Applying the Regression Anatomy Formula

Adam Yang

Open R and verify that the mtcars dataset is automatically loaded.

```
head(mtcars)
```

```
##                    mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

You are interested in the following model:

$$hp = \beta_0 + \beta_1 wt + u$$

Your task is to compute the ols estimate for β_1, using the simple regression formula,

$$\hat{\beta}_1 = \frac{\hat{cov}(y,x)}{\hat{var}(x)}$$

1. Use R to compute the numerator.
2. Use R to compute the denominator.
3. Explain, in a sentence or two, why this method works to compute β_1.

```
y <- mtcars$hp
x <- mtcars$wt
beta1_num <- cov(y,x)
beta1_den <- var(x)
beta1 <- beta1_num/beta1_den
beta1_num
```

```
## [1] 44.19266
```

```
beta1_den
```

```
## [1] 0.957379
```

```
beta1
```

```
## [1] 46.16005
```