 @
t2h1[i] = bh1./ t2sbh1; @ t values under H1: beta=0.15 for t2 @
i = i+1;
endo;

```

```

    @ sorting t-values in terms of absolute values @
t1h0s = sortc(abs(t1h0),1);
t1h1s = sortc(abs(t1h1),1);
t2h0s = sortc(abs(t2h0),1);
t2h1s = sortc(abs(t2h1),1);

```

```

    @ printing answers @
"***** Question 1 - use t1 *****";
"";
"a) estimated size with 5 percent significance level based on normal distribution";
meanc(t1h0s . >nc);
"";
"b) estimated size with 5 percent significance level based on t distribution";
meanc(t1h0s . >tc);
"";
"c) estimated true critical value of the t1 for 5 percent significance level";
t1truec0 = t1h0s[int(rep*0.95)];
t1truec0;
"";
"d) power of the test under H1:beta=0.15 based on t(25) distribution";
meanc(t1h1s . >tc);
"";
"e) size corrected power of the test based on MCS distribution";
meanc(t1h1s . >t1truec0);

```

```

    ***** Question 2 - use t2 *****";
"";
"a) estimated size with 5 percent significance level based on normal distribution";
meanc(t2h0s . >nc);
"";

```

```

”b) estimated size with 5 percent significance level based on t distribution”;
meanc(t2h0s . >tc);
””;
”c) estimated true critical value of the t1 for 5 percent significance level”;
t2truec0 = t2h0s[int(rep*0.95)];
t2truec0;
””;
”d) power of the test under H1:beta=0.15 using t(25) distribution”;
meanc(t2h1s . >tc);
””;
”e) size corrected power of the test using MCS distribution”;
meanc(t2h1s . >t2truec0);
end;

```

@ B. OUTPUT @

Seed number used = 3050426

***** Question 1 - use t1 *****

- a) estimated size with 5 percent significance level based on normal distribution
0.0620
- b) estimated size with 5 percent significance level based on t distribution
0.0460
- c) estimated true critical value of the t1 for 5 percent significance level
2.0466
- d) power of the test under H1:beta=0.15 based on t(25) distribution
0.0860
- e) size corrected power of the test based on MCS distribution
0.0880

***** Question 2 - use t2 *****

- a) estimated size with 5 percent significance level based on normal distribution
0.0700
- b) estimated size with 5 percent significance level based on t distribution
0.0560
- c) estimated true critical value of the t1 for 5 percent significance level
2.0872
- d) power of the test under H1:beta=0.15 using t(25) distribution
0.0940
- e) size corrected power of the test using MCS distribution
0.0880

@ C. EVALUATION @

- 1) Based on a MCS, we can say that in small samples, t1 statistic over-rejects with

a nominal critical value of normal distribution and under-rejects with a nominal critical value of t distribution.

However, t_2 statistic over-rejects in small samples when nominal critical value of either normal distribution or t distribution is used.

Both cases, it is better to use t distribution critical value because of less size distortion in small samples.

2) As the size corrected power of the test using either t_1 or t_2 is the same, no difference between them.