

The ancova data

February 11, 2011

The data:

```
a 5 20
a 10 23
a 12 30
a 9 25
a 23 34
a 21 40
a 14 27
a 18 38
a 6 24
a 13 31
b 7 19
b 12 26
b 27 33
b 24 35
b 18 30
b 22 31
b 26 34
b 21 28
b 14 23
b 9 22
```

The SAS code and output:

```
data drugs;
  infile "ancova.dat";
  input drug $ before after;
  diff=after-before;

proc means;
  class drug;

proc glm;
  class drug;
  model after=drug before;
```

```

lsmeans drug;

proc ttest;
  class drug;
  var diff;

run;

```

The MEANS Procedure

| | | N | | | | | |
|------|-----|----------|----|------------|-----------|------------|------------|
| drug | Obs | Variable | N | Mean | Std Dev | Minimum | Maximum |
| a | 10 | before | 10 | 13.1000000 | 6.0452001 | 5.0000000 | 23.0000000 |
| | | after | 10 | 29.2000000 | 6.6131183 | 20.0000000 | 40.0000000 |
| | | diff | 10 | 16.1000000 | 2.9981476 | 11.0000000 | 20.0000000 |
| b | 10 | before | 10 | 18.0000000 | 7.1492035 | 7.0000000 | 27.0000000 |
| | | after | 10 | 28.1000000 | 5.4660569 | 19.0000000 | 35.0000000 |
| | | diff | 10 | 10.1000000 | 2.6853512 | 6.0000000 | 14.0000000 |

The GLM Procedure

Class Level Information

| Class | Levels | Values |
|-------|--------|--------|
| drug | 2 | a b |

Number of Observations Read 20
Number of Observations Used 20

The GLM Procedure

Dependent Variable: after

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|----|----------------|-------------|---------|--------|
| Model | 2 | 546.2297947 | 273.1148973 | 37.96 | <.0001 |
| Error | 17 | 122.3202053 | 7.1953062 | | |
| Corrected Total | 19 | 668.5500000 | | | |

R-Square 0.817037
Coeff Var 9.362676
Root MSE 2.682407
after Mean 28.65000

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|--------|----|-------------|-------------|---------|--------|
| drug | 1 | 6.0500000 | 6.0500000 | 0.84 | 0.3720 |
| before | 1 | 540.1797947 | 540.1797947 | 75.07 | <.0001 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|--------|----|-------------|-------------|---------|--------|
| drug | 1 | 115.3059567 | 115.3059567 | 16.03 | 0.0009 |

| | | | | | |
|--------|---|-------------|-------------|-------|--------|
| before | 1 | 540.1797947 | 540.1797947 | 75.07 | <.0001 |
|--------|---|-------------|-------------|-------|--------|

The GLM Procedure
Least Squares Means
drug after LSMEAN
a 31.2273292
b 26.0726708

The TTEST Procedure
Variable: diff

| drug | N | Mean | Std Dev | Std Err | Minimum | Maximum |
|------------|----|---------|---------|---------|---------|---------|
| a | 10 | 16.1000 | 2.9981 | 0.9481 | 11.0000 | 20.0000 |
| b | 10 | 10.1000 | 2.6854 | 0.8492 | 6.0000 | 14.0000 |
| Diff (1-2) | | 6.0000 | 2.8460 | 1.2728 | | |

| drug | Method | Mean | 95% CL Mean | Std Dev | 95% CL Std Dev |
|------------|---------------|---------|-----------------|---------|----------------|
| a | | 16.1000 | 13.9553 18.2447 | 2.9981 | 2.0622 5.473 |
| b | | 10.1000 | 8.1790 12.0210 | 2.6854 | 1.8471 4.902 |
| Diff (1-2) | Pooled | 6.0000 | 3.3260 8.6740 | 2.8460 | 2.1505 4.208 |
| Diff (1-2) | Satterthwaite | 6.0000 | 3.3237 8.6763 | | |

| Method | Variances | DF | t Value | Pr > t |
|---------------|-----------|--------|---------|---------|
| Pooled | Equal | 18 | 4.71 | 0.0002 |
| Satterthwaite | Unequal | 17.786 | 4.71 | 0.0002 |

Equality of Variances

| Method | Num DF | Den DF | F Value | Pr > F |
|----------|--------|--------|---------|--------|
| Folded F | 9 | 9 | 1.25 | 0.7481 |