Statistics with Spa  ows

Lecture 11

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Other ways than OLS to estimate b's…

- Maximum likelyhood
- Bayesian inference
- Bootstrap
- Jack-knifing
- Sensitivity analysis

Maximum Likelihood Estimation

- Another way to estimate parameters
- Maximizes the likelihood that the data you have comes from the model you assume

Maximum Likelihood Estimation

- Example: we throw a coin:

- Heads, head, tail, heads, tail
- 3 heads, 2 tails

Maximum Likelihood Estimation

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- Assuming p = 0.5, the likelihood is 0.031

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- Assuming p = 0.5, the likelihood is 0.031
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- Assumption: p = 0.6 -> q = 0.4
- Likelihood: $0.6^3 * 0.4^2$

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- Assumption: p = 0.6 -> q = 0.4
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- Assumption: p = 0.75, q = 0.25

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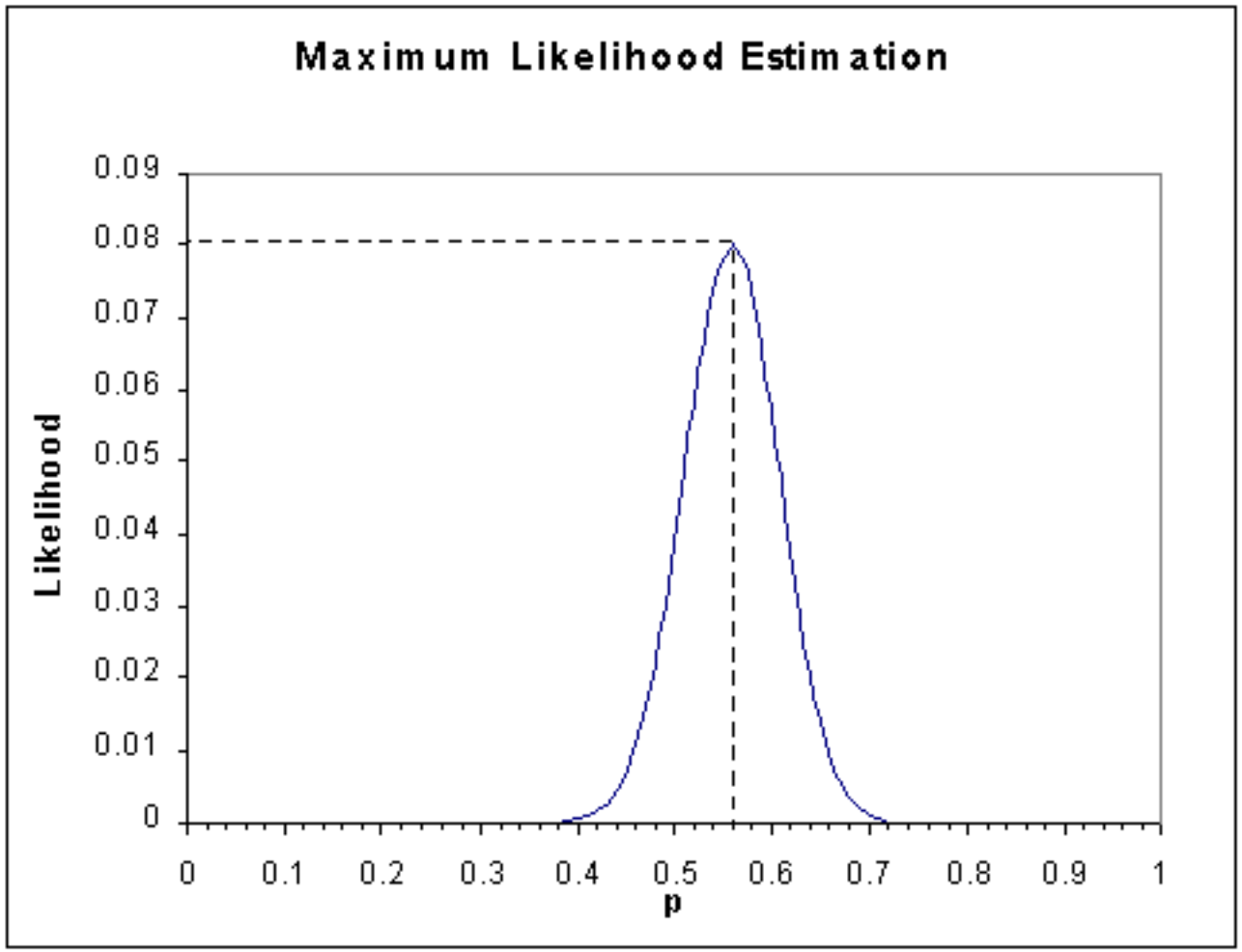
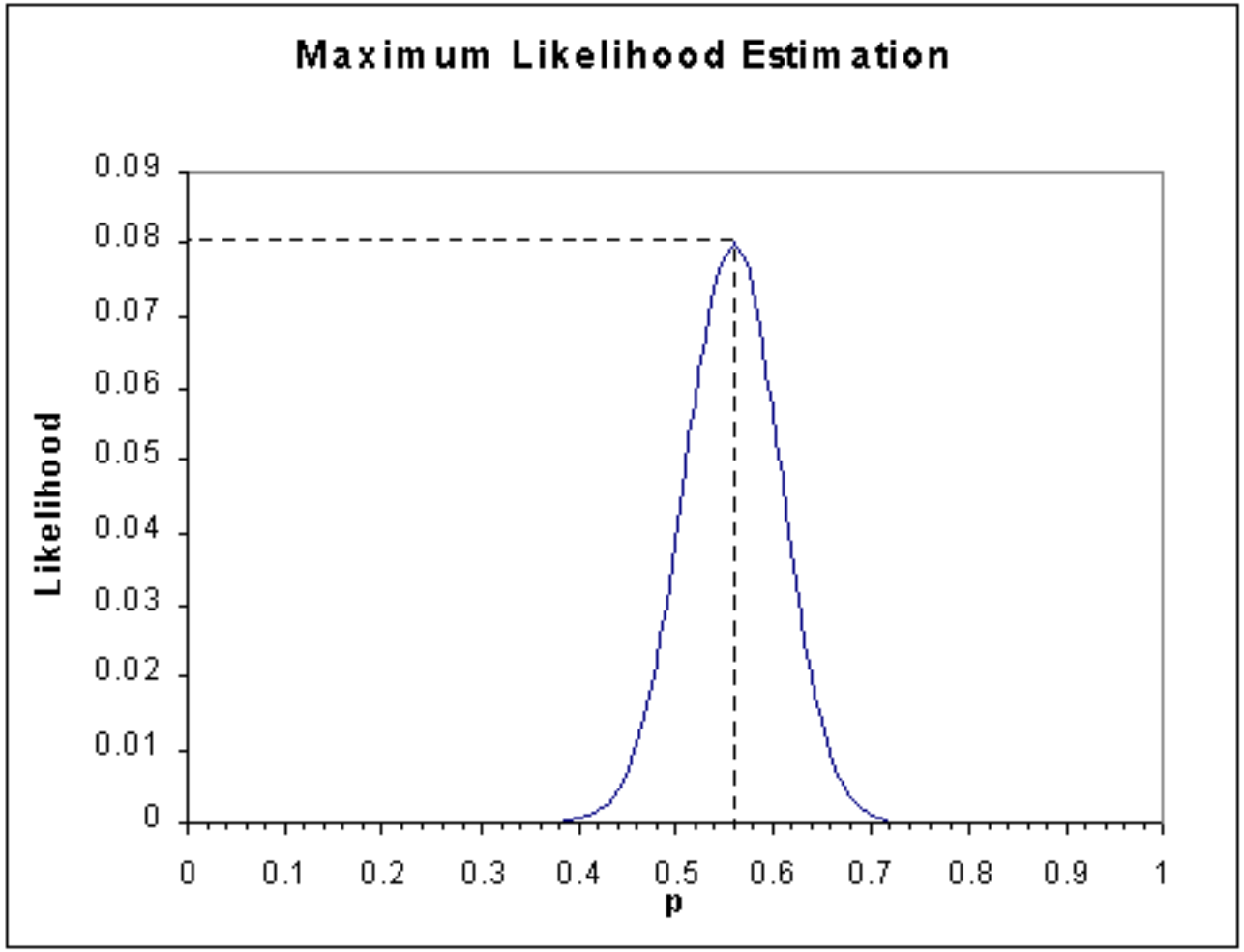
- Likelihood: 0.33

Maximum Likelihood Estimation



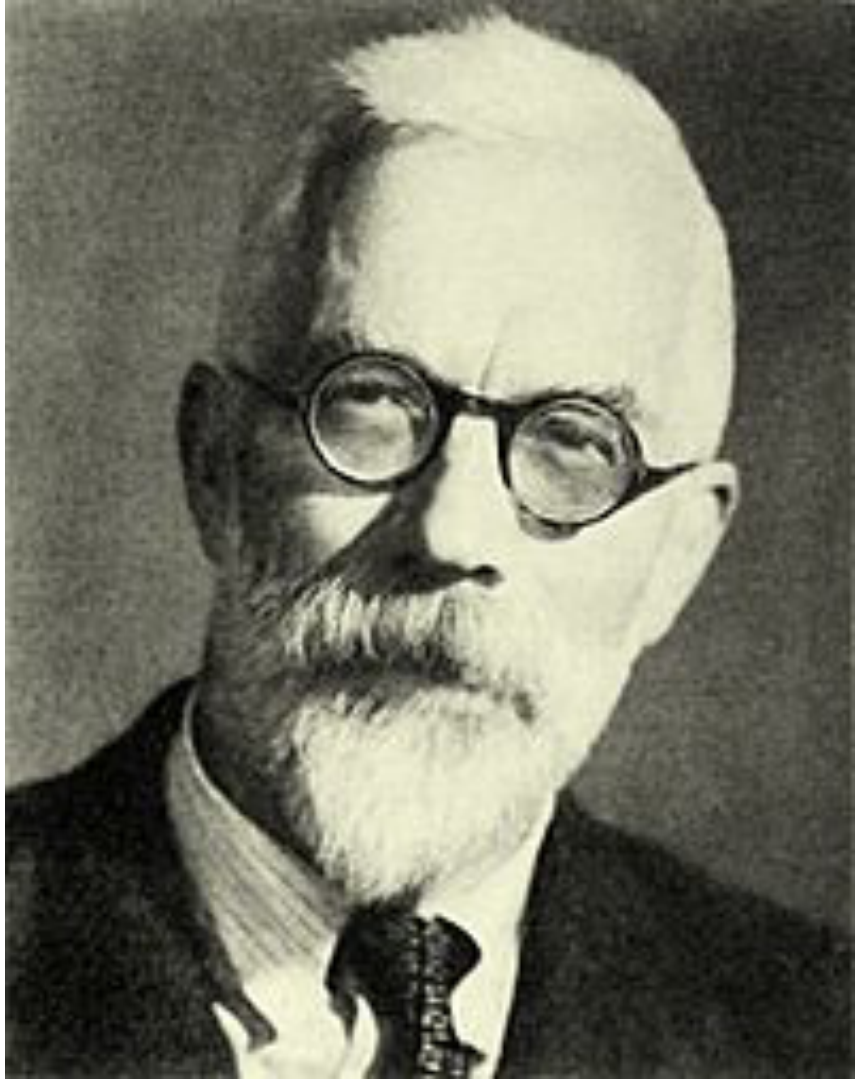
Maximum Likelihood Estimation



Ronald Fisher

Your new idol

- Father of
- Statistics
- Modern evolutionary synthesis
- Quantitative genetic



"a genius who almost single-handedly created the foundations for modern statistical science" (said someone I don't know)

"the greatest biologist since Darwin" (said R. Dawkins)

also an eugenist and thus not always nice guy (says I) – but I am in awe of his genius!

ML estimation

- Usually arithmetic with some iterations (going back and forth, “trying” things)
- We want to MAXIMIZE ML
- Due to some arithmetic magical things, it’s often easier to maximise the LogLikelihood
- That’s ok, too.

ML vs OLS

- Both most often used
- Similarly precise

- OLS inappropriate when assumptions are violated (response and/or residuals not normally distributed)

Bayesian inference

- Thomas Bayes, 1701–1760

- Uses likelihood and previous knowledge
- Solution is not uniform
- Many solutions with different probabilities (degrees-of-belief)

Bootstrapping

- Re-sampling sample to get estimates

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Jack-knife

- Sampling sample n-1
- N-2
- …

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Sensitivity analysis

- Systematically exclude datasets