**Activity Ref: Chapter 8**

**Activity 8.1: Paired T-test (Ref: Example data Table 8.1 pg. 281)**

A study was conducted to determine the relationship between oral contraceptive (OC) use and blood pressure in women. Systolic blood pressure of a sample of 10 women before and after using OC are measured, denoted respectively by sbp\_BOC and sbp\_aOC. The measurements, in mgHg, are as in the following table:

| **sbp\_bOC** | **sbp\_aOC** |
| --- | --- |
| 115 | 128 |
| 112 | 115 |
| 107 | 106 |
| 119 | 128 |
| 115 | 122 |
| 138 | 145 |
| 126 | 132 |
| 105 | 109 |
| 104 | 102 |
| 115 | 117 |

We wish to test the null hypothesis vs at 5% level of significance.

1. What test statistic should you use?
2. Find the value of the test statistic and p-value for the test.
3. What conclusion can you reach regarding the test?

**Activity 8.2: Equal variance t-test (Ref: Problem 8.23 pg. 322)**

A study is intended for the difference in the mean heart rate between Caucasian and African American newborns. A sample of 218 Caucasian newborns and a sample of 156 African American newborns reveals the following summary statistics:

Caucasian: mean=125 and sd=11

African American: mean=133 and sd=12.

Assume that the variances of the new born heart rates in Caucasian and African Americans are **equal and unknown**.

1. Find an estimate of the pooled standard deviation .
2. Find the margin of error for the 95% CI estimate of .
3. Find a 95% confidence interval for the mean difference in the mean heart rate between Caucasian and African American newborns.
4. We wish to test vs and at 5% level of significance.
5. What test should you use?
6. Find the value of the test statistic.
7. Find the p-value for the test.
8. What is your conclusion about the test?

**Activity 8.3: Unequal variance t-test**

In reference to the activity 8.2, assume thatthe variances of the new born heart rates in Caucasian and African Americans are **unequal and unknown**.

1. Find a 95% confidence interval for the mean difference in the mean heart rate between Caucasian and African American newborns under the new assumption.
2. We wish to test vs and at 5% level of significance.
3. What test should you use?
4. Find the value of the test statistic.
5. Find the p-value for the test.
6. What is your conclusion about the test?

**Activity 8.4: F-test for equality of variances**

In reference to the Activity 8.2, we wish to test the null hypothesis vs at 5% level of significance.

1. What test statistic should you use?
2. Find the value of the test statistic and p-value for the test.
3. What conclusion can you reach regarding the test?

**/\*Ref: Act 8 SAS solution BioSTAT class;\*/**

**data** act8pt1;

input id sbp\_bOC sbp\_aOC;

diff=sbp\_aOC-sbp\_bOC;

cards;

1 115 128

2 112 115

3 107 106

4 119 128

5 115 122

6 138 145

7 126 132

8 105 109

9 104 102

10 115 117

;

**run**;

\*ods select Statistics ConfLimits TTests;

ods trace on;

**proc** **ttest** data= act8pt1 alpha=**0.05**;

paired sbp\_aOC\*sbp\_bOC;

title "Results with paired t for act 12.1";

**run**;

ods trace off;

**proc** **print** data=act12pt1 (drop=id diff) noobs;**run**;

ods trace on;

\*ods select Statistics ConfLimits TTests;

**proc** **ttest** data=act12pt1 alpha=**0.05**;

var diff;

title "Results with univariate ttest for act 8.1";

**run**;

ods trace off;

**data** act8pt2;

input n1 n2 x1bar x2bar s1 s2;

df=n1+n2-**2**;

sp=sqrt(((n1-**1**)\*s1\*\***2**+(n2-**1**)\*s2\*\***2**)/df);

se=sp\*sqrt(**1**/n1+**1**/n2);

me=quantile("t",**0.975**,df)\*se;

ciL=(x1bar-x2bar)-me;

ciU=(x1bar-x2bar)+me;

t=(x1bar-x2bar)/se;

p=**2**\*cdf("t",-abs(t),n1+n2-**2**);

keep df sp me ciL ciU t p;

cards;

218 156 125 133 11 12

;

**run**;

**proc** **print**;

title "Results for act 8.2";**run**;

**data** act8pt3;

input n1 n2 x1bar x2bar s1 s2;

num=(s1\*\***2**/n1+s2\*\***2**/n2)\*\***2**;

den1=(s1\*\***2**/n1)\*\***2**/(n1-**1**);

den2=(s2\*\***2**/n2)\*\***2**/(n2-**1**);

den=den1+den2;

dfa=round(num/den);

se=sqrt(s1\*\***2**/n1+s2\*\***2**/n2);

me=quantile("t",**0.975**,dfa)\*se;

t=(x1bar-x2bar)/se;

ciL=(x1bar-x2bar)-me;

ciU=(x1bar-x2bar)+me;

p=**2**\*cdf("t",-abs(t),dfa);

keep dfa se me ciL ciU t p;

cards;

218 156 125 133 11 12

;

**run**;

**proc** **print**;

title "Results for act 8.3";**run**;

**data** act8pt4;

input n1 n2 s1 s2 ;

f=s1\*\***2**/s2\*\***2**;

pL=cdf("f",f,n1-**1**,n2-**1**);

pR=**1**-pL;

pT=**2**\*min(pL,pR);

f2=s2\*\***2**/s1\*\***2**;

pL2=cdf("f",f2,n2-**1**,n1-**1**);

pR2=**1**-pL;

pT2=**2**\*min(pL,pR);

keep f pT f2 pT2;

cards;

218 156 11 12

**run**;

**proc** **print**;

title "Results for act 8.4";

**run**;