

Likelihood and Log Likelihood

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1 Background

The likelihood is the probability that a given set of parameters would give rise to a given data set.

Formally, the likelihood is a product of probabilities.

$$\mathcal{L}(\beta) = \prod p(\beta|x, y)$$

2 Maximum Likelihood Estimation

Maximum Likelihood Estimation is essentially the process of finding the combination of parameters (e.g. β) which maximizes the likelihood of producing the data.

Joint Likelihood of Two Parameters

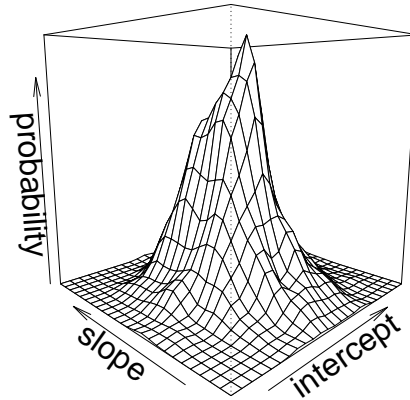


Figure 1: Joint Likelihood of Two Parameters

3 Log-Likelihood

Because probabilities are by definition < 1 , the likelihood \mathcal{L} tends to be a very small number. For a variety of reasons, it is often easier to work with the logarithm of the likelihood: $\ln \mathcal{L}$.

4 Visualizing the Likelihood and Log-Likelihood

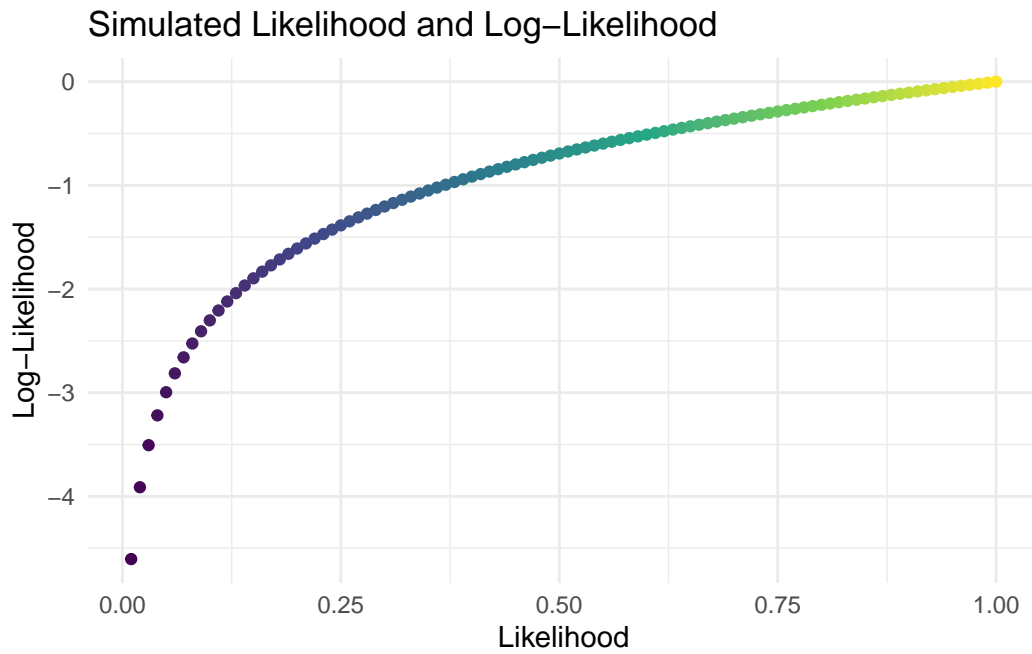


Figure 2: Likelihood and Log-Likelihood

5 Conclusion

Higher values of the *log-likelihood*, closer to 0, represent models with a better fit.