Covariance Matrix

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This is a walk through about how to calculate the covariance matrix of a model. First, I'm going to use data inherent to R.

```
#Using the "Women" data
data <- women
summary(women)
```

```
##      height         weight
##  Min.   :58.0   Min.   :115.0
##  1st Qu.:61.5   1st Qu.:124.5
##  Median :65.0   Median :135.0
##  Mean   :65.0   Mean   :136.7
##  3rd Qu.:68.5   3rd Qu.:148.0
##  Max.   :72.0   Max.   :164.0
```

Variance

To find the variance, we calculate the sum of the squared difference between x and its mean[1], over the number of observations we are observing (correcting for the degrees of freedom[2]). Here is the equation for variance.

$$var(x) = \frac{\sum x - \bar{x}}{n-1}$$

```
#Calculating variance.
my.var <- sum((data$weight-mean(data$weight))^2)/(length(data$weight)-1) #My calculation

R.var <- var(data$weight) #R's calculation

paste0("My calculation of variance ",my.var," and R's ",R.var)
```

```
## [1] "My calculation of variance 240.209523809524 and R's 240.209523809524"
```

Covariance

[1] Why square the sum of the differences? Because we are going to generate negative and positive values that will cancel each other out, throwing off our estimation. Squaring the term gets us around this issue

[2] insert powner quote