Homework Eight

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5.1a T^2 = 13. 636364,

```
                x

                2        12
                8         9
                6         9
                8        10

              mu0      x-bar

                7         6
               11        10


        s                sinv

                8 -3.333333 0.4090909 0.6818182
       -3.333333          2 0.6818182 1.6363636


          t2       df1       df2
   13.636364         2         2
```

5.1b T^2 distributed as $((n\text{-}1)p/(n\text{-}p))^*F_{p,\ n\ -\ p}$, (statement 5-5 from book) and $F_{2,\ 2,(0.05)}$ = 19.00 thus ((4 − 1)2/(4 − 2))*$F_{2,\ 4\ -\ 2}$, or $3F_{2,\ 4\ -\ 2}$. The critical value for α = 0.05 is $3F_{2,\ 2}$ = 57.

5.1c Since $T^2 < F$ (13.64 < 57; statement 5-7 in book), at the α = 0.05 level of significance we cannot reject the null hypothesis that $H_0 = H_1$.

5.5 $F_{2,\ 40}$ at α = 0.05 = 3.23 thus ((42− 1)2/(42 − 2))*$F_{2,\ 42\ -\ 2}$ or $2.05F_{2,\ 40}$ = 6.62. Since $T^2 < F$ (1.227 < 6.62), at the α = 0.05 level of significance we cannot reject the null hypothesis that $H_0 = H_1$.

```
          s                sinv

  0.0143502 0.0117155 203.49815 -163.9069
  0.0117155 0.0145453 -163.9069 200.76907


    t2        df1       df2

1.2271163         2        40
```

From example 5.3 from the book, the critical value for the 95% confidence ellipses for μ is 6.62 and any values of μ_1 and μ_2 that satisfy ≤ 6.62 from the following equation are within the ellipse.

$$42(203.018)(.564 - \mu_1)^2 + 42(200.228)(.603 - \mu_2)^2 - 84(163.391)(.564 - \mu_1)(.603 - \mu_2) \leq 6.62$$

As 1.6712 + 0.0757 – 0.576 ≤ 6.62, we can conclude that μ’ = [.55, .60] is in the region of the ellipse and is thus consistent with the 95% confidence ellipse for μ in Figure 5.1 and the T^2 hypothesis test.

/* CODE */

```
/* 5.1 */
```

```
data fiveone;
      input x1 x2;
      datalines;
      2 12
      8  9
      6  9
      8 10
      ;

proc iml;
  start hotel;
    mu0={7, 11};
    one=j(nrow(x),1,1);
    ident=i(nrow(x));
    ybar=x`*one/nrow(x);
    s=x`*(ident-one*one`/nrow(x))*x/(nrow(x)-1.0);
      sinv = inv(s);
    print mu0 ybar;
    print s sinv;
    t2=nrow(x)*(ybar-mu0)`*inv(s)*(ybar-mu0);
    f=(nrow(x)-ncol(x))*t2/ncol(x)/(nrow(x)-1);
    df1=ncol(x);
    df2=nrow(x)-ncol(x);
    p=1-probf(f,df1,df2);
    print t2 f df1 df2 p;
  finish;
  use fiveone;
  read all var{x1 x2} into x;
  print x;
  run hotel;
quit;



/* 5.5 */

data t41;
  infile "\\psf\Home\Documents\University\Spring_2012\STA4702\Datasets\T4-1.dat";
  input closed;
run;

data t45;
  infile "\\psf\Home\Documents\University\Spring_2012\STA4702\Datasets\T4-5.dat";
  input open;
run;

data microwave;
      merge t41 t45;
      closedtrans = closed**(1/4);
      opentrans   = open**(1/4);
run;

proc iml;
  start hotel;
    mu0={.55, .60};
    one=j(nrow(x),1,1);
    ident=i(nrow(x));
    ybar=x`*one/nrow(x);
    s=x`*(ident-one*one`/nrow(x))*x/(nrow(x)-1.0);
      sinv = inv(s);
    print mu0 ybar;
    print s sinv;
    t2=nrow(x)*(ybar-mu0)`*inv(s)*(ybar-mu0);
    f=(nrow(x)-ncol(x))*t2/ncol(x)/(nrow(x)-1);
    df1=ncol(x);
    df2=nrow(x)-ncol(x);
    p=1-probf(f,df1,df2);
    print t2 f df1 df2 p;
  finish;
  use microwave;
  read all var{closedtrans opentrans} into x;
  print x;
  run hotel;
quit;
```