

1 Correlation - Scatter plots

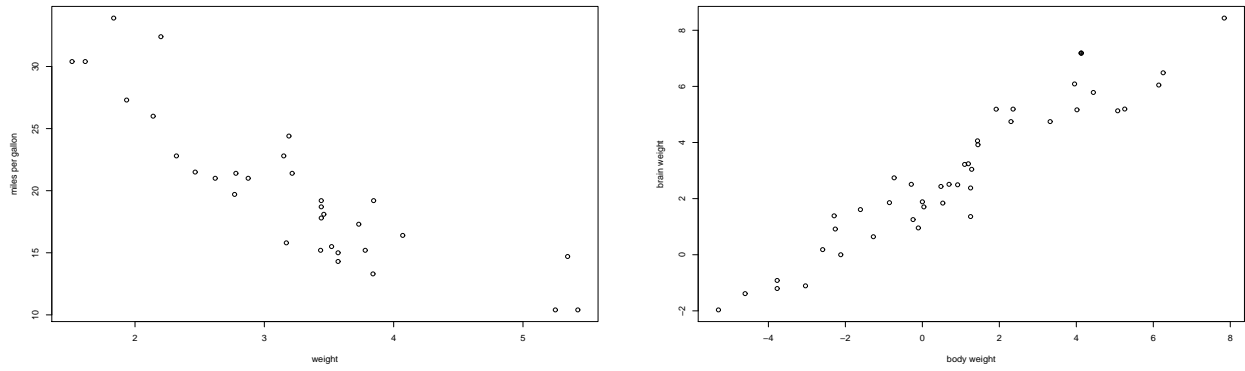


Figure 1: Left: mpg on weight, Right: brain on body weight (log-scale)

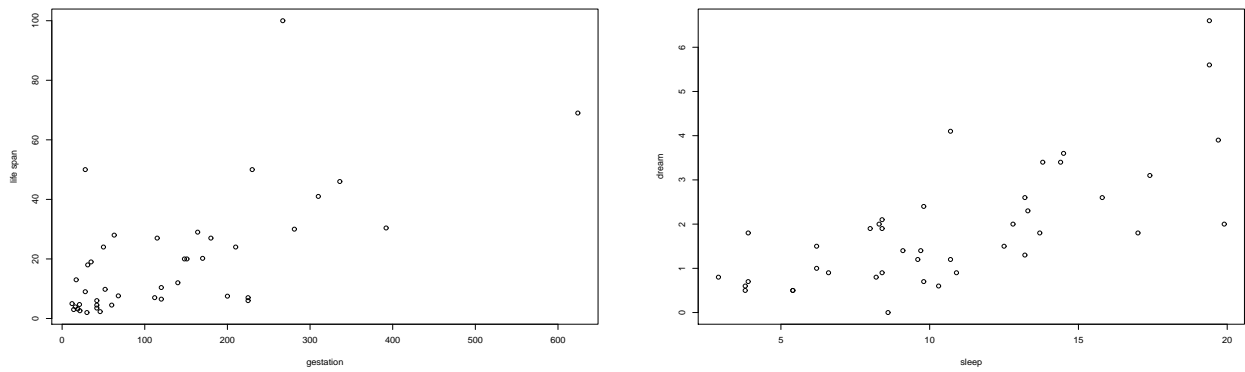


Figure 2: Left: lifespan on gestation, Right: dream hrs on sleep hrs

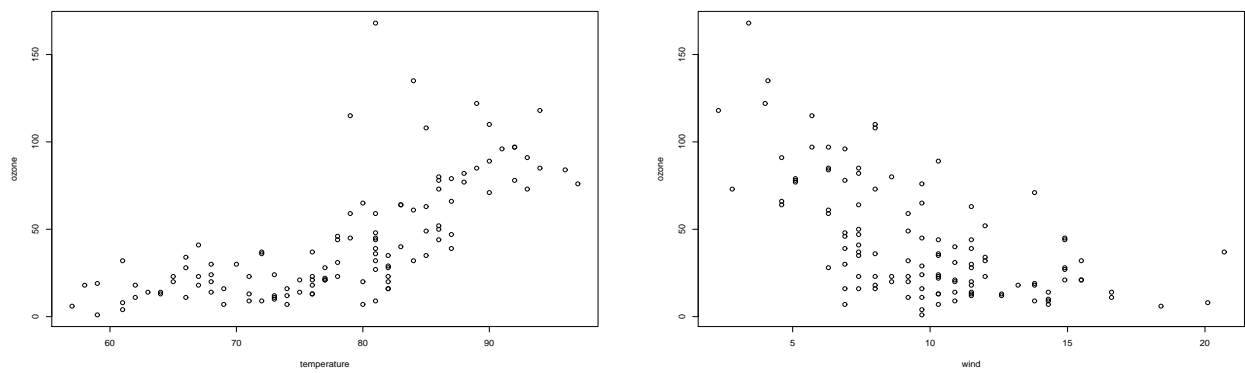


Figure 3: Left: ozone level on temperature, Right: ozone on wind speed

2 Regression

Mpg vs Weight of car

What do you see?

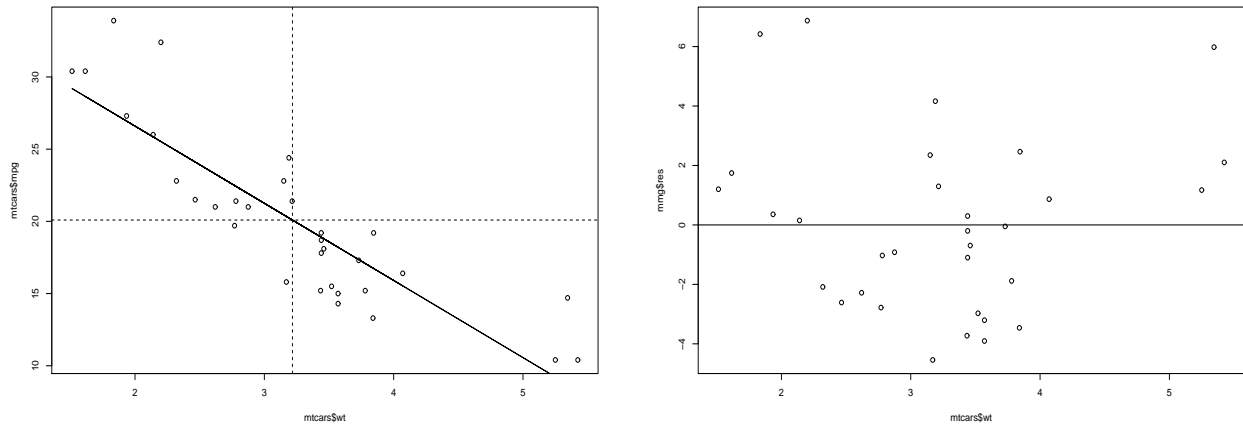


Figure 4: Left: Regression of mpg on weight, Right: Residual plot

```
lm(formula = mpg ~ weight)
```

```
Residuals, fivenumber summary:
```

```
      Min       1Q   Median       3Q      Max
-4.5432 -2.3647 -0.1252  1.4096  6.8727
```

```
Coefficients:
```

```
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  37.2851     1.8776   19.858 < 2e-16 ***
mtcars$wt    -5.3445     0.5591   -9.559 1.29e-10 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 3.046 on 30 degrees of freedom
```

```
Multiple R-Squared:  0.7528
```

Transformation of data

Is the relationship more linear after the transform. Are there any patterns in the residual plot?

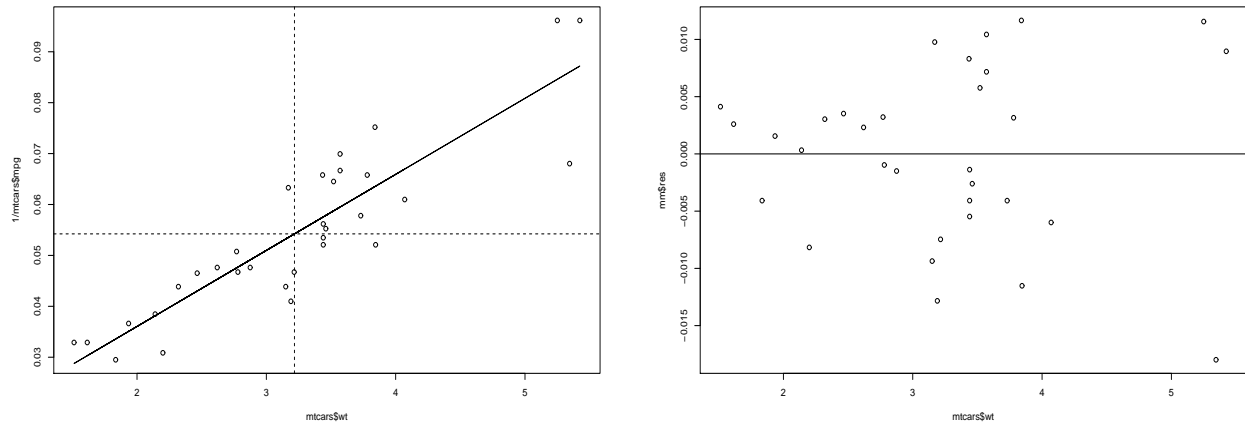


Figure 5: Left: Regression of 1/mpg on weight. Right: Residual plot

```
lm(formula = 1/mpg ~ weight)
```

```
Residuals, fivenumber summary:
```

```
      Min       1Q   Median       3Q      Max
-0.0179837 -0.0044301  0.0009413  0.0045354  0.0116583
```

```
Coefficients:
```

```
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.006169   0.004695   1.314   0.199
mtcars$wt    0.014938   0.001398  10.685 9.57e-12 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.007616 on 30 degrees of freedom
```

```
Multiple R-Squared:  0.7919
```

Ozone and Temperature

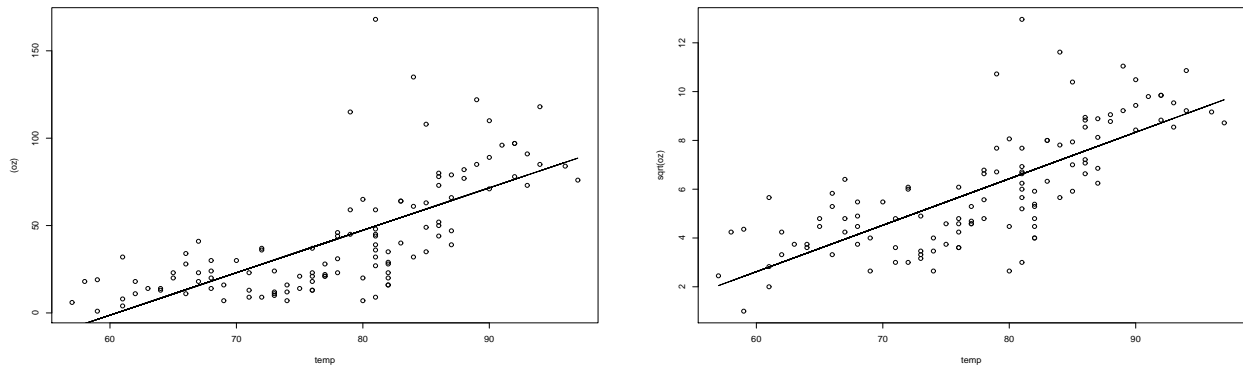


Figure 6: Left: Ozone on Temp, Right: Square root of ozone on Temp.

```
(formula = sqrt(oz) ~ temp)
```

```
Residuals, five number summary:
```

```
      Min       1Q   Median       3Q      Max
-3.78260 -1.25721  0.08565  1.06591  6.34264
```

```
Coefficients:
```

```
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -8.81129    1.25892  -6.999 1.89e-10 ***
temp         0.19050    0.01605  11.869 < 2e-16 ***
```

```
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 1.633 on 114 degrees of freedom, Multiple R-Squared: 0.5527
```

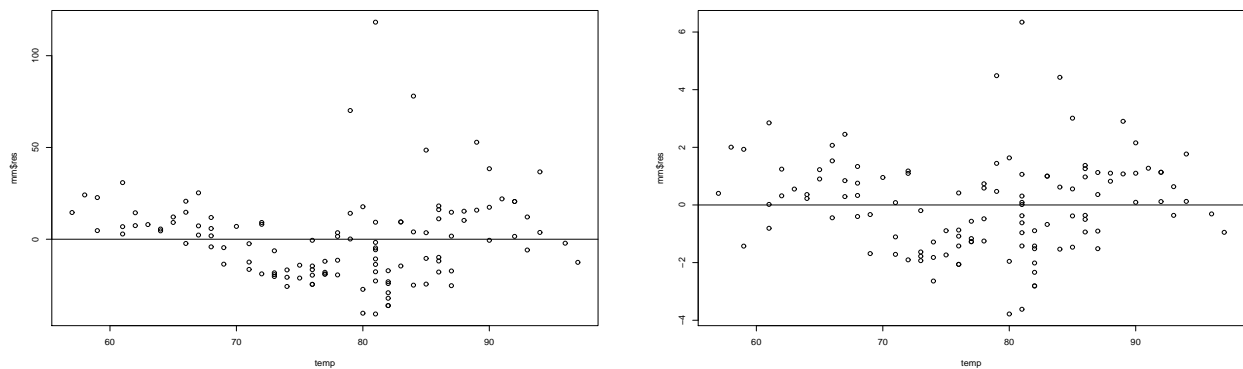


Figure 7: Left: Residuals for Ozone on Temp, Right: Residuals for Square root of ozone on Temp.

Checking other variables.

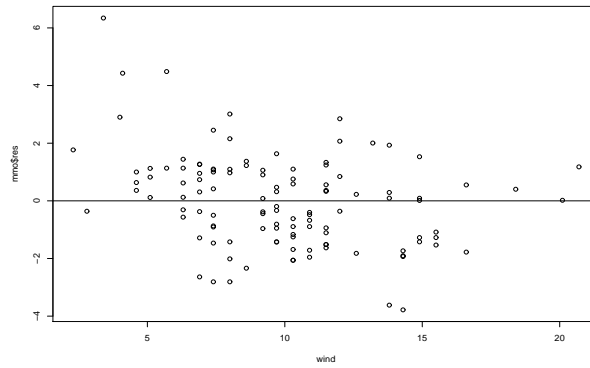


Figure 8: Residuals on wind speed. Note large residuals for small wind speeds. Omitted variable.

Sleep and Dream

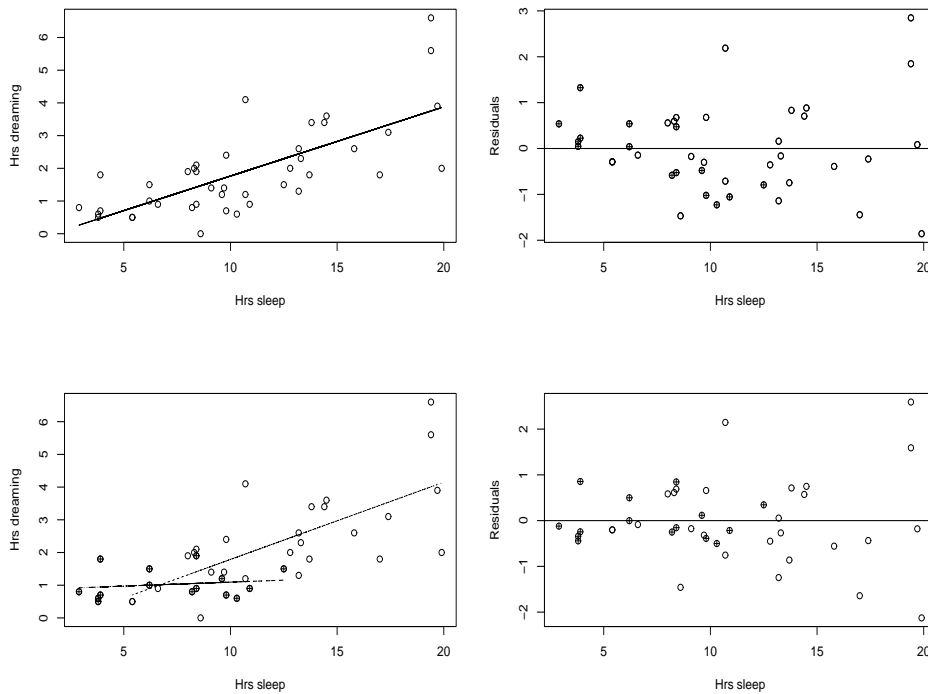


Figure 9: Top Left: Regression line. Top Right: Residual plot. Dark circles indicate animals that sleep in an exposed environment. Lower Left: Two regression lines, one for exposed, or for non-exposed. Lower right: The new residual plot(s).