

Plotting Predictions and Prediction Uncertainty

Mark Kurzeja

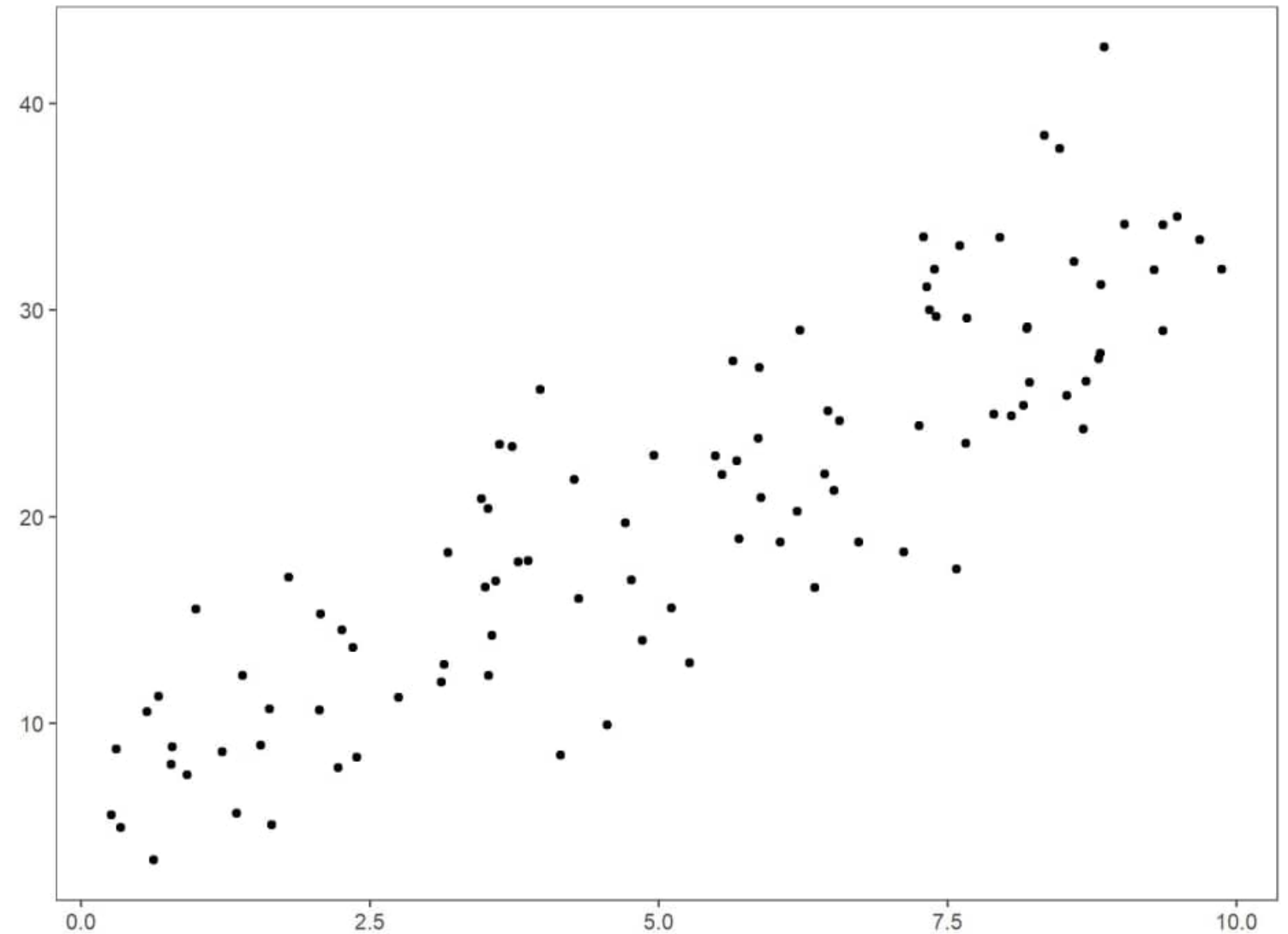
Overview

- Most modeling in statistics is concerned with estimating the mean function and the prediction of the model
- Today: Visualization of uncertainty is often as important (or more so) than the prediction!



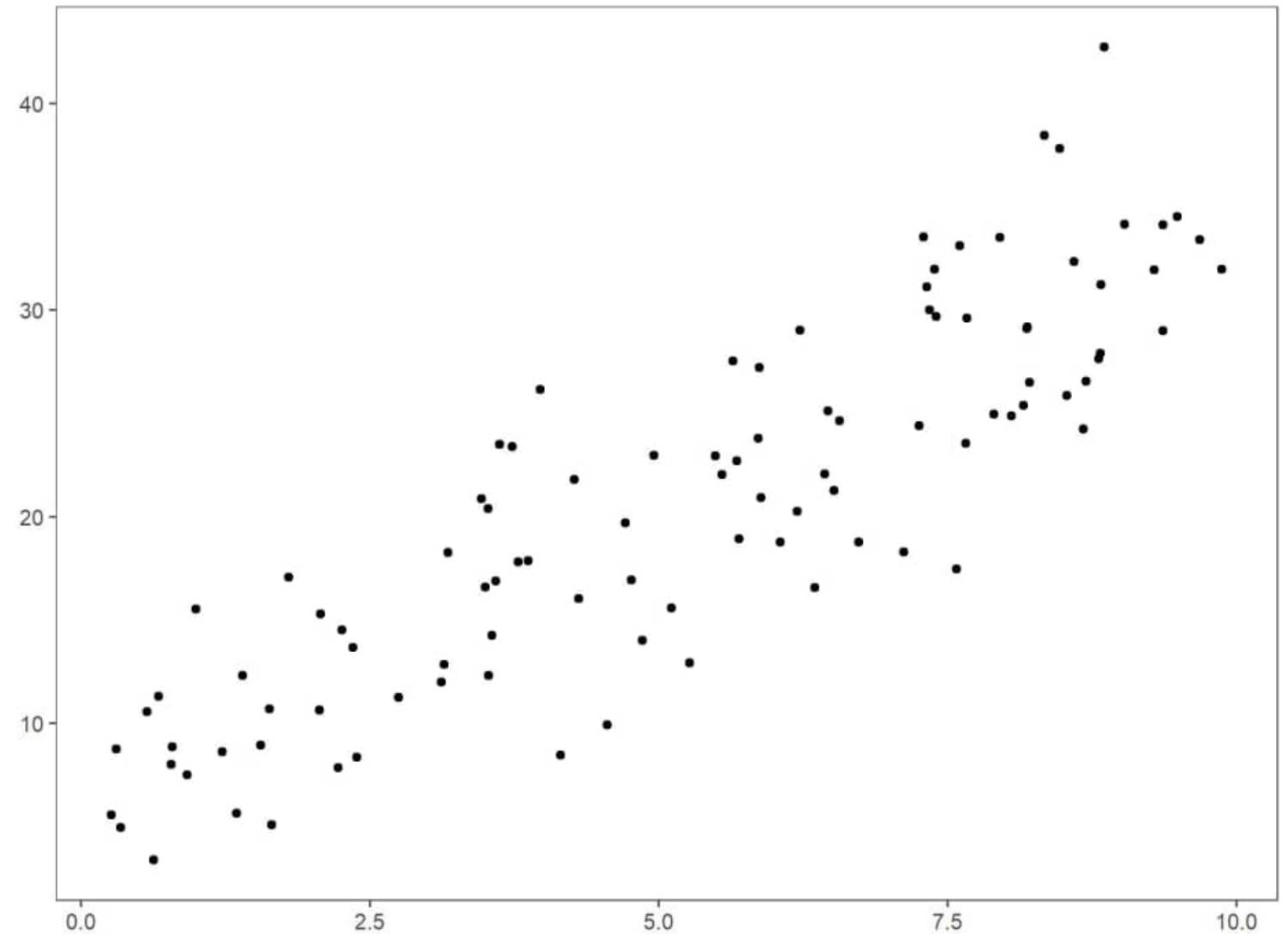
Blindly Fitting Models

- Imagine I'm working on a project. I plotted my data and saw the scatterplot to the right



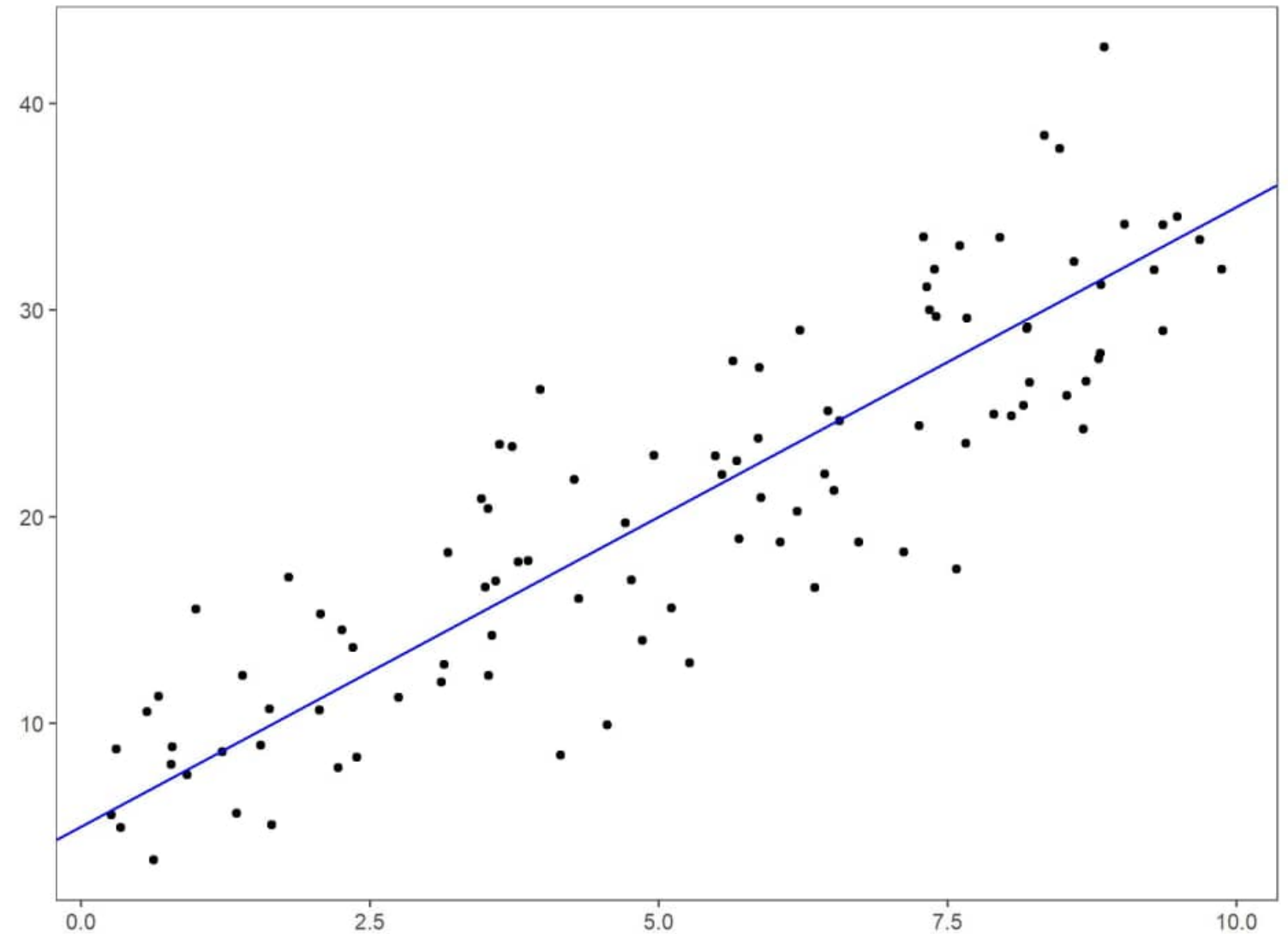
Blindly Fitting Models

- I plotted my data and saw the scatterplot to the right
- Then my boss says, “Hmm.. a linear model seems OK. You should fit one”



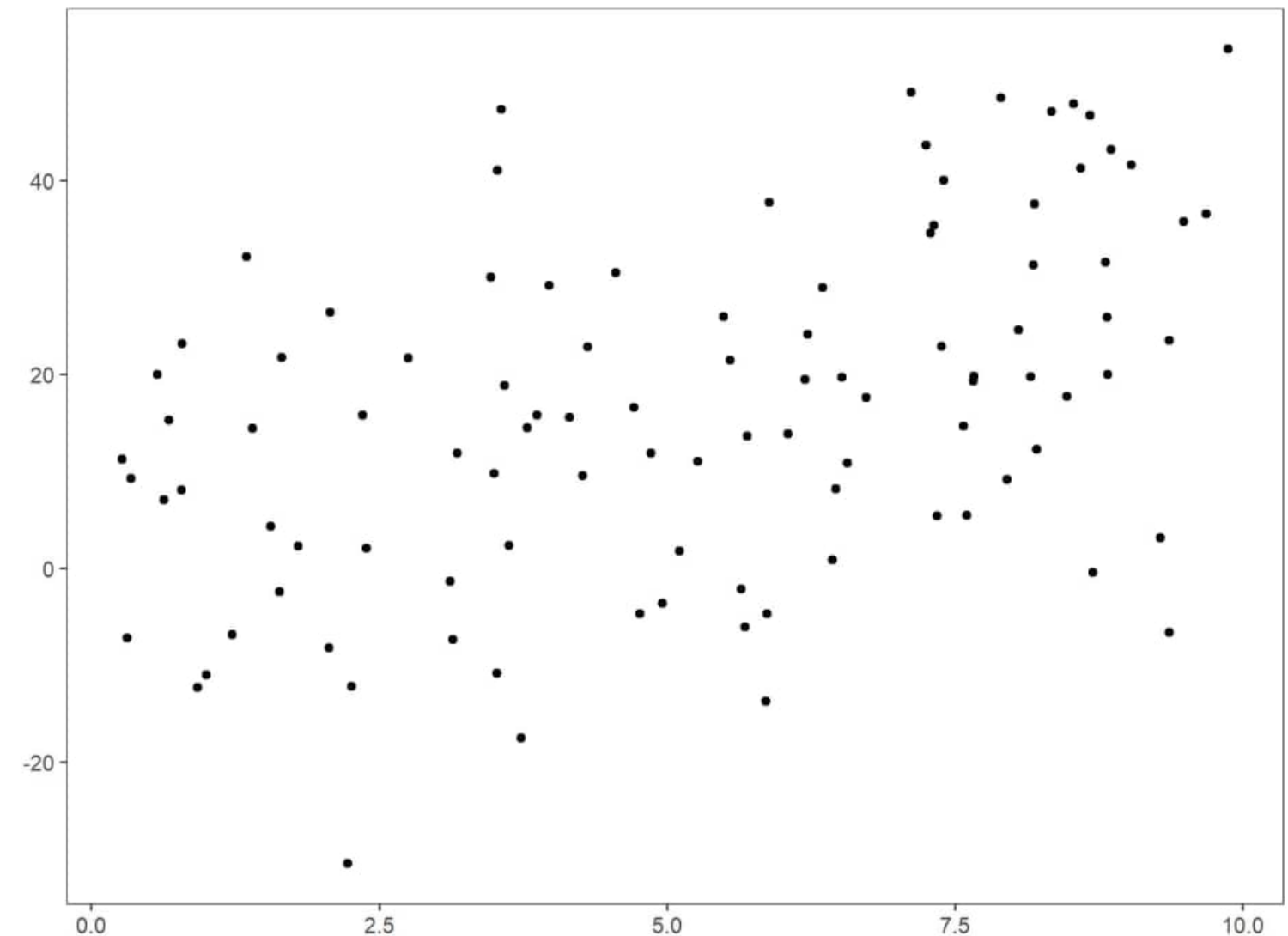
Blindly Fitting Models

- I plotted my data and saw the scatterplot to the right
- Then my boss says, “Hmm.. a linear model seems OK. You should fit one”
- $Y = a + bx$
- $b \approx 2.97, a \approx 5.43$!



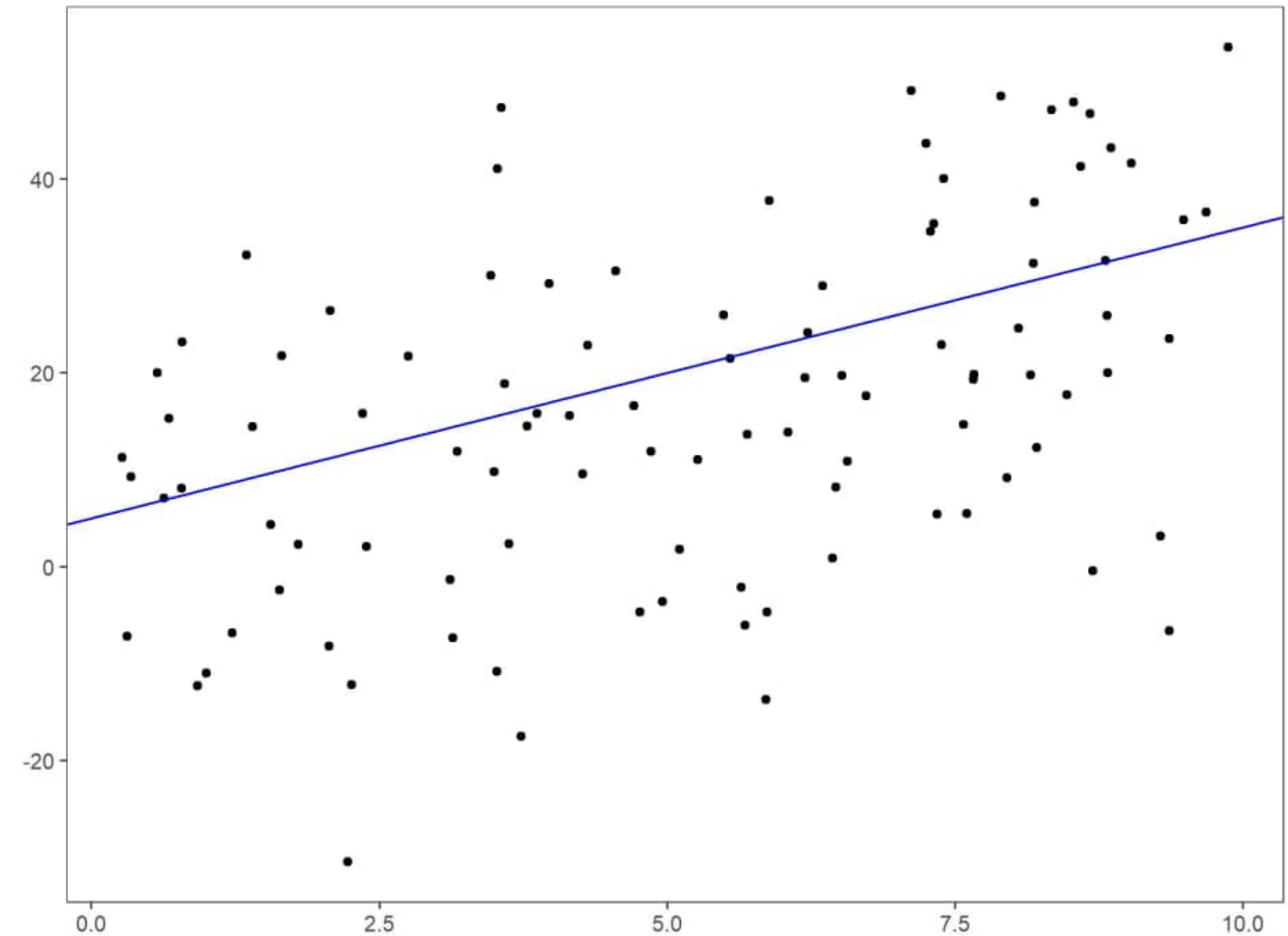
Blindly Fitting Models

- Before I go home, I get some more data from a different sensor or data source. We plot it and get the scatterplot to the right.

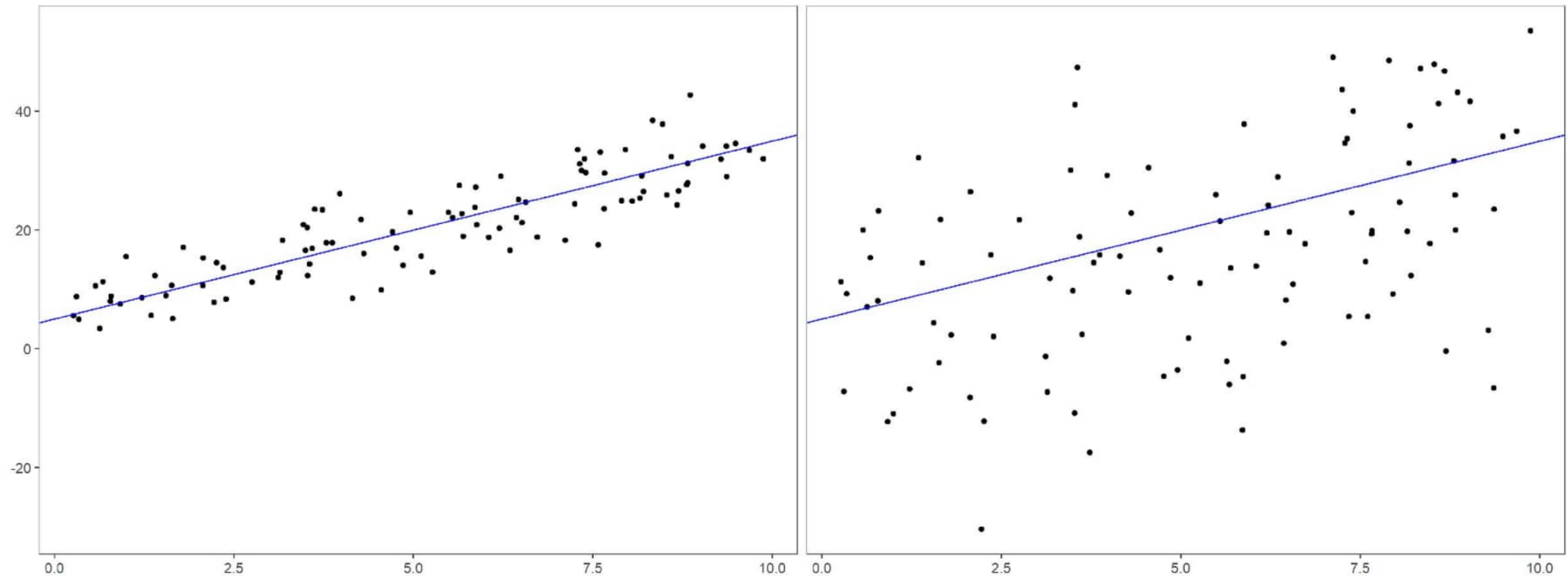


Blindly Fitting Models

- Before I go home, I get some more data from a different sensor or data source. We plot it and get the scatterplot to the right.
- I fit the linear model again, and get the line in blue.
- $Y = a + bx$

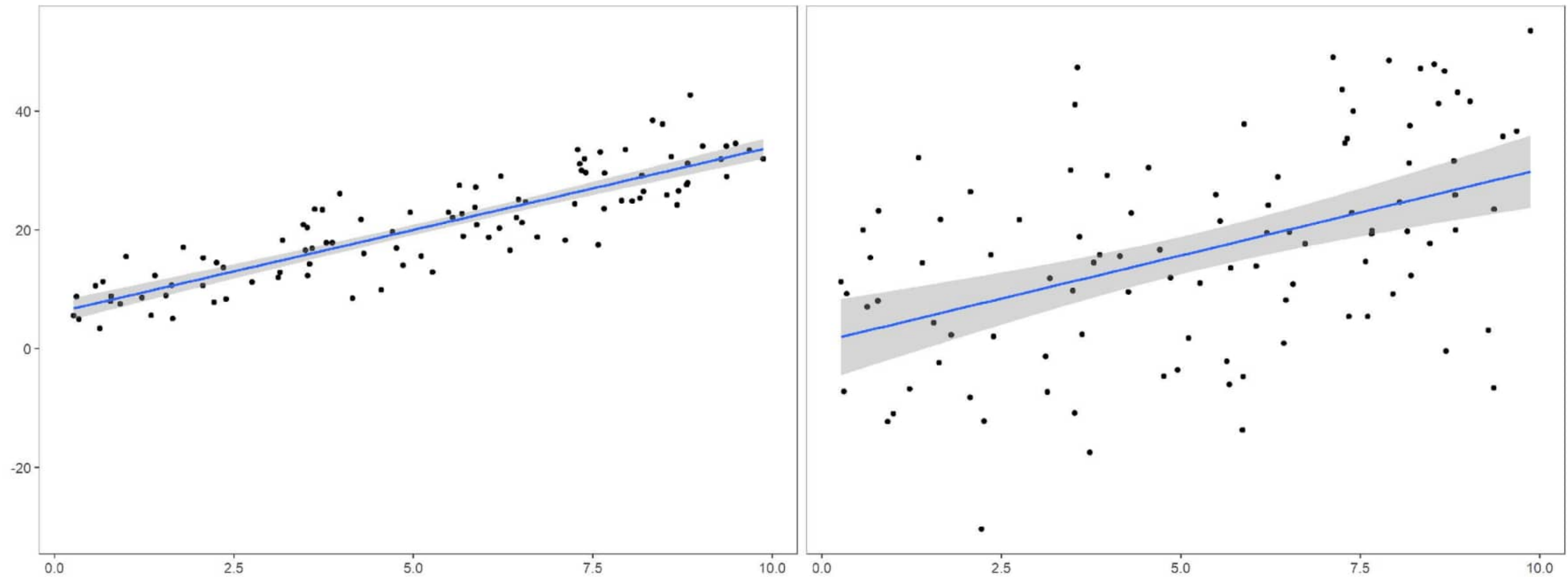


Blindly Fitting Models



They have the same linear regression line – but widely different variances !

Estimation Uncertainty

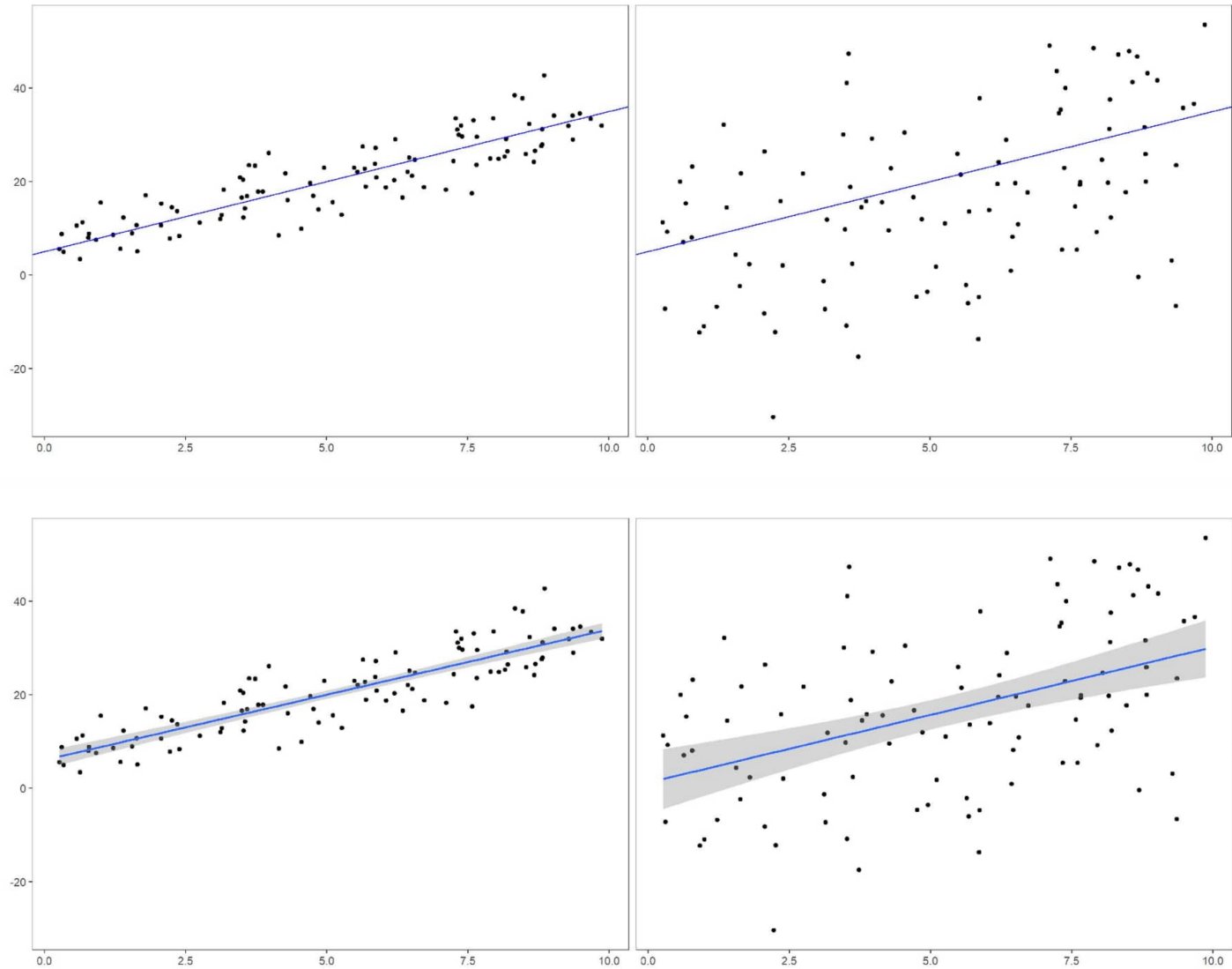


Plot your uncertainty!

Estimation Uncertainty

- We can determine most of our uncertainty using a notion of **Standard Errors**
- **Standard Errors** provide how far we expect our estimates to deviate from the truth

Estimate	Estimate	First Model SE	Second Model SE
a	2.97	0.92	3.36
b	5.43	0.15	0.56



Estimation Uncertainty

- If possible, plot your data and fits
- If using a model, always try to determine what the variance is on your estimates
- High variance of estimates → Caution in using estimates

Estimate	Estimate	First Model SE	Second Model SE
a	2.97	0.92	3.36
b	5.43	0.15	0.56

