

Data File Used in this Analysis:

```
# Math 3080 - 1      Anesthetic data      March 24      2010
# Treibergs
#
# From Devore, "Probability and Statistics for Engineering and the
# Sciences 5th. ed.," (2000)
# Study "Sympathoadrenal and Hemodynamic Effects on Isoflurane, Halothane and
# Cyclopropane in Dogs," (Anesthesiology, 1974) measured plasma epinephrene
# concentration y for ten experimental subjects under different anesthetic
# treatments A1 isoflurane, A2 halothane and A3 cyclopropane.
"response"  "Anesthetic"  "Subject"
.28  1  1
.51  1  2
1  1  3
.39  1  4
.29  1  5
.36  1  6
.32  1  7
.69  1  8
.17  1  9
.33  1  10
.3  2  1
.39  2  2
.63  2  3
.38  2  4
.21  2  5
.88  2  6
.39  2  7
.51  2  8
.32  2  9
.42  2  10
1.07  3  1
1.35  3  2
.69  3  3
.28  3  4
1.24  3  5
1.53  3  6
.49  3  7
.56  3  8
1.02  3  9
.3  3  10
```

R Session:

R version 2.10.1 (2009-12-14)
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[R.app GUI 1.31 (5538) powerpc-apple-darwin8.11.1]

[Workspace restored from /Users/andrejstreibergs/.RData]

```
> tt <- read.table("M3081DataAnesthetic.txt",header=TRUE)
> tt
```

	response	Anesthetic	Subject
1	0.28	1	1
2	0.51	1	2
3	1.00	1	3
4	0.39	1	4
5	0.29	1	5
6	0.36	1	6
7	0.32	1	7
8	0.69	1	8
9	0.17	1	9
10	0.33	1	10
11	0.30	2	1
12	0.39	2	2
13	0.63	2	3
14	0.38	2	4
15	0.21	2	5
16	0.88	2	6
17	0.39	2	7
18	0.51	2	8
19	0.32	2	9
20	0.42	2	10
21	1.07	3	1
22	1.35	3	2
23	0.69	3	3
24	0.28	3	4
25	1.24	3	5
26	1.53	3	6
27	0.49	3	7
28	0.56	3	8
29	1.02	3	9
30	0.30	3	10

```

> attach(tt)
> A <- factor(Anesthetic)
> B <- factor(Subject)
> #=====SUMMARY OF FACTOR A=====
> tapply(response,A,summary)
$'1'
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
0.1700 0.2975  0.3450  0.4340  0.4800  1.0000

$'2'
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
0.2100 0.3350  0.3900  0.4430  0.4875  0.8800

$'3'
  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
0.2800 0.5075  0.8550  0.8530  1.1980  1.5300

> y<-response
> tapply(y,A,mean)
  1    2    3
0.434 0.443 0.853
> tapply(y,B,mean)
  1    2    3    4    5    6    7
0.5500000 0.7500000 0.7733333 0.3500000 0.5800000 0.9233333 0.4000000
  8    9   10
0.5866667 0.5033333 0.3500000
> tapply(y,A,sd)
  1    2    3
0.2442767 0.1916043 0.4482571

>=====RUN ANOVA=====
> f1 <- aov(y~A+B);anova(f1)
Analysis of Variance Table

Response: y
      Df Sum Sq Mean Sq F value    Pr(>F)
A         2  1.1458  0.57290   6.1068 0.009454 **
B         9  0.9872  0.10969   1.1692 0.369730
Residuals 18  1.6887  0.09381
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> model.tables(f1,"means")
Tables of means
Grand mean

0.5766667

A
  1    2    3
0.434 0.443 0.853

B

```

```
      1      2      3      4      5      6      7      8      9     10
0.5500 0.7500 0.7733 0.3500 0.5800 0.9233 0.4000 0.5867 0.5033 0.3500
```

```
> model.tables(f1,"effects",se=TRUE)
```

```
Tables of effects
```

```
A
```

```
      1      2      3
-0.14267 -0.13367  0.27633
```

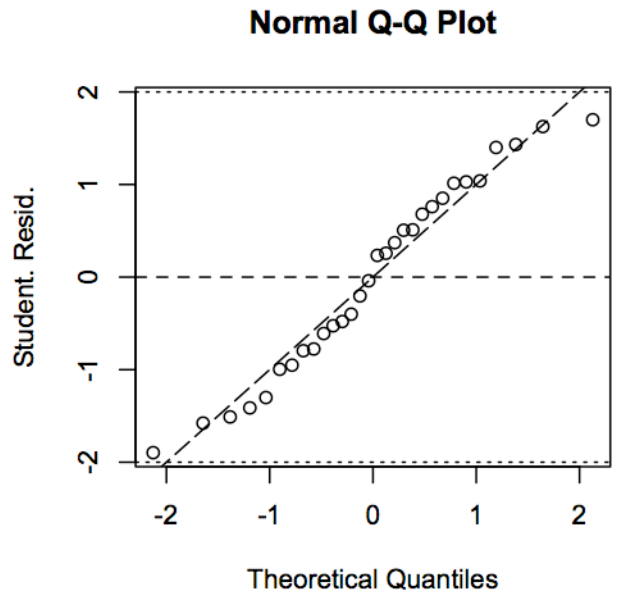
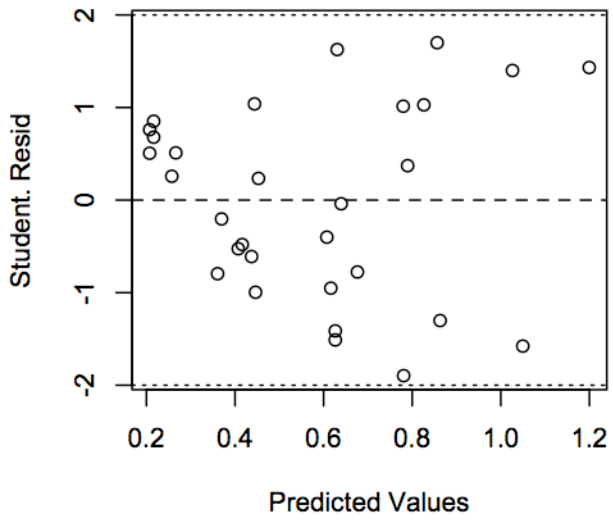
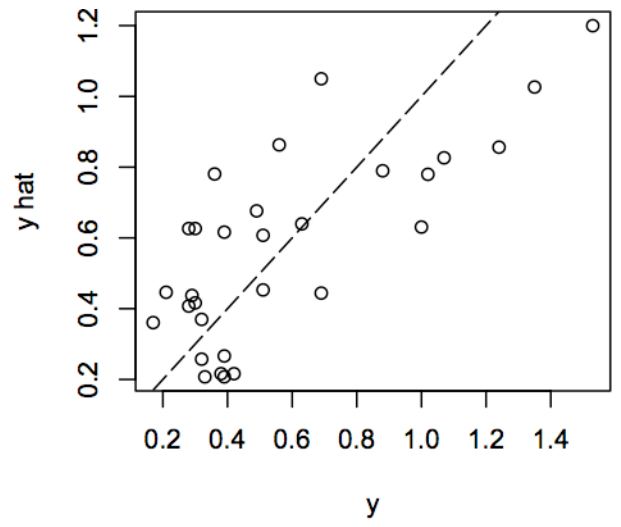
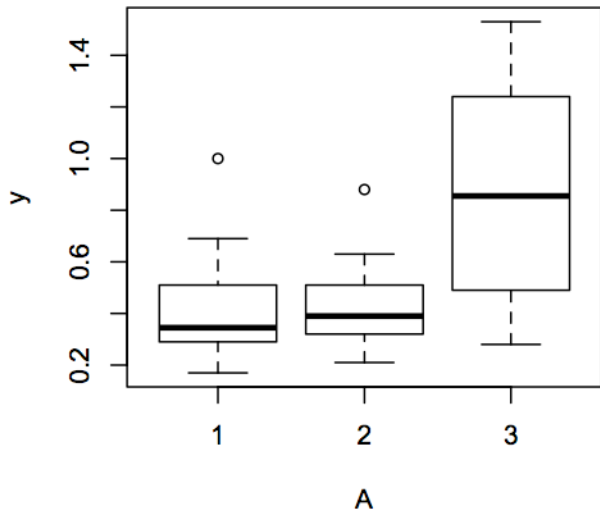
```
B
```

```
      1      2      3      4      5      6      7      8      9
-0.0267  0.1733  0.1967 -0.2267  0.0033  0.3467 -0.1767  0.0100 -0.0733
      10
-0.2267
```

```
Standard errors of effects
```

```
      A      B
0.09686 0.17684
replic.   10      3
```

```
>#=====PLOT DIAGNOSTICS=====
> layout(matrix(1:4,ncol=2))
> plot(y~A)
> plot(rstudent(f1)~fitted(f1),xlab="Predicted Values",ylab="Student. Resid",
      ylim=max(abs(rstudent(f1)))*c(-1,1))
> abline(h=c(0,-2,2),lty=c(2,3,3))
> plot(fitted(f1)~y,ylab="y hat")
> abline(0,1,lty=5)
> qqnorm(rstudent(f1),ylim=max(abs(rstudent(f1)))*c(-1,1),ylab="Student. Resid.")
> abline(0,1,lty=5);abline(h=c(0,-2,2),lty=c(2,3,3))
```



```

>#=====--TUKEY HSD=====
> TukeyHSD(f1,"A")
  Tukey multiple comparisons of means
    95% family-wise confidence level

Fit: aov(formula = y ~ A + B)

$A
      diff      lwr      upr      p adj
2-1 0.009 -0.34058942 0.3585894 0.9976231
3-1 0.419  0.06941058 0.7685894 0.0176670
3-2 0.410  0.06041058 0.7595894 0.0202868

>#=====SHAPIRO-WILK TEST FOR NORMALITY=====
> shapiro.test(rstudent(f1))

Shapiro-Wilk normality test

data:  rstudent(f1)
W = 0.9616, p-value = 0.3406

>#=====--RUNN SAME DATA WITHOUT BLOCKING=====
>#===EACH ANESTHETIC WAS GIVEN TO THE SAME ANIMALS SO THIS IN INAPPROPRIATE ANALYSIS
>#=====THIS ANALYSIS SHOWN FOR COMPARISON=====
> f2 <- aov(y~A)
> anova(f2)
Analysis of Variance Table

Response: y
      Df Sum Sq Mean Sq F value  Pr(>F)
A       2  1.1458  0.57290   5.7807 0.008135 **
Residuals 27  2.6759  0.09911
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1  1

> TukeyHSD(f2)
  Tukey multiple comparisons of means
    95% family-wise confidence level

Fit: aov(formula = y ~ A)

$A
      diff      lwr      upr      p adj
2-1 0.009 -0.34007159 0.3580716 0.9977497
3-1 0.419  0.06992841 0.7680716 0.0162452
3-2 0.410  0.06092841 0.7590716 0.0188820
>

```