Homework Six

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STA4702
02.16.12

4.25.

a

108.28	17.05	1484.1
152.36	16.59	750.33
95.04	10.91	766.42
65.45	14.14	1110.46
62.97	9.52	1031.29
263.99	25.33	195.26
265.19	18.54	193.83
285.06	15.73	191.11
92.01	8.1	1175.16
165.68	11.13	211.15

Scov

7476.4532	303.61862	-35575.96
303.61862	26.190316	-1053.827
-35575.96	-1053.827	237054.27

Sinv

0.000867	-0.005864	0.000104
-0.005864	0.0861661	-0.000497
0.000104	-0.000497	0.0000176

x_bar

155.603
14.704
710.911

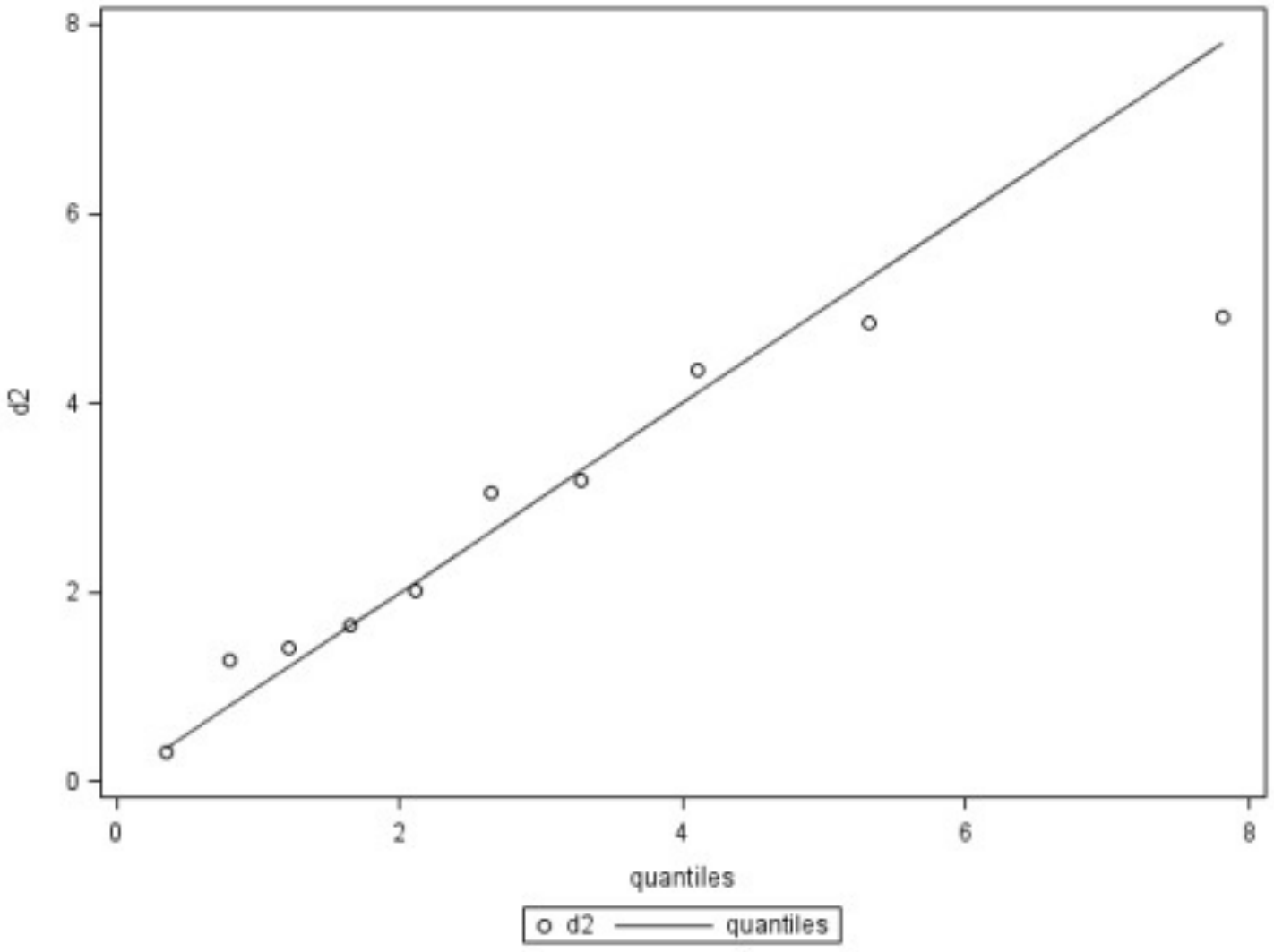
diff (x – x-bar)

-47.323	2.346	773.189
-3.243	1.886	39.419
-60.563	-3.794	55.509
-90.153	-0.564	399.549
-92.633	-5.184	320.379
108.387	10.626	-515.651
109.587	3.836	-517.081
129.457	1.026	-519.801
-63.593	-6.604	464.249
10.077	-3.574	-499.761

d^2

4.8364455
0.3142263
1.2894373
2.0194923
1.4072664

```
4.9090461
1.6418144
4.3520262
3.041105
3.1891403
```



4.26a.

```
     a

 1     18.95
 2        19
 3     17.95
 4     15.54
 5        14
 6     12.95
 7      8.94
```

```
 8      7.49
 9         6
11      3.99

 Scov                   Sinv

 10.266667 -17.54289   3.4212167 1.9452037
-17.54289   30.854366  1.9452037 1.1383962

 x_bar

  5.6
12.481

diff (x – x-bar)

-4.6     6.469
-3.6     6.519
-2.6     5.469
-1.6     3.059
-0.6     1.519
 0.4     0.469
 1.4    -3.541
 2.4    -4.991
 3.4    -6.481
 5.4    -8.491


   d²
4.2640977
1.4161667
1.8575523
0.3696258
0.3126117
1.5276379
1.693266
1.4628942
1.6390493
3.457098
```

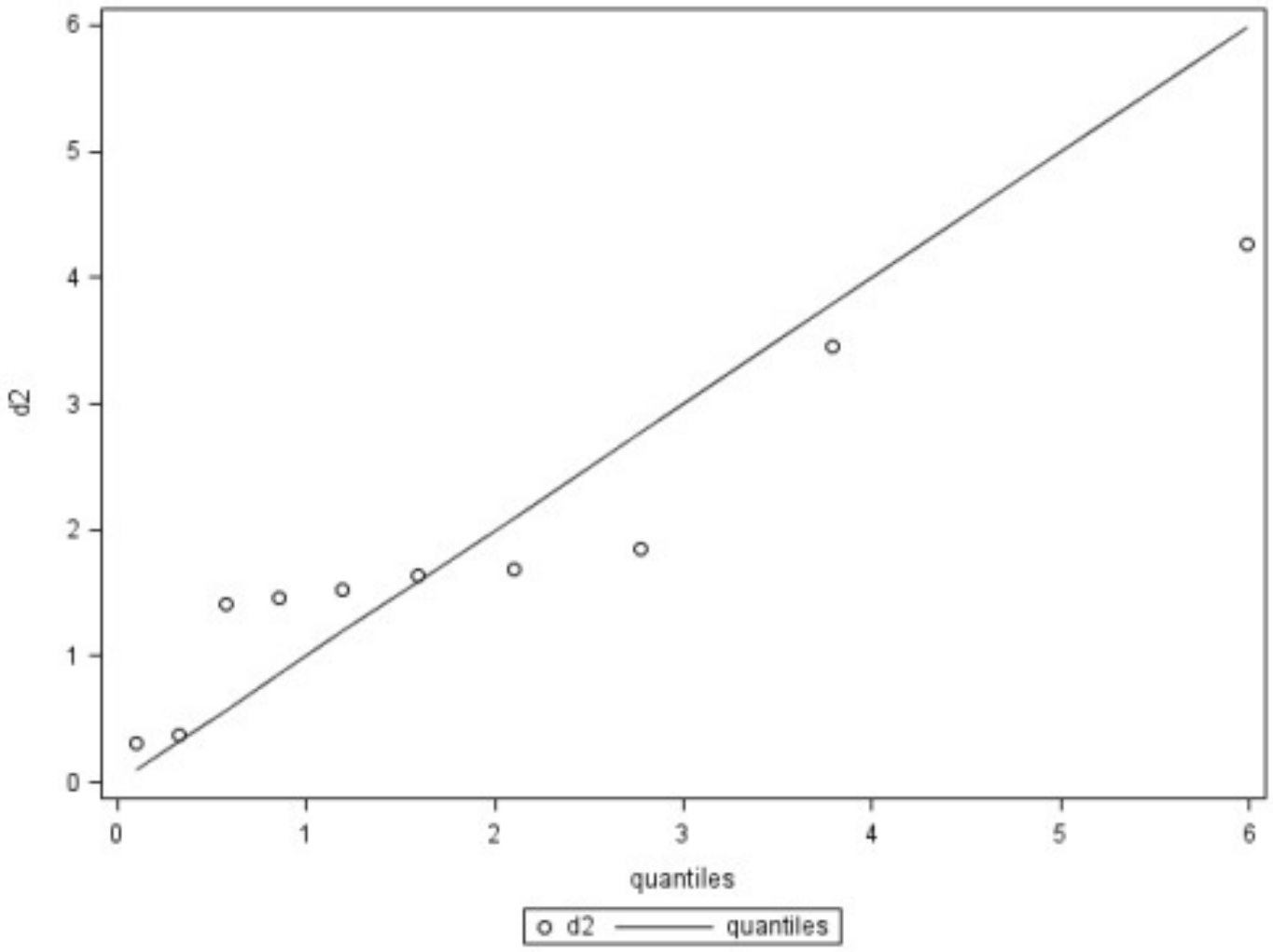
4.26b.

50% probability contour with $p(2)$ = 1.3862943611
2 distances < 1.39, thus 20% of the observations fall within 50% probability contour.

4.26c.

```
   d²       quantiles
0.31261      0.1025
0.36963      0.3250
1.41617      0.5753
1.46289      0.8615
1.52764      1.1956
```

```
1.63905      1.5970
1.69327      2.0996
1.85755      2.7725
3.45710      3.7942
4.26410      5.9914
```



4.26d. The data do not appear to be bivariate normal. There are serious departures from normality in the chi-square plot, and only 20% of the observations fall within the 50% contour (one would expect 50% of the observations to be within the contour if the data were normal).

CODE

```
data P1_4;
     infile
'\\psf\Home\Documents\University\Spring_2012\STA4702\Datasets\P1-4.dat';
```

```
      input x1 x2 x3;
run;

/* 4.25 */
proc iml;
use work.P1_4;
read all into a;
at = t(a);
Scov   = cov(a);
Sinv   = inv(Scov);
x_bar  = mean(a);
x_bart = t(x_bar);
diff = at - x_bart;
difft = t(diff);
dist2 = difft*Sinv*diff;
d2 = vecdiag(dist2);
print a at Scov Sinv x_bar x_bart diff difft dist2 d2;
print Scov Sinv;
create d2_one from d2;
append from d2;
quit;

proc sort data = d2_one;
      by col1;
run;

data plot;
      set d2_one;
      rename col1 = d2;
      input quantiles;
      datalines;
      0.3518
      0.7978
      1.2125
      1.6416
      2.1095
      2.6430
      3.2831
      4.1083
      5.3170
      7.8147
      ;
run;

proc sgplot data=plot;
   scatter y=d2 x=quantiles;
   series y=quantiles x=quantiles;
run;

/* 4.26 */

proc iml;
at = {1 2 3 4 5 6 7 8 9 11, 18.95 19.00 17.95 15.54 14.00 12.95 8.94 7.49
6.00 3.99};
a = t(at);
Scov   = cov(a);
Sinv   = inv(Scov);
x_bar  = mean(a);
```

```
x_bart = t(x_bar);
diff = at - x_bart;
difft = t(diff);
dist2 = difft*Sinv*diff;
d2 = vecdiag(dist2);
probs = (rank(d2) - j(10,1,.5))/10;
quants = quantile('chisquare', probs, 2);
print a at Scov Sinv x_bar x_bart diff difft dist2 d2 probs quants;
create d2_one from d2;
append from d2;
quit;

/* 4.26b */

data quant;
      quants = quantile('chisquare', .50, 2);
run;

/* 4.26c */

proc sort data = d2_one;
      by col1;
run;

data plot;
      set d2_one;
      rename col1 = d2;
      input quantiles;
      datalines;
      0.1025
      0.3250
      0.5753
      0.8615
      1.1956
      1.5970
      2.0996
      2.7725
      3.7942
      5.9914
      ;
run;

proc print data = plot;
run;

proc sgplot data=plot;
   scatter y=d2 x=quantiles;
   series y=quantiles x=quantiles;
run;
```