

Understanding Relationships as “Conditional Expectations”

Understanding Political Numbers

Feb 27, 2019

Agenda

Exercise 1

Relationship therapy

Exercise...2!

Data sources

[DIME](#): campaign contributors and recipients

[US Census](#), [BLS](#)

[Polity](#): Political regimes

[Correlates of War](#): conflict, MIDs, alliances, trade flows, diplomacy

[IMF](#), [World Bank](#), [OECD](#): World economic and development data

Exercise 1

The internet will make those bad words go away



Essential

Googling the Error Message

○ RLY?

STARECAT.COM

The Practical Developer
@ThePracticalDev

How to actually learn any new programming concept



Essential

Changing Stuff and Seeing What Happens

○ RLY?

@ThePracticalDev

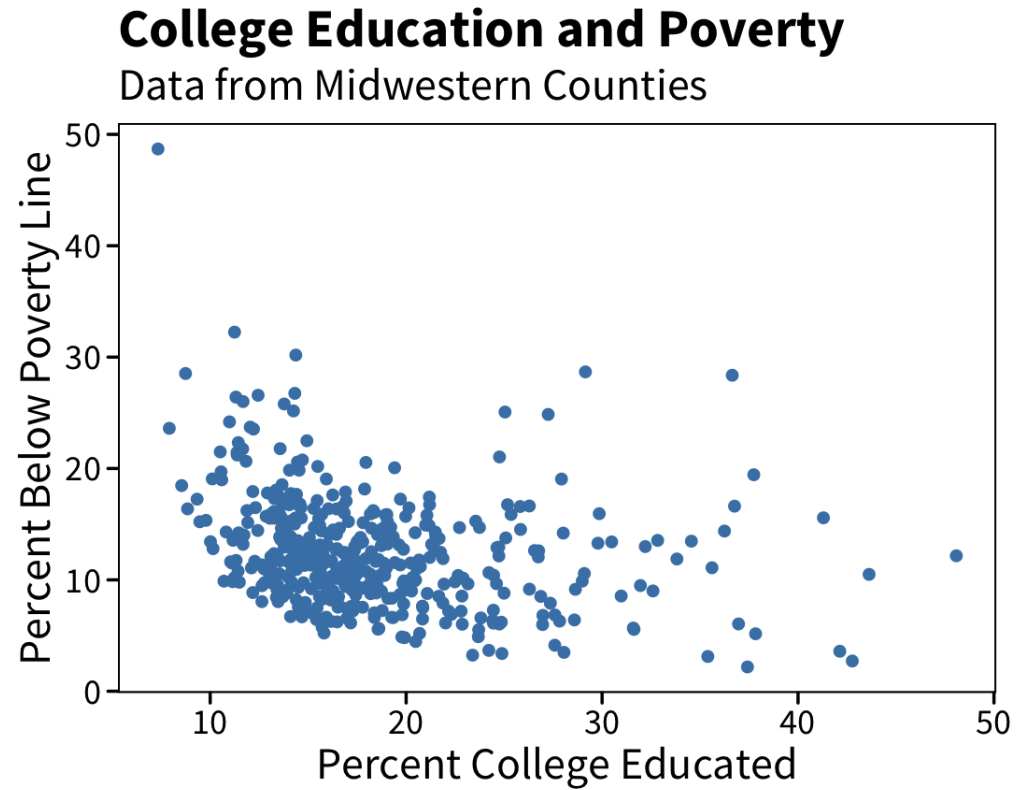
Practice (and modify) old material. Write fresh code. Use notes and internet.

Relationships

X and Y

As x increases, y does what?

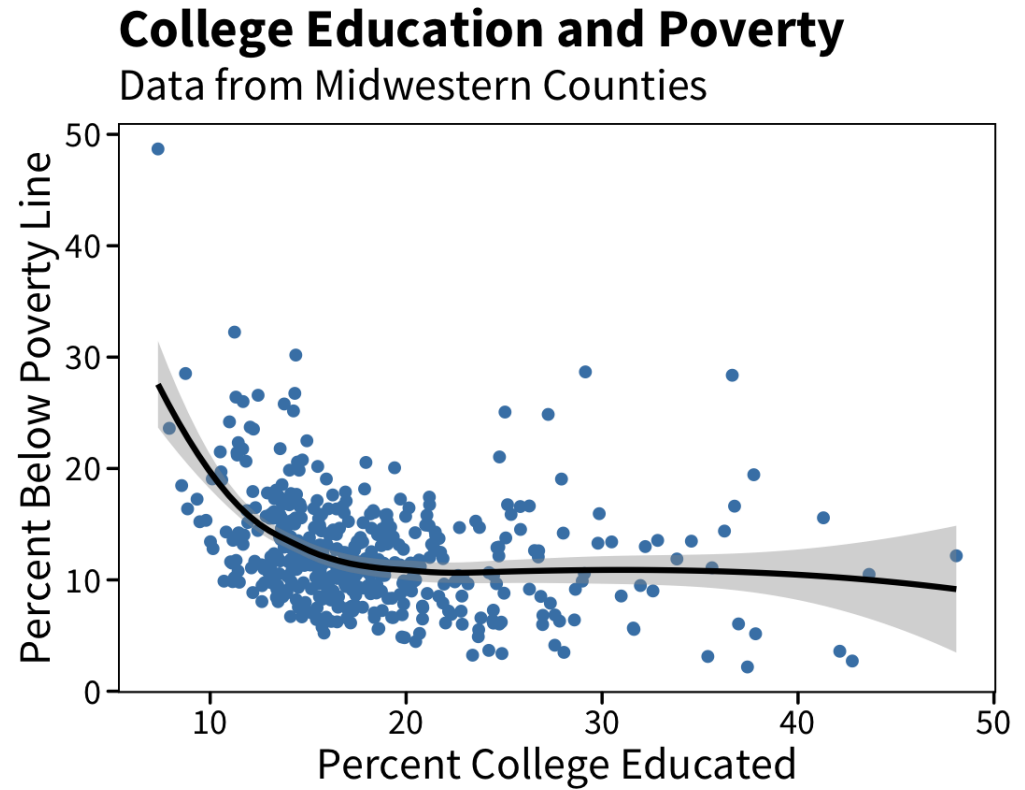
Does y change when x changes?



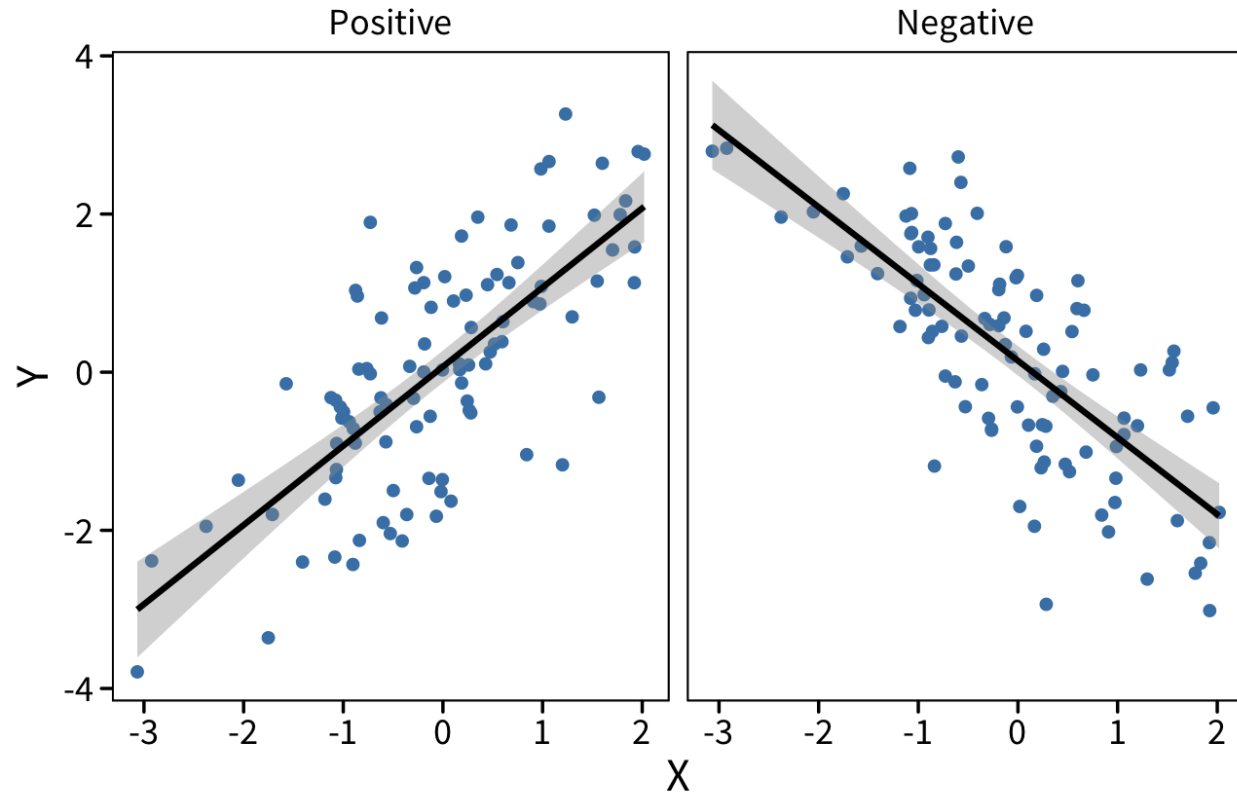
X and Y

As x increases, y does what?

Does y change when x changes?



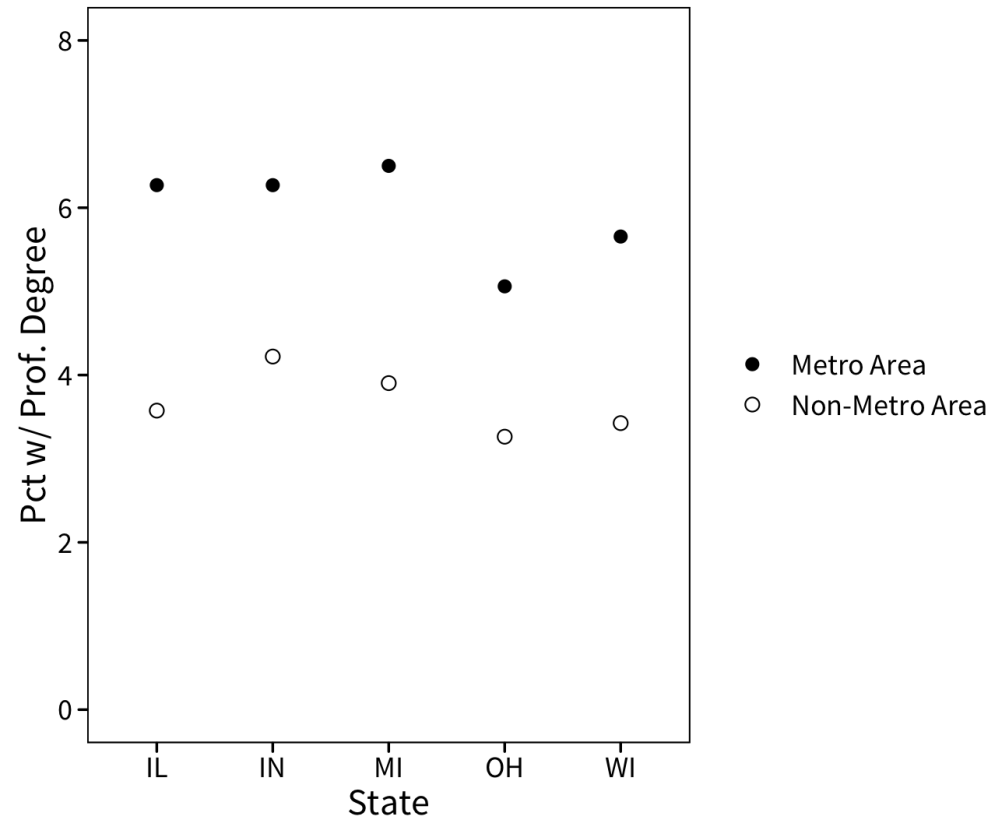
Positive and Negative Relationships



Relationships among Categorical Variables

```
prof_degrees <- midwest %>%
  group_by(state, inmetro) %>%
  summarize(prof = mean(percpof)) %>%
  mutate(
    metro = ifelse(inmetro == 1,
                  "Metro Area",
                  "Non-Metro Area")
  )

ggplot(prof_degrees,
       aes(x = state, y = prof)) +
  geom_point(aes(shape = metro),
            size = 2.5,
            fill = "white") +
  scale_shape_manual(
    values = c(16, 21)
  ) +
  coord_cartesian(ylim = c(0, 8)) +
  labs(x = "State",
       y = "Pct w/ Prof. Degree",
       shape = NULL)
```



A Mathematical Language for Relationships

$E[Y]$

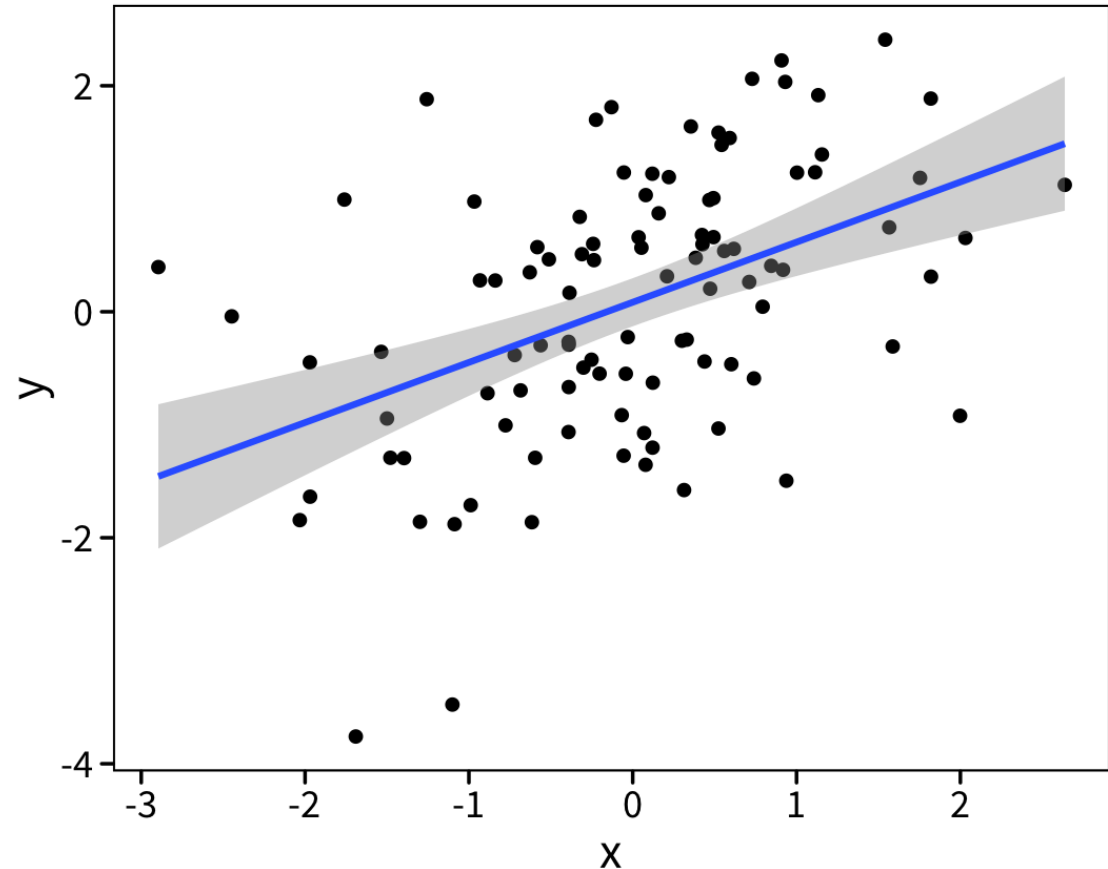
$$E[Y | X]$$

"Expected Y , given X "

$E[Y | X]$

Relationship means the expectation is changing

- Within sample: almost always some non-zero relationship
- Inference to the population: an we infer that our expectation should change in the real world?



Independence (no relationship)

$$E[Y] = E[Y | X]$$

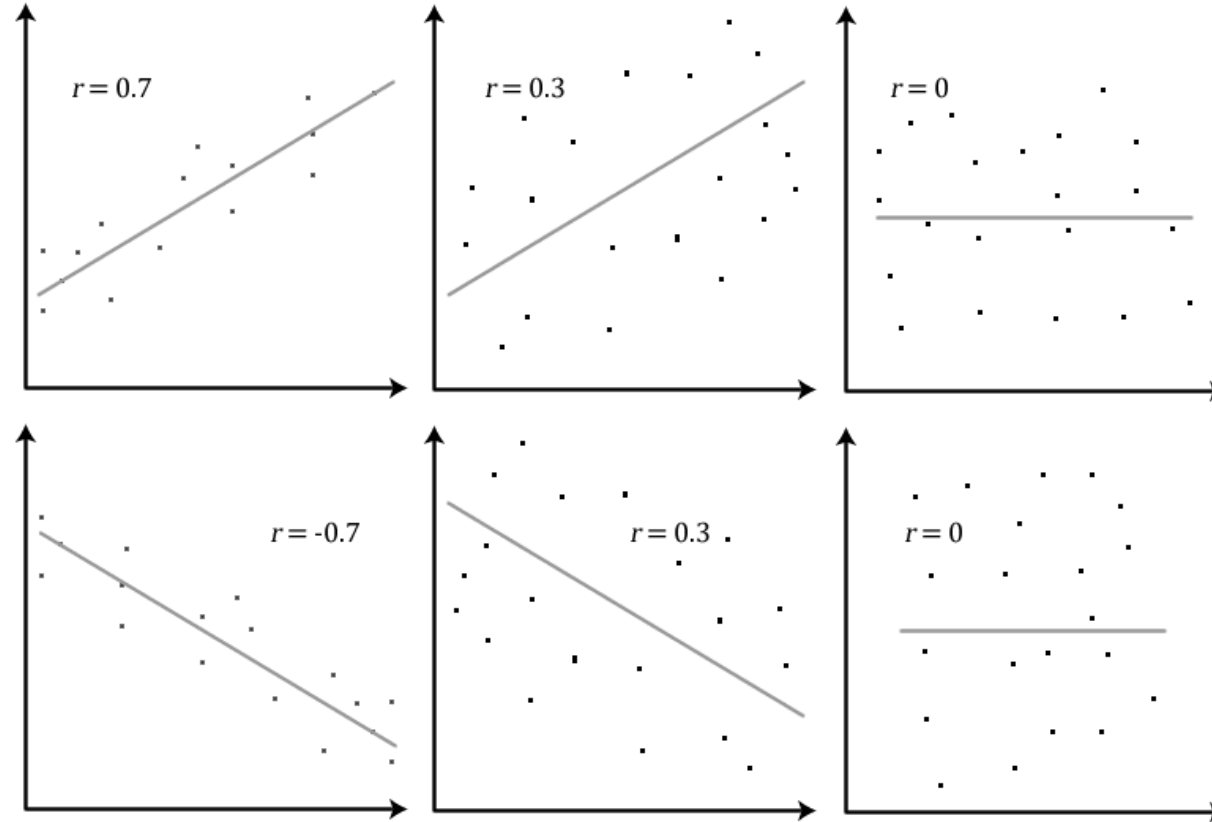
"Knowing X doesn't affect my expectation of Y "

Dependence

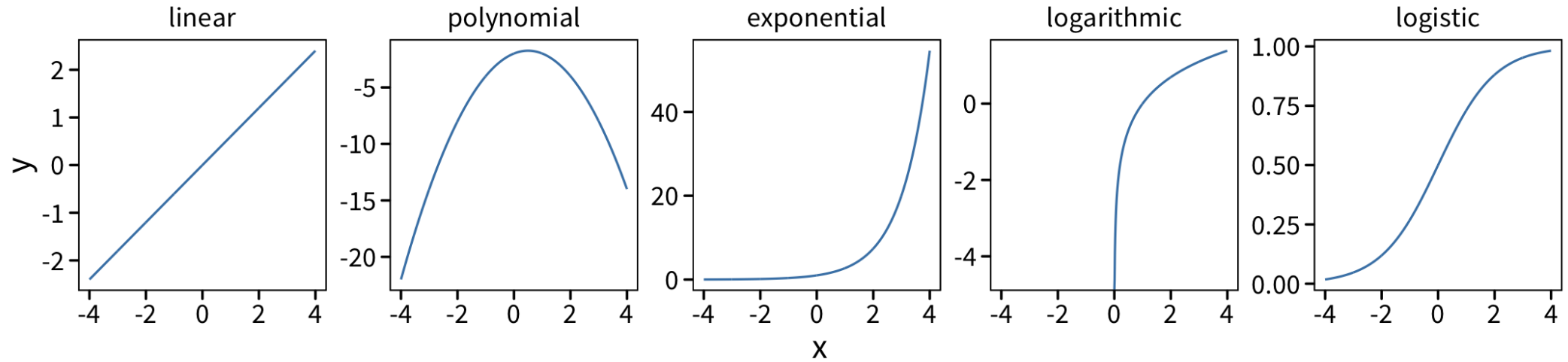
$$E[Y] \neq E[Y | X]$$

"Knowing X would change my expectation of Y "

Correlation



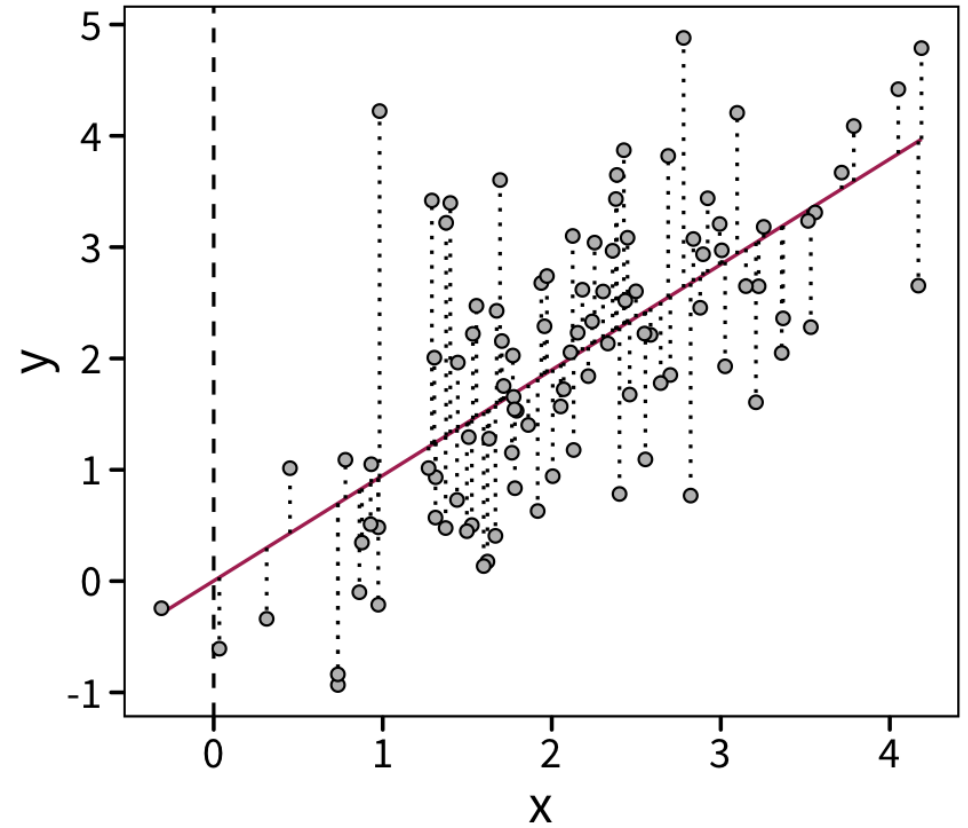
Common relationships



Finding y_i

$$y_i = a + bx_i + e_i$$

- Every observation i has an x_i and y_i
- The line $(a + bx_i)$ is our *prediction* for y_i
- The "residual" e_i is the error between actual and predicted y_i



Next week

on Monday: *linear regression*

- How do we estimate a "line of best fit"

on Wednesday: *statistical significance*

- How do we conclude that relationships are "real" or just noise?