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# VIF

VIF (Variance Inflation Factor) = evaluate effect of multicolliniarity

VIF $= \frac{1}{1-R_j^2}$ for $j^{th}$ regression coefficient $\hat{\mathrm{B}}_j$.

We do $x_j \sim x_1 + x_2 + \cdots + x_{j+1} + \cdots + x_{p-1}$.

Here is some code to run `vif`:

```
fitB3a = lm (y ~ x1 + x2 + x3 + x4 + x5 + x6 + x7 + x8 + x9 + x10, data=dataB.3)
library (car)
vif (fitB3a)
```

$$R = \sqrt{R^2} = \text{multiple correlation coefficient} = correl(Y, \hat{Y})$$

Rule of thumb, is that correlated ones are going to have lower alpha values, but it is sometimes not going to happen primarily because there is usually a fairly high degree of correlation. In fact, when removing predictor variables, the direction of the coefficients (a.k.a estimates) might also change.

GENERALLY SPEAKING, DO NOT JUST USE `vif` TO GET RID OF REGRESSOR VARIABLES OR ELIMINATE MULTICOLLINIARITY. A GOOD PRACTICE IS TO USE IT AS A VERIFIER OF RESULTS. FIRST, GET RESULTS AND THEN VERIFY THEM USING `vif`.

ALSO, INFLATION FACTORS SHOULD BE LESS THAN 5.

# Practice

```
plot (dataB.13)

# Fit the full-order model (include all individual predictors ~ no extra stuff)

fit13a = lm (y ~ x1 + x2 + x3 + x4 + x5 + x6, data=dataB.13)
summary (fit13a)
vif (fit13a)

# Let us take out x6
# This is Zach's idea

fit13b = lm (y ~ x1 + x2 + x3 + x4 + x5, data=dataB.13)
summary (fit13b)
vif (fit13b)

# Let us take out x2 now as it was the least significant
# Note that we put x6 back (bad idea taking it out, Zach...)
fit13c = lm (y ~ x1 + x3 + x4 + x5 + x6, data=dataB.13)
summary (fit13c)
vif (fit13c)

# Let us take out x4 now as it was the least significant
fit13d = lm (y ~ x1 + x3 + x5 + x6, data=dataB.13)
summary (fit13d)
vif (fit13d)

# Let us take out x5 since it is least significant
fit13e = lm (y ~ x1 + x3 + x6, data=dataB.13)
summary (fit13e)
vif (fit13e)
confint (fit13e)
```

# Interpretation of fit13e

x1, x3, and x6 together explain 99.7% of the variation in thrust. The residual standard error is 27.8 thrust units and is small compared to the range of thrust values.

Mean thrust increases 1.36 Newtons per rad/seconds and between 1.07 and 1.6751.36 Newtons per rad/sec with 95% seconds.

# R Output

For each parameter, we are going to get a separate VIF value. One needs to look at the rightmost column, not the leftmost column. VIF for each parameter should be less than 5 and some of them less than 10.