

Power-law relations

Log-log regressions

- Several biological relations take the form of power-law relations
- We can linearize these relations using a log-log transformation
- In this model, the slope is an estimate of the exponent of the power-law
- The interpretation of the slope is that a 1% increase in x leads to a β % increase in y

$$\log(y_i) \sim N(\mu_i, \sigma)$$

$$\mu_i = \alpha + \beta \log(x_i)$$



$$\% \Delta y \approx \beta \% \Delta x$$

Quick reference for log transformations

Model	Dependent variable	Independent Variable	Interpretation of β
Level-level	y	x	$\Delta y \approx \beta \Delta x$
Level-log	y	log(x)	$\Delta y \approx (\frac{\beta}{100}) \% \Delta x$
log-level	log(y)	x	$\% \Delta y \approx (100 \beta) \Delta x$
Log-log	log(y)	log(x)	$\% \Delta y \approx \beta \% \Delta x$