4.9: Putting It Together- Nonlinear Models

Let's Summarize

This is what we have learned about exponential models:

The general form of an *exponential model* is $y = C \cdot b^x$.

- Exponential models are nonlinear. More specifically, exponential models predict that y increases or decreases by a constant percentage for each 1-unit increase in x.
- C is the *initial value*. It is the y-value when $x = 0$. It is also the y-intercept.
- b is the *growth factor* or *decay factor*. b is always positive.
  - If b is greater than 1, b is a growth factor. In this case, the association is positive, and y is increasing. This makes sense because multiplying by a number greater than 1 increases the initial value. From the growth factor, we can determine the percent increase in y for each additional 1-unit increase in x.
  - Similarly, if b is greater than 0 and less than 1, b is a decay factor. In this case, the association is negative, and y is decreasing. From the decay factor, we can determine the *percentage decrease* in y for each additional 1-unit increase in x.

Let's compare the general form of an exponential model to the general form for a *linear model:* $y = a + bx$.

- In the linear model, a is the *initial value*. It is the y-value when $x = 0$. It is also the y-intercept.
- b is the *slope*. From the slope, we can determine the *amount* and *direction* the y-value changes for each additional 1-unit increase in x. When b is positive, there is a positive association, and y increases. When b is negative, there is a negative association, and y decreases.

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