DEFEND-THE-MODEL PROTOCOL

Example

Let's say you did a sampling of various cars and found that gas mileage G (in mpg) decreases as the mass of a car m (in pounds) increases. You fit a line (your *mathematical model*) to your data and find:

$$G = -0.0043 \text{ mpg/pound} \cdot m + 60 \text{ mpg}$$

Conceptual tools

1 Does my mathematical model make reasonable predictions for *large values* of the independent variable?

2 Does my mathematical model make reasonable predictions for *small values* of the independent variable?

3 Does the type of my mathematical model (e.g. constant, linear, inversely proportional) have reasonable *scaling behavior* (e.g. when I change the horizontal variable by a factor of n, what happens to the vertical variable?)?

4 Could the *uncertainty* in my measurements be consistent with a simpler or alternate mathematical model?

HAPPY MODELING!