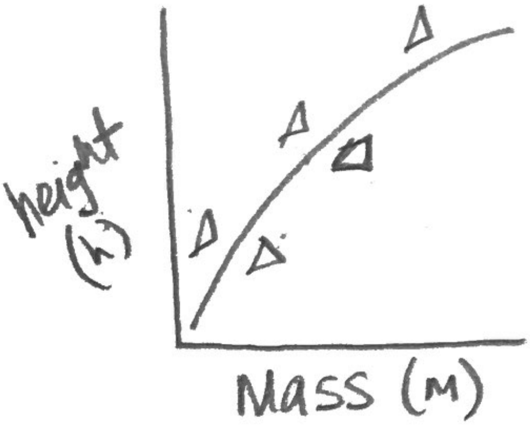
6/1/2018

CALIBRATION ERRORS

Calibration equation

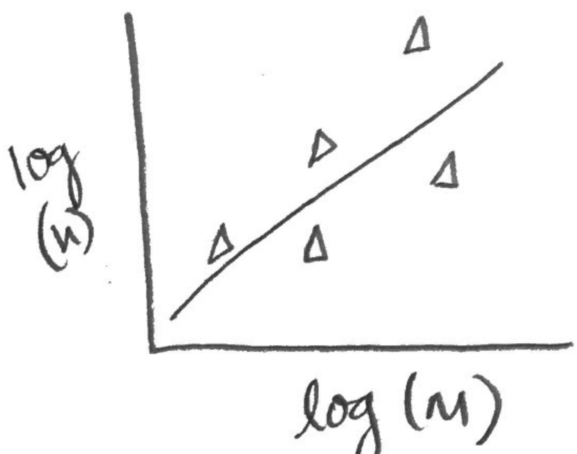
$$\begin{tikzcd} & h_i & & M_i \arrow[ll, dashed] \\ a \arrow[ur] & b \arrow[u] & \sigma_c^2 \arrow[ul] & \end{tikzcd}$$

(not μ_i)



$$M = ah^b$$
$$h = (M/a)^{1/b}$$

(allometric scaling relationship)



$$\log(h) = \tfrac{1}{b}\log(M) - \tfrac{1}{b}\log(a)$$

* you can linearize this but it is difficult to "think" in log space.

(*) Interested in estimating tree biomass
h = tree height (not Δ in height)

$$g(a,b,m_i) = (m_i/a)^{1/b}$$

$$[a, b, \sigma_c^2 \mid \underline{h}] \propto \prod_{i=1}^{n} [h_i \mid g(a,b,m_i), \sigma_c^2]$$
$$\times [a][b][\sigma_c^2]$$

→ choices for the liklihood

#1 $h_i \sim \text{gamma}\left(\frac{g(a,b,m_i)^2}{\sigma^2}, \frac{g(a,b,m_i)}{\sigma^2}\right)$

#2 $h_i \sim \text{lognormal}\left(\log(g(a,b,m_i)), \sigma_c^2\right)$

#3 $\log(h_i) \sim \text{normal}\left(\log(g(a,b,m_i)), \sigma_c^2\right)$

on the log scale

how to choose:

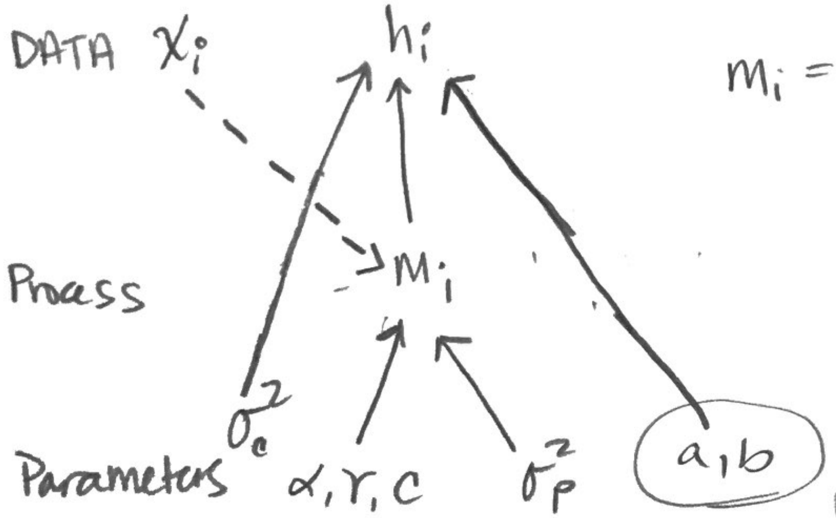
#1 if varience is constant because variance doesnt change as a function of the mean

if variance increases as a function of the mean use lognormal

no longer concerned with having negative values of the parameter (or you need full number line)

↳ you will catch this when you check your model using posterior predictive checks

* observe height but want true mass



m_i = true unobserved mass

Informed Priors from the calibration study

$$[\sigma_c^2, \alpha, r, c, \sigma_p^2, a, b, \underline{M} \mid \underline{h}] \propto \prod_{i=1}^{n} \left[h_i \,\middle|\, \left(\frac{m_i}{a}\right)^{1/b}, \sigma_c^2\right]$$

$$\times \left[M_i \mid g(\alpha, r, c, x_i), \sigma_p^2\right]$$

$$\times [\sigma_c^2][\alpha][r][c][\sigma_p^2][a][b]$$

be very careful how this is scaled b/c dependent on distribution chosen in the calibration model
gamma = exponential scale
lnorm / norm on log scale