Correlations

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> ### Descriptive Statistics

> lapply(CorrelationData, function(x) c(length(x), mean(x), sd(x)))

$Outcome1
[1] 4.00000 2.00000 2.44949

$Outcome2
[1] 4.00000 6.00000 2.44949

> cov(Outcome1,Outcome2)

[1] 3

> cor(Outcome1,Outcome2)

[1] 0.5

> ### Inferential Statistics

> cor.test(Outcome1,Outcome2)

      Pearson's product-moment correlation

data:  Outcome1 and Outcome2
t = 0.8165, df = 2, p-value = 0.5
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.8876337  0.9868586
sample estimates:
cor
0.5
```

These statistics calculated separately for each variable using procedures described previously.

These boxes represent the conjunction of both variables and therefore present the statistics relevant to the relationship between the two variables.

The Sum of Cross Products ("SCP") is not easily determined from the summary statistics of the output, but rather from the data (and the calculations are therefore not shown here).

The Covariance ("COV") is a function of the Sum of Cross Products and the sample size:

$$COV = \frac{SCP}{(N-1)} = \frac{9.000}{(4-1)} = 3.000$$

The Correlation coefficient ("r") is a function of the covariance and the standard deviations of both variables:

$$r = \frac{COV}{(SD_X)(SD_Y)} = \frac{3.000}{(2.449)(2.449)} = .500$$

The "t", "df", and "p" columns provide a statistical significance test of whether the correlation differs from zero:

$$t = \frac{r}{\sqrt{(1-r^2)/(N-2)}} = \frac{.500}{\sqrt{(1-.500^2)/(4-2)}} = .816$$

The *t* statistic follows a non-normal (studentized or *t*) distribution that depends on degrees of freedom. Here, *df* = *N* – 2 = 4 – 2 = 2. A *t* with 2 *df* that equals .816 has a two-tailed probability (*p*) of .500, which is not a statistically significant finding.